

The Dynamics of Self-Regulation Model in the Domain of
Problematic Internet Usage: Can Commitment and Progress Frameworks Help Regulate
Problematic Internet Use?



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ABSTRACT

Problematic Internet Usage (PIU) is a growing public health concern and despite an upsurge in research, there is limited information regarding effective psychological interventions. PIU has been shown to be associated with many adverse life outcomes and psychosocial disorders such as depression, anxiety, loneliness, social anxiety, eating disorders, sleep problems, relationship and family breakdowns. PIU interventions are yet to show strong evidence of efficacy or effectiveness. In order to gain control over PIU individuals need to self-regulate their behaviours.

The Dynamics of Self-Regulation model may provide a useful framework for developing psychological interventions for PIU. The model has mainly been tested in consumer and marketing research and has yet to be applied in a clinical domain. The model explains and predicts how opposite behaviour outcomes can be achieved by holding commitment or progress frameworks.

In a series of five studies, the research project tested the dynamics of self-regulation model in the domain of PIU. The first study tested a single component of presentation format. Actions can be presenting choices together (so that they appear to complement each other) or apart (so that they appear to compete against each other). Results suggested that the theory is applicable to the PIU domain, with participants forming mental frameworks and indicating their perceived behaviour values in directions predicted by the theory.

The second, third and fourth studies took additional components of the model: questions about commitment or progress, high versus low engagement of goals, and abstract goals versus concrete goal actions. Asking questions about commitment or progress is enough to prime those frameworks leading to the opposite behavioural effects. Highly engaged individuals are certain of their commitment and therefore tend to focus on their progress (forming a progress frame), whereas lower engaged individuals tend to

worry if they are committed or not (forming a commitment frame). Focusing on the concrete steps to achieve a goal gets individuals to concentrate on their progress whereas focusing on the high-level goal emphasises their commitment to the goal. Results from these studies also supported the model. Commitment and progress frameworks were able to be primed and participants then valued perceived behaviour choices in directions as predicted by the model.

In the final study, an online randomised control trial was conducted over 21 days to test an intervention constructed using the previously tested components of the model. The study measured daily personal Internet hours and used a population of individuals who met criteria for PIU, according to the Internet Addiction Test (IAT).

Results showed that, after 21 days, participants in the experimental group had reduced their daily personal Internet hours significantly more than the active control group, who employed self-monitoring. In addition, one third of participants in the experimental group reduced their IAT scores to below clinical cut-off scores for PIU.

The research suggests that the framework may provide a promising approach to regulate problematic Internet use leading to a reduction of PIU and a lessening in subsequent negative life outcomes for individuals.

DECLARATION

I, David William Dunbar, certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any University or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any University or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

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OVERVIEW

Outline of Thesis

This research project aimed to determine whether the dynamics of self-regulation (DSR) model could be applied to a clinical domain and, if so, whether it could create positive clinical outcomes. Problematic Internet Usage (PIU) was chosen as an appropriate clinical domain, as it is a relatively new issue for society and for research, is a world-wide phenomenon, and because failures in self-regulation and self-control processes are regarded as fundamental components of the problem.

An initial study was created to test a single component of the model in the domain of PIU. After the success of that study, three further studies were undertaken to test additional features of the model. Following the success of the first four studies, an online randomised controlled trial (RCT) was conducted that specifically targeted a clinical population of individuals identified as experiencing PIU using a theory-driven intervention based on the first four studies of the DSR model.

The structure of this thesis follows the framework of the research described above. Chapter 1 provides an introduction and overview of PIU. Chapter 2 examines the self-regulation and self-control literature, introduces and reviews the DSR model, and presents the research aims.

Chapters 3, 4 and 5 contain the original research in the form of manuscripts that have been prepared for and submitted to, or prepared for and published by, peer-reviewed academic journals. Chapter 3 presents a published empirical study that situates the DSR model in the clinical domain of PIU. Chapter 4 contains a published set of three empirical studies that test additional components of the model. Chapter 5 presents a manuscript submitted for publication that shows the results of an online RCT using an intervention motivated by the results of the first four studies and the DSR model. The RCT targeted a clinical population of individuals identified as experiencing PIU and employed an active-

control group (using self-monitoring) to provide the best chance of discovering if any positive effects were produced by the intervention.

The manuscripts presented in Chapters 3, 4 and 5 are identical to those that have been accepted for publication or submitted for publication to peer-reviewed academic journals with only minor exceptions. Specifically, the numberings of headings, Tables and Figures have been changed for consistency with the format of the current thesis. As well as this, the reference sections have been combined in to a single reference section at the end of the thesis. There is some duplication of content between chapters as they contain manuscripts as prepared for peer-reviewed journals. Australian English spelling is used throughout the thesis except for prepared manuscripts in Chapters 3, 4 and 5, as American English spelling was a publication requirement of the journals they were prepared for.

The thesis concludes with a final chapter that provides a synthesis of all findings, theoretical and practical implications of the research, limitations and strengths, future directions, and concluding comments. References for the entire thesis are presented in a single section at the end of the paper. Published versions of manuscripts are provided in the Appendices.

Chapter 1: Problematic Internet Use

1.1 Problematic Internet Usage is a Rising and Global Trend.

From a few million users in 1995, the number of individuals using the Internet has grown to an estimated more than 5 billion worldwide (International Telecommunication Union, 2019; Internet World Stats, 2019). The growth rate over the last 15 years has averaged around 10% annually and is only slowing down due to many countries reaching saturation levels (International Telecommunication Union, 2019; Internet World Stats, 2019). The incredible growth in Internet use was not started by the smart phone revolution, but this appears to be helping to increase it, through an estimated 3 billion unique mobile Internet subscriptions globally (O'Dea, 2020; Taylor & Silver, 2019). With the growing uptake in mobile network subscriptions, individuals can now connect to the Internet anywhere in the world and at any time (Australian Communications and Media Authority, 2014; comScore, 2014). Almost two thirds of the world's population is now accessing the Internet and in most developed countries that percentage is from 80% to 90%, with some almost reaching 100% of their population (Internet World Stats, 2019). The median ownership of smartphones in countries with advanced economies is 76% and 45% in emerging economies. This number is well into the 90% range for those aged 18-49 years in many countries, with older generations catching up (Taylor & Silver, 2019).

The Internet is integrated into our societies and has become an indispensable conduit for social communication, education, employment, academic research, and entertainment. Despite its many positive benefits (Baym, 2015), there is a growing number of studies showing that use of the Internet can sometimes be problematic (Aboujaoude, 2010; Billieux & Van der Linden, 2012; Cash et al., 2012; Didelot et al., 2012; Fisoun et al., 2012; Jelenchick et al., 2014; Ko et al., 2012; Kuss & Lopez-Fernandez, 2016; Muusses et al., 2014; Pontes et al., 2015; Škařupová et al., 2015; Spada, 2014; Weinstein et al., 2014; World Health Organization, 2015).

Psychology researchers have been aware of the potential pitfalls of problematic Internet use (PIU) for over two decades since questions about PIU were originally raised (Griffiths, 1996; O'Reilly, 1996) and the first published case was recorded (Young, 1996). Researchers suggest that scientific knowledge of PIU has trailed the technological advancement in Internet use because of variations in defining the problem space, inconsistent and different methodological approaches used in research, and even disagreements about its actual existence (Aboujaoude, 2010; Block, 2008; Cash et al., 2012; Greenfield, 2018; King & Delfabbro, 2014; Kuss & Lopez-Fernandez, 2016; Pies, 2009; Spada, 2014; Winkler et al., 2013).

Psychological research regarding PIU has increased in recent years, but there is still not enough known about PIU to draw anything other than preliminary conclusions about its etiology, underlying mechanisms and treatment approaches (Billieux & Van der Linden, 2012; Cash et al., 2012; Weinstein et al., 2014; Winkler et al., 2013). Researchers view PIU as a pathology or addiction (Ha et al., 2006b; Poli & Agrimi, 2012; Young, 1996, 1998b), a cognitive-behavioural problem (Caplan, 2002; Davis, 2001), a socio-cognitive construct (LaRose & Eastin, 2004; LaRose et al., 2003), or as self-control failures in regulating mood and behaviours (Tokunaga, 2016).

Perhaps the most difficult hurdle researchers have to overcome in studying PIU is the debate around classification of maladaptive or dysfunctional use of the Internet (Aboujaoude, 2010; Fernandes et al., 2019; Kuss & Lopez-Fernandez, 2016; LaRose et al., 2003; Pontes et al., 2015; Spada, 2014; Starcevic & Aboujaoude, 2017; Tokunaga, 2015, 2017; Weinstein et al., 2014). The latest versions of the World Health Organization International Classification of Diseases (ICD-11) and the American Psychiatric Association Diagnostic and Statistical Manual of Mental Disorders (DSM-V) do not include any relevant diagnoses of PIU (American Psychiatric Association, 2013; World Health Organization, 2018). Indeed, there is still no consensus in the scientific literature

on what to call PIU, as it is also known as Internet addiction, Internet addiction disorder, pathological Internet use, excessive Internet use, Internet dependence, compulsive computer use, and virtual addiction (McIntyre et al., 2015; Shaw & Black, 2008; Spada, 2014; Weinstein et al., 2014).

The most common terms used in the research are Internet Addiction (IA) or Problematic Internet Use (PIU) and these terms subsume most other categorisations (Fernandes et al., 2019; Tokunaga, 2015; Yellowlees & Marks, 2007). These terms are sometimes (erroneously) used interchangeably. Throughout this thesis, the term Problematic Internet Use (PIU) is used, a term introduced by Beard and Wolf (2001), for as will be discussed, the addiction or pathology position is questionable, restrictive and lacks theoretical clarity. In contrast, the term *problematic* is unfettered from a pathology model and allows discussion of the broad range of maladaptive Internet behaviours from the minor to the extreme (Ang et al., 2012; Caplan, 2002). Specific note will be made when speaking directly about IA.

1.2 Associations, Comorbidities, and Psycho-Social Factors

Regardless of the lack of agreement in the literature about the nature and definition of PIU, there can be no doubt that certain individuals suffering from problematic Internet use have significant issues that warrant and require therapeutic interventions (King & Delfabbro, 2014; Przepiorka et al., 2014; Shek et al., 2009; Winkler et al., 2013; Young, 2007). There is now an abundance of literature including original empirical research, systematic reviews, and meta-analyses demonstrating that PIU is associated with many psychosocial disorders, comorbidities, and a range of dysfunctional behavioural patterns that lead to adverse and potentially serious life outcomes. A summary of these are shown in Table 1.1

Due to the large number of comorbid conditions that exist, a predominance of cross-sectional studies and lack of longitudinal research, there is difficulty in attributing

causality to the etiology and maintenance of PIU (Beard, 2005; Jorgenson et al., 2016; Weinstein et al., 2014; World Health Organization, 2015). Some recent research is beginning to shed light on certain aspects but the evidence is still sparse (Müller et al., 2019; Müller et al., 2017; Wölfling et al., 2019).

These difficulties can be seen in the example of loneliness investigated by Nowland et al. (2018). Social connections and relationships are increasingly established and maintained in the online world and the researchers theorise that a bidirectional and dynamic relationship exists between loneliness and using the Internet for social connection. Their model proposes that, if the Internet is used as a means to enhance current relationships and create new ones, it can be seen to benefit loneliness. However, if the Internet is used as a shield from difficulties with face-to-face social interaction it can increase loneliness and be detrimental to well-being. Therefore, Internet use can lead to both positive or negative outcomes in relation to loneliness. In contrast, loneliness is also a cause of social Internet use and loneliness is said to be linked to withdrawal behaviours and interpretative biases that can lead to maladaptive uses. That is, loneliness can lead to harmful use of the Internet. Thus, loneliness is both a cause and effect of Internet use (Nowland et al., 2018). Similar arguments have been made for depression (Davis, 2001) and social anxiety (Caplan, 2007).

Although there is a lack of agreement about causality of PIU, almost all research suggests that self-regulation processes play a key role in development and persistence of PIU (Billieux & Van der Linden, 2012; Kuss & Lopez-Fernandez, 2016; LaRose et al., 2003; McIntyre et al., 2015; Özdemir et al., 2014; Pontes et al., 2015; World Health Organization, 2015; Yau et al., 2013).

Table 1.1*Psychosocial issues and comorbidities associated with PIU*

Psychosocial Issue	References
Depression	(Bernardi & Pallanti, 2009; Caplan, 2002; Carli et al., 2013; Davis, 2001; Ho et al., 2014; Kim et al., 2006; Lam & Peng, 2010; LaRose, Eastin, et al., 2001; LaRose et al., 2003; Tokunaga & Rains, 2010)
Anxiety	(Bernardi & Pallanti, 2009; Ho et al., 2014; LaRose et al., 2003; Spada, 2014; Weinstein et al., 2014)
Stress	(Caplan, 2002, 2003; Davis, 2001; Lam et al., 2009; LaRose et al., 2003; Wang et al., 2015)
Social Anxiety	(Aboujaoude, 2010; Bernardi & Pallanti, 2009; LaRose et al., 2003; Odacı & Çelik, 2013; Pontes et al., 2015; Sapacz et al., 2016; Shapira et al., 2003; Tokunaga, 2014; Tokunaga & Rains, 2010; Weinstein et al., 2014)
Loneliness	(Caplan, 2007; Davis, 2001; Kim et al., 2009; Kuss et al., 2014; Nowland et al., 2018; Odacı & Çelik, 2013; Özdemir et al., 2014; Tokunaga, 2017; Tokunaga & Rains, 2010, 2016; Weinstein et al., 2015)
Eating Disorders including anorexia nervosa, bulimia nervosa, binge-eating disorder, food preoccupation, loss of control eating, and dieting	(Hinojo-Lucena et al., 2019)
Sleep Problems such as insomnia, short sleep duration, and poor sleep quality	(Lam, 2014)
Suicidality with higher ideation and attempts even when adjusted for depression	(Cheng et al., 2018; Kim et al., 2006)
Academic Performance difficulties	(Shapira et al., 2003; Tokunaga, 2014, 2016; Young, 2004)
Work Performance difficulties and Work Burnout	(Avcı & Şahin, 2017; Iwaibara et al., 2019; Shapira et al., 2003; Tokunaga, 2016, 2017; Young, 2004)
Alcohol Dependence	(Buneviciene & Bunevicius, 2020; Ho et al., 2014; Kuss et al., 2014; Weinstein et al., 2014)
Hostility/Aggression	(Carli et al., 2013; Yen et al., 2007)
Family and Relationship Issues	(Aboujaoude et al., 2006; Tokunaga, 2016; Young, 2004)
Obsessive Compulsive Disorder (OCD)	(Ha et al., 2006a; Ho et al., 2014; Kuss & Lopez-Fernandez, 2016; Weinstein et al., 2014)
Attention Deficit Hyperactivity Disorder (ADHD)	(Bernardi & Pallanti, 2009; Ha et al., 2006a; Ho et al., 2014; Kuss et al., 2014; Spada, 2014; Weinstein et al., 2014; Yen et al., 2007)

1.3 Theories

The majority of research conceptualises PIU in three different ways. PIU is modelled as an addiction or pathology (Beard, 2005; Beard & Wolf, 2001; Griffiths, 1996, 2000b; Young, 1996, 1998a, 1998b), according to a cognitive-behavioural model (Caplan, 2002; Davis, 2001), or according to social-cognitive theory (LaRose & Eastin, 2004; LaRose et al., 2003).

1.3.1 Internet Addiction as a Disease or Pathology

The Internet addiction (IA) model is generally defined as a dysregulated preoccupation with the Internet, resulting in urges and behaviours to spend more time on the Internet, leading to harm and distress across numerous life domains (Pontes et al., 2015). It has been likened to substance use and impulse control disorders. Researchers who take this perspective have used the psychiatric disorder criteria of psychoactive substance dependency and pathological gambling to fashion their models and assessment measures (Beard & Wolf, 2001; Griffiths, 2005; Young, 1998b). It is commonly agreed by researchers taking this approach that IA is a behavioural addiction (Jorgenson et al., 2016).

Among different aetiological models suggested for Internet addiction, the most prominent is based on learning theory (Chakraborty et al., 2010; LaRose et al., 2003). Internet use acts on an operant conditioning variable ratio reward schedule, similar to gambling (Beard, 2005; Cash et al., 2012; Davis, 2001; Kuss & Lopez-Fernandez, 2016; LaRose et al., 2003; Yau et al., 2013). Unpredictable reward schedules and variable reward structures can be established with many different Internet activities. For example, continually checking for message or email replies can result in an arbitrary schedule with unpredictable results. When the reply finally comes, the behaviour is reinforced with their reward. If this behaviour is coupled with mood enhancement, such as on a dating site, the return on their efforts can be strengthened even further (Beard, 2005; Cash et al., 2012).

The addiction model is supported by brain-imaging studies which have shown numerous similarities in brain function of substance users to excessive Internet users (Kuss & Griffiths, 2012). In 2011, the American Society of Addiction Medicine (ASAM) updated its definition of addiction, removing the need for substance use, and opening the way for behavioural addictions to be included and classified as addictions. This opened the way for substance and behavioural disorders to be seen in a common light to other addictions, sharing the characteristics of: an inability to abstain, impairment in behavioural control, cravings for the substance or behaviour, diminished recognition of resulting outcomes or fallout, and a dysfunctional emotional response (American Society of Addiction Medicine, 2011). Further to this, the American Psychiatric Association moved the Pathological Gambling disorder from Impulse-Control Disorders Not Elsewhere Classified section in the DSM-IV to the newly renamed Substance Use and Addictive Disorders section in the DSM-V, reflecting a view that behavioural addictions activate brain rewards systems in similar manner to substance use (American Psychiatric Association, 2000, 2013).

The disease model is not, however, without criticisms. Despite the acknowledgement and definitions of behavioural addiction and inclusions of some specific disorders (such as gambling and gaming disorders) in recent diagnostic manuals, there is still no agreed definition or gold standard assessment tool to screen for and diagnose Internet addiction (Chakraborty et al., 2010; King et al., 2011; Starcevic & Aboujaoude, 2017). Recent meta-analyses identified at least 45 different measures developed and employed in Internet use research that has led to issues when aggregating research across studies (Laconi et al., 2014; Tokunaga & Rains, 2016).

The fact that many different measures and constructs are used is displayed in the heterogeneity in prevalence rates reported across studies with various research finding prevalence rates reported anywhere from 0.7% up to 38% (Chakraborty et al., 2010;

Jorgenson et al., 2016; Pontes et al., 2015; Spada, 2014; Starcevic & Aboujaoude, 2017). The lack of uniformity or a common definition of Internet addiction has led to various assessment measures, operationalisations, and methodological differences, leading some researchers to state that many of the people considered to be Internet addicts are incorrectly classified with an addiction disorder (Greenfield, 2018; King et al., 2011; Starcevic & Aboujaoude, 2017).

Other researchers point out that, while numerous studies have repeatedly shown associations between PIU and psychosocial problems (such as depression, social anxiety, anxiety, loneliness), these studies have been cross-sectional and have not been able to apportion causal relationships (Fernandes et al., 2019; Pontes et al., 2015; Tokunaga, 2015; Winkler et al., 2013). They argue that there is inadequate evidence of cause and effect to claim PIU is a primary disorder that leads to development of other psychosocial problems or if it represents a secondary disorder arising from other primary disorders (Ko et al., 2012; Pies, 2009; Pontes et al., 2015; Weinstein & Lejoyeux, 2010; World Health Organization, 2015; Yau et al., 2013). For example, does a depressed person use the Internet in order to alleviate their symptoms of depression, leading to more and more time spent there, or does the person develop depression due to dysregulated Internet use in the first place? (Caplan, 2002; Elavarasan et al., 2018; Tokunaga, 2017).

Difficulties finding suitable models to attribute causality has resulted in some researchers moving away from direct effect models and towards a model that looks at the interactions and mediations between motivations for internet behaviours and the resulting effects on psycho-social well-being (Elhai et al., 2017; Kardefelt-Winther, 2014). Called compensatory internet use, the basic premise is that problematic internet use is enabled and motivated by an individual's response to a negative life outcome (Kardefelt-Winther, 2014). An example might be an individual with little daily social interactions who is then motivated to use an online gaming platform where socialising is facilitated. Thus, their

need for social interaction is sated; however they may also develop internet addiction type symptoms due to the amount of time spent online that may not allow time to create offline friendships. Coupled with this is a likelihood that as their social interactions exist more and more online, individuals develop more addictive symptom-like behaviours in order to maintain these relationships. Focusing on these symptoms would pathologize the behaviour. However, that ignores the compulsion aspect of the individual behaviour that compensates for lack of social interaction by acquiring online friends (Kardefelt-Winther, 2014). Researchers argue that some of the alleged symptoms of Internet addiction may simply be new social behavioural norms rather than a pathology or disease (Kardefelt-Winther, 2014).

Critics also point out that it is still not entirely clear what people are actually supposed to be addicted to, as the Internet is merely a medium through which content or services are delivered. Is it the content/activity or the medium to which they are addicted? (Chakraborty et al., 2010; Griffiths, 2000a; King et al., 2011; Meerkerk et al., 2009; Yau et al., 2013). Griffiths (2000a) pointed out that research must clarify the difference between being addicted *to* the Internet and being addicted *on* the Internet. If the Internet is a means to fulfil a need to engage in gambling, gaming, or cybersex, it is therefore indicative of an underlying disorder that is better classified as such (Chakraborty et al., 2010; Starcevic & Aboujaoude, 2017; Yau et al., 2013). Indeed, some researchers now posit that technology-based addictive behaviours are better conceptualized within a continuum of distinct yet related disorders that have common as well as unique etiological factors (Baggio et al., 2018; Billieux & Van der Linden, 2012; Starcevic & Billieux, 2017).

These issues are perhaps supported by the decision of the American Psychiatric Association to include Gambling Disorder as a behavioural addiction and promoting the specific behaviour of Internet Gaming Disorder as a condition for further study in the latest version (DSM-V), as these disorders have clear definitions and conceptualisations, while

leaving out the more general Internet addiction which is yet to establish them (American Psychiatric Association, 2013; McIntyre et al., 2015; Petry & O'Brien, 2013).

However, researchers have pointed out that the some DSM-V criteria of Internet Gaming Disorder (e.g. tolerance and withdrawal) which are based on an addiction model are not capable of distinguishing between non-problematic and problematic behaviours; have low diagnostic validity, clinical utility, and prognostic value; and this may lead to pathologising non-problematic gaming behaviours (Castro-Calvo et al., 2021; Starcevic, 2016).

In summary, there may indeed be some people who have a true behavioural addiction to the Internet, but it is challenging to identify them due to a lack of clear definitions, diagnostic criteria and assessment tools (King et al., 2011; Starcevic & Aboujaoude, 2017). Due to a tendency of instruments that lack degrees of severity, temporal dimensions, and not clarifying the context of Internet use, it is likely that there are far fewer people with a behavioural addiction to the Internet than currently being observed in the research (Greenfield, 2018; Griffiths, 2008; King et al., 2011). It does appear to be the case that there are specific behavioural addictions while “on” the Internet, such as online gambling, online gaming, and online cybersex, and that the Internet plays an important role in developing and maintaining these particular behavioural addictions (Fernandes et al., 2019; Starcevic & Aboujaoude, 2017; Tokunaga, 2015).

Because of perceived shortcomings of the Internet addiction model, researchers have looked for different ways to conceptualise PIU.

1.3.2 Cognitive-Behavioural Model

A cognitive behavioural model was developed by Davis (2001), Davis et al. (2002), and expanded upon by Caplan (2002, 2003, 2005). Originally named pathological Internet use (Davis, 2001), it was later re-termed problematic Internet use in a direct movement away from the disease and pathology framework (Davis et al., 2002).

The model proposes that individuals with psychosocial problems (such as depression or loneliness) develop maladaptive cognitions about themselves and these dysregulated cognitions make them more susceptible to develop maladaptive behaviours around Internet use (Davis, 2001). These behaviours reinforce and reward the dysfunctional thoughts and thus lead to the development and maintenance of PIU which then leads to further negative outcomes (Davis, 2001).

The model posits that PIU exists in specific and generalised forms. Specific PIU refers to problematic or excessive use of specific content or services on the Internet such as gambling, gaming, or cybersex. These specific behaviours rely on the Internet as a delivery mechanism and would occur outside or without the Internet. General PIU, on the other hand, refers to non-specific, general and multidimensional excessive Internet use that is driven by an individual's social context (Davis, 2001). Maladaptive cognitions and behaviours are not linked to any specific content, but general PIU develops due to the unique (and presumably interpersonally safer) delivery mechanisms of the Internet and individuals then begin to substitute in-person for virtual social communication and contact (Caplan, 2002; Davis, 2001).

PIU, then, is conceptualised a multidimensional disorder describing problematic Internet use that comprises distinct cognitive and behavioural symptoms causing behavioural impulse control dysregulation leading to negative social, academic, and/or professional consequences (Caplan, 2002, 2003, 2005; Davis, 2001; Davis et al., 2002).

Research has provided support for the model, finding various cognitive and behavioural constructs of Internet use related to negative outcomes for individuals, such as having a preference for online social interaction (Caplan, 2002, 2003; Kim & Davis, 2009; Kim et al., 2009), regulating mood (Caplan, 2002; LaRose et al., 2003), deficient self-regulation (Billieux & Van der Linden, 2012; LaRose et al., 2003; Tokunaga, 2015), and obsessive thought patterns about going online (Caplan & High, 2006; Shapira et al., 2003).

Individuals who are lonely, depressed, socially anxious, and have low social skills exhibit a preference for online social interaction, believing they are safer, have more confidence, communication self-efficacy and can form better social relationships (Caplan, 2003, 2005, 2007; Davis, 2001; Kim & Davis, 2009; Kim et al., 2009).

The cognitive-behavioural model offers specific explanations of why people go online. Previous addiction models were able to deal with specific instances of PIU, such as gambling, gaming, and cybersex, but they struggled with explaining why people appear to spend excessive amounts of time on the Internet for no explicit purpose (Caplan, 2002).

A critique of this model is that while studies support the predictions made by the theory, they are predominantly cross-sectional in nature and there is still yet to be a body of evidence that can properly conclude causality (Tokunaga, 2015).

1.3.3 Social Cognitive Model

LaRose, Mastro, et al. (2001) developed a model that situated the symptoms of PIU within the social-cognitive theory developed by Bandura (1989, 1991). Specifically, the model proposes that diminishing self-regulation leads to a conditioning of behaviours (or habits). These habits can range from controllable and manageable issues leading all the way to uncontrollable and unmanageable pathological behaviour.

Social cognitive theory takes the perspective of human agency, positing that individuals act on their worlds and that their behaviours and motivations are regulated by a balance between internal and external sources. Individuals self-regulate their own behaviours, and the effects of and from their behaviours on others and the environment. Self-regulation comprises self-observation (for and against themselves, others and the environment), judgments (past, present and future individual standards; group norms; and social-norms) and self-reactions (a function that provides psychological or behavioural rewards or punishments). These rewards and punishments provide incentives that reinforce or inhibit behaviours (Bandura, 1991).

The model (LaRose, Mastro, et al., 2001) proposes that effective self-regulation relies on an individual's careful attention to behaviour and accurate judgements that are performed and responded to in real time. When PIU behaviours are formed that are automatic, they inhibit these processes and result in deficient self-regulation. Deficient self-regulation can further lead to the strengthening of these behaviours. Deficient self-regulation is not a permanent state (as having an addiction might be) and individuals can vary in their levels of deficiency and competency across time. Indeed, a so-called normal person can lapse with their self-regulation and so-called addicted individuals can experience periods of normal self-regulation. The social cognitive model interprets PIU as a deficiency in self-regulation and regards the symptoms of Internet addiction (e.g. preoccupation, loss of control, relapse, ignoring consequences, and escape) as better specified as indicators of deficient self-regulation (LaRose et al., 2003; LaRose, Mastro, et al., 2001).

LaRose et al. (2003) offer depression as an example of how the model works. Depressed people have cognitive biases that minimise success and emphasise failures and PIU may begin as an individual seeks to alleviate their symptoms of depression on the Internet. However, engaging in PIU behaviours can lead to further adverse outcomes such as increases in dissatisfaction with life as individuals engage in unrealistic social comparisons (Steers et al., 2014). This, and other consequences, deepen the depression and starts the cycle of seeking relief from symptoms all over again. The pattern of repetition can then form a conditioned response associating a depressed mood with PIU behaviours. The PIU behaviours may start deliberately but can soon move into an automatic pattern of behaviour that, in itself, further inhibits self-regulation processes. As the deficiency in self-regulation grows in the individual so do PIU behaviours, potentially leading to further negative outcomes across educational, social, professional, and relationship domains (LaRose et al., 2003).

Various research has been conducted in support of the social-cognitive deficient self-regulation model (Caplan, 2010; Kim et al., 2009; LaRose & Eastin, 2004; LaRose et al., 2003). Tokunaga and Rains (2010) conducted a series of meta-analyses and created models to test the relationships between loneliness, depression, social anxiety, time spent using the Internet, and PIU in the contexts of Internet addiction or deficient self-regulation. Little support was found for the addiction model of PIU but results showed that loneliness, depression, and social anxiety all contributed to PIU in the deficient self-regulation model (Tokunaga & Rains, 2010).

1.3.4 Interaction of Person-Affect-Cognition-Execution (I-PACE) Addiction Model

Difficulties finding suitable models to attribute causality has resulted in some researchers moving away from direct effect models and towards models that look at the interactions and mediations between motivations for internet behaviours and the resulting effects on psycho-social well-being (Elhai et al., 2017; Kardefelt-Winther, 2014). One such model has been developed by Brand et al. (2016) who leveraged previous models developed using brain imaging techniques, integrated other models' components (e.g. cognitive-behavioural), and combed newer research findings, to develop The Interaction of Person-Affect-Cognition-Execution (I-PACE) model of specific Internet-use disorders.

This theoretical framework describes the principal processes in the development and maintenance of addictive behaviours for certain Internet services and applications where Internet addictions are considered to be specific to a service or application (e.g. cybersex, shopping or gaming). Specific Internet-use disorders result from interactions between predisposing factors that are moderated and mediated by variables that help form and maintain the addiction process (Brand et al., 2016).

The I-PACE model includes the following main components: Predisposing variables such as neurobiological, psychological, and personality factors; affective responses to internal or external stimuli such as coping styles, and mood and emotional

regulation; cognitive responses to internal or external stimuli such as cognitive biases, and cue-reactivity and craving thoughts; reduced executive and inhibitory controls such as self-regulation processes; decision-making behaviours resulting in the use of certain Internet services and applications; and the resultant consequences of using the chosen Internet services and applications. Diminished control over Internet use and negative daily life consequences indicate addictive processes have taken place and a specific Internet-use disorder has developed (Brand et al., 2016).

The I-PACE model attempts to allow the research field to move past the focus on single disorders like Internet gaming disorder by supplying a generic model that explains the processes that go into any type of specific Internet-use addiction disorder. Additionally, most previous research focused on single variable interaction such as personality traits, mood or genetic traits. Combining interactions for various moderator and mediator variables it allows for the interaction of these to be studied together (Brand et al., 2016).

Numerous research supports the model components. For example: genetics predisposition (Dalbudak et al., 2014; Odacı & Çıkrıkçı, 2014) and negative early life events (Li et al., 2014; Vink et al., 2016); comorbid psychosocial conditions (Ho et al., 2014); personality factors (Weinstein et al., 2015); social cognitions (Caplan, 2007; Pontes et al., 2014); affective and cognitive responses (Kaptis et al., 2016; Koolhaas et al., 2011); internet related cognitive biases (Taymur et al., 2016); cue reactivity (Dong & Potenza, 2014); mood regulation (Gross & Jazaieri, 2014); attentional biases (Ciccarelli et al., 2016); executive functioning and inhibitory control (Dong & Potenza, 2014); decision making (Pawlikowski & Brand, 2011); and consequences from Internet behaviours (Duka et al., 2011; Klucken et al., 2016; Piazza & Deroche-Gamonet, 2013).

The I-PACE model views PIU as a pathology or addiction. It is a comprehensive biopsychosocial view of PIU that aims to explain how and why specific internet use

addictions develop and, by doing so, expose those components that may be targeted for therapeutic treatment. Authors of the model acknowledge that, while the individual components do have empirical research evidence supporting them, the processes defined by the I-PACE model that bind the components together require further study and support.

1.3.5 Summary of PIU Models – PIU is on a Continuum

Research has supported all three models independently but none of the models is able to entirely account for the development, growth and maintenance of PIU (Fernandes et al., 2019; Tokunaga, 2015). The models share some common assumptions, emphasise other factors and reach different conclusions about what PIU leads to for individuals.

All models agree that PIU has cognitive and behavioural facets and emphasise that maladaptive self-regulation processes leading to the loss of self-control over Internet use is a key feature of PIU (Billieux & Van der Linden, 2012; Caplan, 2010; Davis, 2001; LaRose et al., 2003; Tokunaga, 2015, 2017; Young, 2004). The addiction model includes tolerance and withdrawal as key symptoms that need to be present whereas the other two models do not require this, and indeed place little or no emphasis on time spent on the Internet, and recent discussion and debate by expert researchers has questioned the validity of such criteria (Castro-Calvo et al., 2021; Starcevic, 2016). The addiction model also expects significant maladaptive life outcomes from PIU and require them to be present for a PIU diagnosis, whereas the other two models predict small to moderate effects from PIU and are comfortable explaining behaviours that are maladaptive but do not necessarily lead to long term negative outcomes (Beard & Wolf, 2001; Caplan, 2002, 2010; Davis, 2001; Griffiths, 2005; LaRose et al., 2003; Pontes et al., 2016; Tokunaga, 2015; Young, 1998b).

This has led researchers to position PIU as a continuum, positing that technology-based addictive behaviours are better conceptualized within a spectrum of distinct yet related disorders that have common as well as unique etiological factors (Baggio et al., 2018; Billieux & Van der Linden, 2012; Starcevic & Billieux, 2017). Under this context,

cognitive-behavioural and social-cognitive models would appear in the middle or moderate range and the Internet addiction models at the extreme and upper end (Fernandes et al., 2019; LaRose et al., 2003; Pontes et al., 2016; Tokunaga, 2015). Despite the issues regarding clear definitions, diagnostic criteria and assessment tools, researchers agree that PIU is a socially and clinically important condition and individuals experiencing it require professional therapeutic treatment (Kuss & Lopez-Fernandez, 2016; Pontes et al., 2015; Yau et al., 2013).

1.4 Assessment and Classification

In an effort to help standardise and encourage the use of only validated and established measures, Laconi et al. (2014) conducted a meta-analysis aimed at collecting evidence regarding the validity and effectiveness of the different scales. They found 45 measures and identified that researchers have developed their assessment tools based on existing models of substance dependence, pathological gambling, cognitive-behavioural theory, qualitative and expert assessments, or combinations of several approaches.

Laconi et al. (2014) found that only eight of the measures had been evaluated more than three times and nine had been evaluated at least once. The Internet Addiction Test (IAT; Young, 1998a) was by far the most evaluated measure with 29 studies listed, followed by the Compulsive Internet Use Scale (CIUS; Meerkerk et al., 2009) with 8 evaluation studies, the Chen Internet Addiction Scale (CIAS; Chen et al., 2003) with 6, as well as the Internet Addiction Diagnostic Questionnaire (IADQ; Young, 1998b), 5 for the Generalized Problematic Internet Use Scale 2 (GPIUS-2; Caplan, 2010) and the Online Cognition Scale (OCS; Davis et al., 2002), and four for the Problematic Internet Use Questionnaire (PIUQ; Demetrovics et al., 2008) and the Internet Related Problem Scale (IRPS; Armstrong et al., 2000).

Laconi et al. (2014) reported that all of these scales show excellent internal consistency, typically reporting Cronbach alpha numbers in the excellent range (greater

than or equal to 0.90). The IAT has been used by other scales as their starting point (e.g. the PIUQ), shows satisfactory test-retest reliability (ranging between $r = .73$ and $r = .88$), has concurrent validity with the CIAS, IADQ, GPIUS-2, CIUS and IRPS (Laconi et al., 2014), and has the highest reported convergent validity with time spent online and depression. While the other scales reported similar validities, some issues were noted, such as only being validated in Eastern and Middle Eastern parts of the world (CIAS) and having no reported cut-off scores (OCS and GPIUS-2). The IAT appears to have many advantages over the other scales at present time (Laconi et al., 2014).

1.5 Prevalence Rates

There are several issues with investigating prevalence rates of PIU in the general population. To date, there has been a lack of epidemiological research conducted (Aboujaoude, 2010; Spada, 2014). Most studies that investigate or report prevalence rates suffer from methodological issues such as using different diagnostic instruments (due to lack of consensus on PIU conceptualisation), different cut-off scores (due to lack of validity studies), population biases (e.g. using University students), and sampling selection biases (using convenience samples) (Aboujaoude, 2010; Moreno et al., 2019; Spada, 2014). This may explain why prevalence rates reported across studies have ranged from 0.7% up to 38% (Chakraborty et al., 2010; Jorgenson et al., 2016; Pontes et al., 2015; Spada, 2014; Starcevic & Aboujaoude, 2017).

A recent meta-analysis (Pan et al., 2020) was conducted across the literature in order to derive a conclusion about the PIU prevalence rate. Of the 116 included studies, 44% used the IAT measure, 29% used the YDSQ, 11% the CIAS and 16% used other scales. The calculated prevalence rate for PIU was 7.02%, 95% CI, [6.09%, 8.08%] and the researchers noted that it appeared to be increasing by year (Pan et al., 2020). A prevalence rate of 7.02% with an estimated worldwide Internet user population of 5 billion yields a staggering total of 351 million people who could potentially have or develop PIU.

1.6 Treatment

The first systematic review of PIU interventions, conducted by King et al. (2011), revealed many issues and areas for improvement for researchers. These included differences in definitions and assessment criteria, a lack of randomised controlled trials, inadequate or no control groups for comparison, methodological deficiencies such as lack of randomisation and blinding and not reporting effect sizes, and an overall lack of studies to draw from (King et al., 2011). Unfortunately, subsequent systematic reviews and meta-analyses continue to report the same issues (Pontes et al., 2015; Przepiorka et al., 2014; Winkler et al., 2013; Zajac et al., 2017). The most recent review notes lack of methodological rigour, inadequate control group inclusion, a lack of standardised measures and a scarcity of studies that met the necessary quality criteria for inclusion (Zajac et al., 2017).

Regardless of these issues, the need for an effective treatment approach was apparent since PIU was originally described, and researcher practitioners have been working towards that goal (Pontes et al., 2015; Przepiorka et al., 2014). Treatment centres specialising in treating PIU have opened all around the world, from China, Taiwan, South Korea to the United States of America (King et al., 2011).

Interventions for PIU were originally based on treatments and approaches previously used for substance use and impulse control disorders (Greenfield, 2018; Weinstein et al., 2014). The most commonly reported treatments are: cognitive behaviour therapy (CBT), medication (usually prescribed to treat underlying depression or ADHD),

family-based therapy (FBT), multi-level counselling programs, integrative therapy¹ (IT), motivational interviewing techniques (MI), solution-focused brief therapy (SFBT), and social competence training. Therapies are delivered individually or in group based settings and can also include a combination of approaches (Cash et al., 2012; Chun et al., 2017; Greenfield, 2018; King et al., 2011; Pontes et al., 2015; Przepiorka et al., 2014; Weinstein et al., 2014; Winkler et al., 2013; Zajac et al., 2017).

CBT and pharmacology are the most common therapeutic approaches and appear to result in the best treatment outcomes for treating time spent on the Internet and depression, with mixed results for anxiety symptoms, but don't appear to achieve better outcomes than other therapies for other symptoms (Przepiorka et al., 2014; Winkler et al., 2013; Zajac et al., 2017). Given a lack of published clinical trials, methodological consistency and rigour, varying assessment measures, or accumulation of research on specific therapeutic approaches, PIU treatments are yet to show strong evidence of efficacy or effectiveness in order to achieve evidence-based criteria (Greenfield, 2018; Tokunaga, 2017; Tokunaga & Rains, 2016).

The Internet is now part of our everyday lives and we use it for education, work, recreation and socialising (International Telecommunication Union, 2019; Internet World Stats, 2019; Taylor & Silver, 2019). It seems unrealistic that the final goal for any intervention for problematic Internet usage could be complete abstinence. Indeed, a non-abstinence approach is receiving support from researchers and clinicians alike, who argue that a balanced and controlled use of the Internet and applications should be the goal of any

¹ Integrative therapy combines different therapeutic tools and approaches meet the needs of the specific client. It is designed to provide be a more inclusive and flexible therapeutic approach compared to traditional and singular forms of psychotherapy. It aims to actively engage with the client and build a set of therapeutic tools and methods tailored to the client, problem at hand and contexts Zarbo, C., Tasca, G. A., Cattafi, F., & Compare, A. (2015). Integrative Psychotherapy Works. *Frontiers in psychology*, 6, 2021-2021. <https://doi.org/10.3389/fpsyg.2015.02021> .

therapy (Cash et al., 2012; Young, 2007). This approach is not only supported by researchers and clinicians but also by individuals experiencing PIU (O'Brien et al., 2016). Analysis by Przepiorka et al. (2014) concluded that any therapy must find ways to modify the automatic and maladaptive behaviours of PIU individuals and enable them to restore and improve their self-control skills. In order to achieve these therapeutic goals, individuals will need to utilize their *self-regulation* skills to manage, monitor and alter their cognitions, attention, affect, and behaviours (Carver & Scheier, 2011; Cash et al., 2012; Fujita et al., 2016; Przepiorka et al., 2014).

Chapter 2: Self-Regulation and Self-Control

2.1 Introduction

Self-regulation is a fundamental capacity of being human, and our ability to self-regulate is seen by many as humanity's most vital attribute (Bandura, 1991; Baumeister, 2003; Boekaerts et al., 2005). Successful self-regulation is a cornerstone of healthy psychological function as it promotes desired outcomes and inhibits detrimental ones (de Ridder et al., 2012; Hoyle, 2010).

Successful self-regulation has been shown to be associated with many positive life outcomes such as self-esteem, physical and mental well-being, occupational success, resilience, emotional regulation and behavioural control (Baumeister & Vohs, 2016; Busch & Hofer, 2012; Elliot et al., 2011; Gagnon et al., 2016; Hofer et al., 2011; Tangney et al., 2004; Vohs et al., 2008).

In contrast, breakdowns in self-regulation are shown to contribute to a wide range of adverse outcomes across the lifespan including issues such as PIU, lack of behavioural inhibition, emotional dysregulation, poor attentional control, and occupational burnout (Billieux & Van der Linden, 2012; Busch & Hofer, 2012; Eiesnberg et al., 1997; Gagnon et al., 2016; LaRose et al., 2003; Spinrad et al., 2006).

Several theories of human motivation emphasize an individual's use of self-regulation processes to model behaviour in pursuit of goals (Bandura, 1991; Carver & Scheier, 1998; Deci & Ryan, 2000; Gollwitzer, 1999; James, 1890; Kruglanski et al., 2002; Locke & Latham, 2015). Self-regulation refers to the processes that allow individuals to manage, monitor, assess and alter their cognitions, affect, feelings, attention, and behaviours (Baumeister & Heatherton, 1996; Fujita, 2011; Hofmann et al., 2009). In relation to goal directed behaviour, self-regulation processes are the dynamic psychological mechanisms that allow individuals to direct their behaviour, successfully or unsuccessfully, towards those goals (Carver & Scheier, 1998; Gendolla et al., 2015; Mann

et al., 2013). Self-control is defined as the capability to override, change or restrain urges, cravings, desires, impulses, or habitual responses (Bandura, 1991; Baumeister, 2003; Carver & Scheier, 1998; Metcalfe & Mischel, 1999).

Self-regulation and self-control are frequently used interchangeably in the literature; however, they are not the same (Baumeister, 2002; Baumeister et al., 2007; Fujita et al., 2016). Self-control can be thought of as a specific self-regulatory challenge where an individual needs to protect a goal, which has long term benefits, against a temptation, which offers short term gains but that is in conflict with the goal (Baumeister et al., 2007; de Ridder et al., 2012; Fishbach & Shah, 2006; Hagger et al., 2010). Therefore, an important requirement for adaptive self-regulation and an appropriate response to avoiding temptations is the implementation of self-control (Baumeister & Heatherton, 1996; Carver & Scheier, 1998; de Ridder et al., 2012; Fishbach et al., 2003; Metcalfe & Mischel, 1999).

An example of self-regulation that is not self-control is given by de Ridder et al. (2012) of a basketball player taking a free throw. The player must monitor, manage and organise their cognitions, affect and behaviour in order to make the shot, but they do so in the absence of a temptation as there is, typically, no incentive to miss the free throw. There is no self-control dilemma here and it is the lack of motivational conflict makes this a self-regulation issue and not one of self-control (de Ridder et al., 2012). In sum, self-control is a subset of self-regulation and, therefore, all self-control is self-regulation, but not all self-regulation is necessarily self-control (Fujita, 2011).

A self-control dilemma is defined as an internal conflict where the attainment of a higher order and typically longer-term goal is jeopardised by a shorter-term goal or temptation (Fishbach et al., 2003; Fishbach & Labroo, 2007; Fishbach & Shah, 2006; Fujita et al., 2016; Hofmann et al., 2009). A self-control dilemma involves a *dual motive* conflict where only one of the motives can be fulfilled (Fujita, 2011). Self-control

dilemmas are a common daily occurrence (Baumeister et al., 2007; Hofmann et al., 2009). For example: “Should I have the chocolate cake or do I go for the salad?” or “Should I surf the Internet right now or study for my exam?” are self-control dilemmas.

Fishbach and Converse (2011) note that identifying self-control dilemmas can be trivial. For example, in the classroom, workplace, or research laboratory, individuals are often explicitly instructed to avoid impulses, emotions and temptations. External cues for self-control greatly facilitate the identification of self-control dilemmas but when an individual is left to their own devices a self-control dilemma may only be noticed if the long-term costs are apparent and excessive; something that is not always obvious. For example, consider an individual who needs to study but thinks: “one online game won’t hurt”. Seen in isolation, the single online game is not framing the action as a threat to their long-term goal of studying and passing their course. If, however, the individual framed it as: “I’ll never be able to stop at one game” or “who knows how long one game will last?” it might trigger identification of a *dual motive* conflict where the short-term gain or temptation is competing against the longer-term goal. Once a self-control dilemma has been identified, self-control resources can be invoked to resolve the problem (Fishbach & Converse, 2011; Myrseth & Fishbach, 2009).

Here we see the essential nature of self-regulation and its working in connection with self-control. It is the self-regulation processes that self-monitor and identify the dilemma and, in turn, mobilise the self-control resources to battle the temptation that facilitates positive outcomes and, in turn, well-being (Baumeister & Heatherton, 1996; Carver & Scheier, 1998; Fishbach & Converse, 2011).

The field of self-regulation has a broad research landscape, with many theories and models that are beyond the scope of the current thesis. A comprehensive discussion can be found in Gendolla et al. (2015), Hoyle (2010), and Vohs and Baumeister (2011). Several leading theories in self-regulation and self-control are discussed in the following sections,

leading to the introduction of the Dynamics of Self-Regulation model that offers to shed new light and insight into self-regulatory and self-control processes.

2.2 The Cybernetic Model of Self-Regulation

Building on the concepts of homeostasis and cybernetics, and borrowing from Powers (1973), Carver and Scheier (1998) built a theory of self-regulation behaviour as goal directed and feedback controlled, known as Control Theory or the Cybernetic Model of Self-Regulation. At the heart of their model is the negative feedback loop. A negative feedback loop is designed to reduce discrepancy in a closed system. Homeostatic systems, such as temperature regulation systems, use negative feedback loops to maintain the goal of a constant temperature.

The feedback loop system (Carver & Scheier, 1998) comprises four components: an input function, a reference value, comparison function, and an output function. The reference value is the goal of the system. It is what the system is trying to reach and then maintain. The comparison function is the monitoring process that detects where the system is in relation to the goal. It checks the value of the input function against the reference value. Any discrepancy that is detected between where the system is (the input function) and where it wants to be (the reference value or goal) leads to a change in output. The output function is the new behaviour, actions, thoughts, etc. that are meant to reduce the discrepancies and move you closer to the reference value or goal. Thus, a *perceived* discrepancy between the inputs and goal creates a change in output (Carver & Scheier, 1998).

As the system is implemented in humans, and not machines, it is prone to a number of misinterpretations, biases and even confusions that are known collectively in the theory as the problem of *perception* (Carver & Scheier, 1998; Powers, 1973). As human beings, we are prone to a number of cognitive distortions and biases; for example, depressed people are prone to negative biases and interpretations of events and will discount positive

feedback or responses and overestimate the negative (Beck, 1963; Greenberger & Padesky, 2015).

A feedback loop system is closed. Therefore, in order to achieve the complexities of human existence, many separate feedback loops must exist and join together. These multiple systems are theorised to be implemented in hierarchies that denote the order of importance or saliency (Powers, 1973).

This model (and other control theory approaches) states that perception and not behaviour should be the focus of study (Powers, 1973). In other words, it changes the emphasis from looking at the self-regulation of behaviour to seeing behaviour as a function (or output) of self-regulation (Powers, 1973). It offers an intriguing question posed by Carver and Scheier (1998): do individuals control behaviour or does behaviour emerge as the output of a system that is driven by perception?

2.3 The Self-Regulatory Strength Model

The strength model of self-control by Baumeister and Heatherton (1996) suggests that there are limited self-regulatory resources and when they are depleted, self-regulation failures are likely. This model likens self-control, or willpower, to that of a muscle that can only lift so many items before it inevitably exhausts itself, a state called *ego depletion*. The theory defines self-regulation as the *exertion* of self-control to override a dominant temptation action with another in order to achieve a long-term goal or comply with ideals, standards or norms (Baumeister & Heatherton, 1996).

The model suggests three factors of self-regulation: standards, monitoring, and self-control. Standards refers to ideals, values, social expectations or long-term goals. Monitoring refers to self-monitoring of cognitions or affect and comparing the current state against the state required by the standards set by the self. Self-control is defined as the *capacity* to change response actions in order to bring them into line, especially to bring

them into line with standards such as ideals, values, morals, and social expectations, and to support the pursuit of long-term goals (Baumeister & Heatherton, 1996).

Critically, the model states that the self-regulation resource draws from a single and limited resource pool, so that when *ego depletion* occurs, the entire self is diminished (hence the term *ego depletion*) and the ability for self-regulatory functions are diminished across all behaviour domains (Baumeister, 2002, 2003; Baumeister & Heatherton, 1996; Baumeister & Vohs, 2016; de Ridder et al., 2012).

For example, in a study by Vohs and Faber (2007) supporting this model, participants were shown a video. The control group was given no instructions about how to watch the video and the experimental group was told to actively not look at or read any words that appear on the screen. That is, they were instructed to regulate their behaviours and employ self-control. They were then asked to participate in a separate marketing survey and asked how much they were prepared to pay for several items. The experimental group, having had their willpower resource depleted, could not control their impulses and offered significantly higher prices than the control group, inferring that their self-control was depleted (Vohs & Faber, 2007).

Numerous research articles have shown similar findings in support of the strength model, and a meta-analysis of 83 studies concluded that the strength model was a worthwhile explanatory system for self-control, reporting an overall medium-to-large effect size, but pointed out that mechanisms explaining how the process works were missing from the theory (Hagger et al., 2010). For example, Muraven and Baumeister (2000) propose several mechanisms that underwrite ego depletion such as conservation, training, recovery and glucose levels. Conservation states that when aware of future demands, individual will conserve their self-control resources and thus act as if they are ego-depleted. Just as training a muscle results in greater muscle strength, it is proposed that training self-control results in a greater resource pool to draw from, so that an

individual's capacity to exert self-control is increased. Using the muscle metaphor again, it is proposed that rest is important for the recovery of self-control resources. Finally, it is proposed that glucose resources mediate self-control, as exercising self-control requires an increase in glucose in order to power the brain and when these levels are exhausted, so is the ability of the brain to implement self-control functions (Muraven & Baumeister, 2000). While evidence exists to support these claims, Hagger et al. (2010) point out that there are other, just as viable, alternative explanations that have yet to be ruled out.

Despite substantial support for the model recent criticism has been put forward. Carter et al. (2015) re-examined the meta-analyses conducted by Hagger et al. (2010) and found that publication-bias (favouring the publication of results that show statistical significance leading to a bias in favour of positive results) and small study bias (the ability of smaller studies to show larger treatment effects than those of bigger studies) may have influenced the results. Carter et al. (2015) re-examined the data, this time including published and unpublished data, utilising amended and enhanced inclusion criteria, and employing newer and sophisticated statistical methods. The results of the new analysis strongly challenged the notion of self-control as a limited self-regulatory resource, finding a probable effect size of zero (Carter et al., 2015). Following this, an impressive multiple laboratory research effort across 23 laboratories conducted replications of standardized ego-depletion tasks with results concluding a probable ego-depletion effect closer to zero (Hagger et al., 2016).

2.4 The Hot-Cool System

Metcalf and Mischel (1999) proposed that people operate two distinct but interacting motivational systems that they called the hot-cool system. The cool system is cognitive. It is slow, deliberate, reflective, and contemplative. The hot system is emotional. In contrast, it is fast, impulsive, reflexive, and responsive to affective triggers. The cool

cognitive system enables self-regulation and self-control, with the hot, emotional system counteracting and undermining self-control (Metcalf & Mischel, 1999).

Much of the theory is based on famous delay of gratification experiments with children (Mischel et al., 1989). The studies presented children of various ages with a single treat (e.g. marshmallow) and then informed them they could have the single treat immediately or if they could wait 15 minutes they could have two treats. Thus, a self-control dilemma was formed: one now or two later? It was shown that the amount of time an individual (child) was able to delay gratification was a function of age. The older the child the greater delay of gratification and this is presumably evidence of self-regulatory system development. Longitudinal follow up studies showed that the delay of gratification time (and by inference better self-control) predicted better life outcomes such as SAT scores later in life (Mischel et al., 1989).

The model situates the cool or cognitive system as the basis for self-regulation functions (e.g. monitoring) whereas the hot or affective system is reflexive, under stimulus control via conditioning and destabilises self-control (Mischel et al., 1989). The hot/cool model has been criticised as it offers an appealing description of human self-regulatory processes but falls short of being a complete explanatory theory that can be easily tested (Tobin & Graziano, 2010).

2.5 Construal Level Theory of Self-Control

Construal level theory (Fujita et al., 2006) builds on temporal, automatic-effortful and affect-cognitive models of self-control. The model specifically deals with the dual-motive conflict that a self-control dilemma presents and is, therefore, a theory of self-control and not self-regulation. It attempts to build a framework over the main self-control constructs represented in literature. Construal level theory offers a robust and worthy attempt at illuminating some underlying self-control mechanisms at play. It is included in this section for completeness.

2.5.1 Temporal Discounting

Temporal self-control is built on the notion that long term goal benefits are, by definition, not available in the present but are frequently only harvested sometime in the future (Fujita, 2008). Therefore, self-control has been framed by researchers as a battle between a more immediate but less valuable reward against a delayed but more desirable outcome (Ainslie, 1975). Known as an intertemporal choice, numerous research studies that have repeatedly shown individuals *discount* the value of future outcomes (e.g. Ainslie, 1975). Individuals will place more value on rewards that are lesser but closer, over rewards that are greater but deferred into the future (Fujita, 2008, 2011). For example, \$10 today is valued and preferred over \$20 in a year from now. Self-control failures are decisions that favour local rewards or incentives at the sacrifice more global objectives (Fujita, 2008).

While gathering a large amount of support in the literature, the model does not specify what cognitive and motivational mechanisms cause of the discounting over time (Fujita, 2008). Further to this, the model can only deal with self-control issues that include a temporal distance between outcomes, which is not always the case (Fujita, 2008). For example, an individual sitting at their computer can choose to play a game or read a course paper. The individual can play the game and risk failing the course or study instead and not have fun. Both choices are immediate and there is no temporal distance involved.

Temporal discounting is different from delay of gratification (Reynolds & Schiffbauer, 2005). In the delay of gratification paradigm, having the lesser immediate reward readily available, individuals have to sustain their behaviour in order to reach the delayed but greater reward (Mischel et al., 1989). There is no temporal discounting as typically the individuals do not know how long they have to hold out in order to reach their reward. The task is a test of the ability to sustain self-control functions in order to battle the temptation. Temporal discounting, however, focuses more on an immediate choice and response. That is, individuals are given two options and make a decision then and there

with temporal discounting influencing the result. It is therefore probable that these two processes are accessing and using different psychological processes (Reynolds & Schiffbauer, 2005).

2.5.2 Automatic-Effortful

In dealing with automatic-effortful self-control models, construal level theory (Fujita, 2008) notes that automatic-effortful models (such as the ego depletion strength model) propose that conscious and effortful processes are required to act on automatic impulses in order to overcome them. Automatic processes are initiated without effort or intent and are triggered outside of conscious awareness (Baumeister & Vohs, 2016). Salient local rewards can automatically trigger thoughts and actions that undermine global concerns (Fujita, 2008). For example, walking past their computer might trigger an individual to get online and check on what their friends are up to despite an intention to go and exercise. These models theorise that conscious processes rely on motivational and cognitive provisions and if these resources are unavailable, distracted, or depleted then the automatic processes are left to run unrestrained (Fujita, 2008).

Various research has shown evidence for just these scenarios (Baumeister & Heatherton, 1996; Gilbert et al., 1988; Ward & Mann, 2000). However, automatic processes do not necessarily have to compete against long-term goals (Fujita, 2008). Research has also shown that the presentation of temptation triggers can actually invoke the long-term goal (Fishbach et al., 2003). For example, upon seeing my computer I am reminded that I want to be fit and healthy (and not sit on the computer all day).

2.5.3 Affect Versus Cognitive Systems

Similar to the automatic and effortful models, the affect versus cognitive models instead frame the responses as hot and emotional versus cool and thoughtful. These cool processes are thought to be overrun by hot, visceral and emotional reactions. Affective experiences can cause a unexpected surge in craving or value for a local reward that can

override or supersede the value of more global objectives (Fujita, 2008). For example, walking past their computer might trigger the fear of missing out that can initiate an affective response.

While an intuitively appealing model, affective and cognitive models lack robustness, as it is not clear what constitutes an affective response, how it actually works, and why an affective response should impair self-control and not support it (Fujita, 2008). For example, why should looking at a computer as an individual exercises invoke a feeling of worry or fear of missing out on social activities and not a feeling of pride as they execute their goal of maintaining fitness? And why would the feeling of worry be hotter than the feeling of pride so that worry overshadows pride and invokes the affective system? This begs the question, why should emotional responses have to invoke self-control failures at all?

2.5.4 The Construal Level Model

In an attempt to integrate and build upon these models, construal level theory (Fujita et al., 2006) proposes that individuals' perception of events (their construal) is greatly influenced by their *psychological distance* to the events. Psychological distance is constructed by how an individual frames the events and is not limited to temporal, automatic or affective components but can include social, environmental, spatial, situational and global alternatives, such as, for example: now or later, me or you, us or them, certain or uncertain, friend or foe, real or imaginary, and here or over there. Psychological distance is determined by the closeness to or distance from the individual to the events. An event is said to be psychologically distant if not part of direct and immediate experience (Fujita et al., 2006).

The theory proposes that events with close psychological distance are construed in terms of concrete, low-level, and context properties whereas psychologically distant events are construed in terms of their abstract, high-level, broader and essential factors (Fujita et

al., 2006). The model predicts that high-level or low-level construal will lead to changes in judgment and decisions (Fujita, 2011). If construing in high-level mode, an individual will give precedence to superordinate, desirability, primary and essential features whereas if construing in low-level mode, an individual will give precedence to subordinate, feasibility, secondary or incidental features (Fujita, 2011). For example, a high-level question such as “Why do I maintain good physical health?” may invoke responses of to live a longer life, to have more energy during the day, and to be able to keep up and enjoy my children. That is, the resultant construal emphasises desirable, primary and essential features of exercising. Contrast this with asking a low-level question of “How do I maintain good physical health?” that may invoke responses of restricting my diet, pounding the pavement each day, and sweating it out at the gym. Here, there low-level construal emphasises subordinate, feasibility and secondary features of exercising. Mental construals can be influenced by factors such as temporal, social, physical, environmental, spatial, situational and global factors (Fujita, 2011). Finally, mental construals can be influenced and shifted which can result in decreased or enhanced self-control (Fujita, 2011).

Self-control dilemmas arise when prominent local rewards or incentives conflict with global objectives (Fujita, 2011). Self-control failures ensue when decisions are made based on local rewards instead of global objectives. Self-control success can occur if the same event is instead construed at high-levels, emphasising global objectives (Fujita, 2011).

Construal theory (Fujita et al., 2006) unifies the three models of self-control. Mental construals are seen as the psychological mechanism that explains temporal discounting and construal level theory does not require a distinction between automatic versus effortful, affective versus cognitive systems, and local and global rewards. It theorises that any of those systems can produce low (local) or high level (global)

construals. Construals can be constructed using both automatic and controlled processes that can activate local or global features that can be processed through effortless and effortful systems. Similarly, high-level representations need not necessarily be more or less emotional than low-level construals. For example, an individual can have an emotional reaction to the concrete action of checking on their friends online (joy of connecting) and to the abstract implications of being online (shame and guilt at missing their gym session). Construal level theory argues it is the level of abstraction that is important, not the affect. If the individual has a low level abstraction they will activate the joy emotion triggering the action of jumping online, whereas a high level abstract will activate the guilt emotion triggering the action of going to the gym (Fujita et al., 2006).

Various research studies have provided evidence for the model (Fujita & Han, 2009; Ledgerwood et al., 2010; Stephan et al., 2010; Wakslak & Trope, 2009). Construal level theory integrates several existing and well-tested self-control models and it offers a mechanism by which they may operate that has been lacking to date.

2.6 The Dynamics of Self-Regulation Model

2.6.1 Introduction

The need for effective treatments for PIU is becoming progressively more evident (King & Delfabbro, 2014; Przepiorka et al., 2014; Rumpf et al., 2018; Zajac et al., 2017). The goal for therapy in treating PIU is to return individuals to balanced and controlled usage of the Internet (Cash et al., 2012; O'Brien et al., 2016; Young, 2007). Research has identified that any therapy must find ways to modify the automatic and maladaptive behaviours of individuals with PIU by improving their self-regulation skills to manage, monitor and alter their cognitions, attention, affect, and behaviours regarding Internet use (Carver & Scheier, 2011; Cash et al., 2012; Fujita et al., 2016; Przepiorka et al., 2014).

A comprehensive research program on the Dynamics of Self-Regulation (DSR) Model by Ayelet Fishbach and colleagues has investigated a dual representation

framework of goal-directed behaviour over the last decade (Fishbach & Shen, 2014; Fishbach et al., 2009). The model has mainly been investigated and utilised in marketing and consumer studies (Campbell & Warren, 2015; Fitzsimons et al., 2008; Wilcox et al., 2009) but has yet to be applied in a clinical setting. The DSR model has the potential to offer novel approaches for clinicians who work with individuals facing the self-control dilemma of PIU.

The model diverged from past models in that it takes into account the ability to hold multiple goals at the same time, the effects of past and future planned behaviours, and their effect on present behaviour choices. The research examined the simultaneous pursuit of multiple goals and temptations and their effects on subsequent behavioural outcomes, and uncovered many processes and variables contributing to the dynamics of self-regulation. An overview of the model is shown in Table 2.1, and for a more comprehensive discussion see Fishbach and Zhang (2009). At the heart of the research is the fundamental proposition that when regulating multiple goals, individuals can evaluate their level of *commitment to*, or their *progress* in moving toward, a focal goal (Fishbach & Dhar, 2005).

Table 2.1*Dynamics of Self-Regulation Model: Commitment and Progress Representations Overview*

Representation	<i>Commitment</i> to the focal goal	<i>Progress</i> towards goal end state
Promotes	Highlighting of the focal goal	Balancing between all goals
Leads To	Emphasizing the focal goal at the cost of alternate goals (temptations).	Valuing alternate goals (temptations) as well as the focal goal.
Causing	Focal goal behaviours increase in perceived value. Alternate goal behaviours (temptations) consequently decrease in perceived value. The selection of focal goal actions is more probable. Decision is likely to be focal goal behaviour over temptation behaviour.	Alternate goal behaviours (temptations) increase in perceived value. Focal goal behaviours consequently decrease in perceived value. Temptations more inclined to be acted on. Decision is likely to be Temptation behaviour and then focal goal behaviour.

Note: Reprinted from *Problematic Internet Usage self-control dilemmas: The opposite effects of commitment and progress framing cues on perceived value of Internet, academic and social behaviors* by Dunbar, D., Proeve, M., & Roberts, R. (2018). *Computers in Human Behavior*, 82, 16-33. Copyright (2018) by Computers in Human Behavior.

2.6.2 Balancing in a Progress Framework

Under a *progress* goal representational framework, individuals are motivated to monitor and regulate the discrepancy between the current and desired end state, a behavioural model that is equivalent to the cybernetic models of self-regulation (Carver & Scheier, 1998; Powers, 2005). Under this framework, a successful goal behaviour would indicate partial completion of the goal and would signal to an individual that enough effort towards completion of the goal has been exerted for now. Consequently, other goals in the environment become more salient as the individual disengages from the focal goal for the moment. The resulting dynamic of self-regulation is that of *balancing*.

2.6.3 Highlighting in a Commitment Framework

Using a *commitment* goal representational framework, individuals are motivated to monitor and regulate their level of commitment to the goal end state. A successful goal

behaviour suggests a strong commitment to the focal goal and increases motivation to ensure completion of this highly committed goal by undertaking related and complementary behaviours at the expense of opposing behaviours. This is in line with work by Dreze and Nunes (2006), who found that individuals work harder towards a goal after experiencing initial goal success and Shah et al. (2002) who found that commitment to a focal goal impedes the availability of alternate goals. The resulting dynamic of self-regulation is *highlighting* congruent goal behaviours.

2.6.4 Opposite Effects

In sum, this dual representational framework model of self-regulation states that individuals utilise either a commitment or progress mode when regulating their behaviour, which produces opposite effects. After successful initial goal pursuit, commitment-focused individuals adopt a highlighting pattern and are more likely to choose goal congruent behaviours, while progress-focused individuals adopt a balancing pattern and are more likely to choose temptations over focal goal actions.

Interestingly, the opposite effects are reversed when an individual fails at a goal behaviour or fails to act upon a goal. Under a mental representation of *progress*, a goal failure signals a discrepancy between the current and desired end states and motivates action on the goal in order to remove the discrepancy (Carver & Scheier, 1998). With a *commitment* frame, however, goal failure indicates a low level of commitment to the goal and individuals are likely to question or even disengage from the goal altogether, leading them to choose other behaviours (Soman & Cheema, 2004).

Thus, opposite behaviour effects are seen both between and within the commitment and progress frameworks. This is perhaps the most pivotal and powerful theory in the DSR model as it provides the model the ability to predict and explain behaviour outcomes in a very flexible and complete manner. A visual representation of how the model might work in the context of PIU is shown in Figure 2.1.

2.6.5 Overview of Factors in the Model

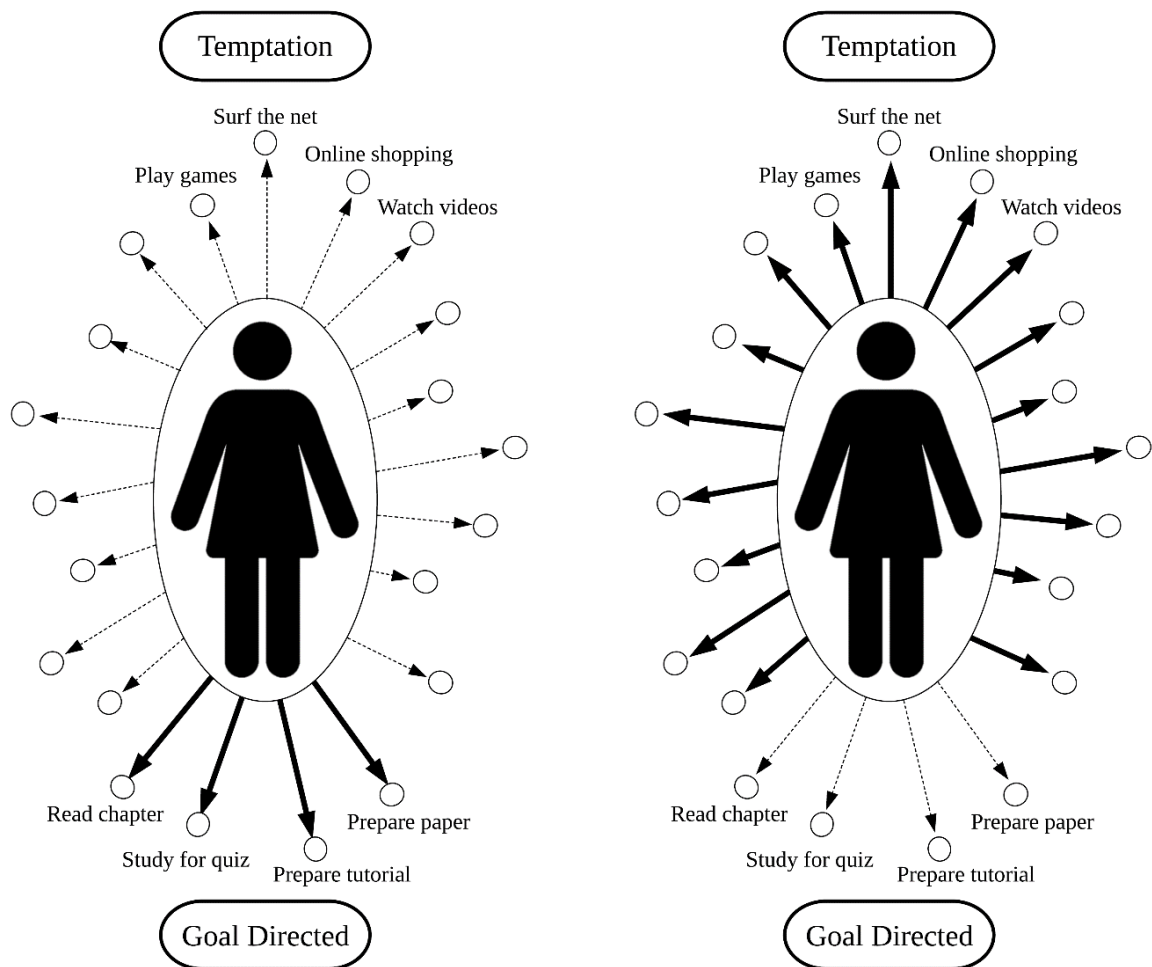
The research program conducted by Fishbach and colleagues identified many processes and variables that influence the dynamics of self-regulation. These include the type of feedback that is sought and offered when under commitment or progress framings (Fishbach & Dhar, 2005; Fishbach et al., 2010), the effects of high versus uncertain commitment to a goal, or focusing on accomplished goal progress or unaccomplished goal progress, on subsequent behaviour choices (Koo & Fishbach, 2008, 2012), the effect of focusing on an abstract or high-level goal versus an individual sub-goal or concrete action on subsequent behaviour when receiving positive or negative feedback (Fishbach et al., 2006), when future expectations of goal progress shape current behaviour (Zhang et al., 2007), why mood attribution towards success or failure of goal attainment is influential (Fishbach & Labroo, 2007), and how presentation format can affect how two behaviours can be perceived (Fishbach & Zhang, 2008).

2.6.5.1 *Framing Cues*

The model proposes that several variables and factors can cause individuals to form the mental representations of commitment or progress and promote the dynamics of highlighting or balancing. The first suggested method of priming or activation utilises sources that can be categorised as framing cues.

Figure 2.1

Visual overview of dynamics of self-regulation model in action.



Factors that promote congruent goal behavior

Progress frame with **negative** feedback:

- A discrepancy is observed between actual and desired goal attainment
- Congruent goal behaviors are more attractive

Commitment frame with **positive** feedback:

- Highlighting occurs
- Congruent goal behaviors are more attractive

Factors that promote incongruent goal behavior

Progress frame with **positive** feedback:

- Balancing occurs
- Enough has been done pursuing the goal for now, others behaviors seen as more attractive

Commitment frame with **negative** feedback:

- Commitment to goal is questioned, the goal is seen as less important
- Other behaviors are now more attractive

Note: Circles represent the multiple behaviour choices that are available at any time. Goal directed actions in the figure are operationalized as academic behaviours. Incongruent goal actions (temptations) are Internet behaviours.

Reprinted from *Problematic Internet Usage self-control dilemmas: The opposite effects of commitment and progress framing cues on perceived value of Internet, academic and social behaviors* by Dunbar, D., Proeve, M., & Roberts, R. (2018). *Computers in Human Behavior*, 82, 16-33. Copyright (2018) by Computers in Human Behavior.

Fishbach and Dhar (2005) and Zhang et al. (2007) found that simply by asking gym members about whether they were expressing their commitment to healthy living by working out induced a commitment framework, so that they increased their interest in future goal-congruent behaviours. However, asking gym members if their workout was helping them make progress towards their goal of staying fit produced a progress framework. These individuals decreased their interest in subsequent goal-congruent behaviours. Questions about goal commitment or goal progress provide cues to individuals and can induce a pattern of highlighting or balancing.

Koo and Fishbach (2008) asked questions about individuals' levels of engagement to their goals. They reasoned that when engagement is high and assured, individuals tend not to worry about their commitment but tend to focus on their progress, however when engagement levels are low or unsure, individuals question if the goal is essential or even achievable. They proposed that high levels of engagement towards a goal promote internal questions that induce a progress framework, while low levels of engagement trigger internal questions that induce a commitment framework.

2.6.5.2 Feedback Cues

Initial goal achievement is a fundamental dynamic of the self-regulation model. Numerous studies (e.g., Fishbach et al., 2006) found that positive feedback was inferred from a successful initial goal pursuit and this causes individuals with commitment framings to highlight subsequent congruent goal behaviours, while individuals with progress framings balance across congruent and incongruent goal behaviours. On the other hand, negative feedback is inferred from unsuccessful initial goal pursuits and this causes individuals with commitment framings to reject the goal and rate incongruent goal behaviours higher, while individuals with progress framings infer a discrepancy and rate congruent goal behaviours higher.

Koo and Fishbach (2008) found that focusing on accomplished actions signalled partial goal completion to the progress-framed individuals and high engagement to the commitment framed individuals. Conversely, focusing on unaccomplished actions signalled a discrepancy in the progress-framed groups and a lack of engagement in the commitment framed groups. Accomplished actions acted like goal achievement or positive feedback. Unaccomplished actions act like incomplete goal action or negative feedback.

2.6.5.3 Abstract Goal or Concrete Goal Actions

Additional studies by Fishbach et al. (2006) and Zhang et al. (2007) investigated outcomes when individuals break a high-level goal into concrete behaviour steps. They explored differences in self-regulation after an initial goal behaviour has been performed, if they focus on the high-level or abstract goal that initiated the behaviour or on the specific behaviour step itself. The results demonstrated that when individuals focus on the abstract or higher-level goal, a commitment framework is formed and when initial goal achievement is positive it induces a highlighting pattern resulting in an increase in interest in goal congruent behaviour. However, when initial goal achievement is negative, there is disengagement from the goal, resulting in a decrease in interest in goal congruent behaviour. Conversely, when the focus is on concrete behaviour steps, a progress framework is formed and when initial goal achievement is positive it induces a balancing pattern resulting in a decrease in interest in goal congruent behaviour. When initial goal achievement is negative, this signifies a discrepancy and in an increase in interest in goal congruent behaviour (Fishbach et al., 2006; Zhang et al., 2007).

2.6.5.4 Committed Versus Uncommitted

Koo and Fishbach (2008) asked questions about individuals' levels of engagement to their goals. The model proposes that when engagement is high and assured, individuals tend not to worry about their commitment but tend to focus on their progress. However, when engagement levels are low or unsure, individuals question if the goal is essential or

even achievable. They proposed that high levels of engagement towards a goal promote internal questions that induce a progress framework, while low levels of engagement trigger internal questions that induce a commitment framework. This was validated in a series of studies (Koo & Fishbach, 2008) which found, for example, that people who were highly committed to a charity would donate more money when given feedback that signalled a lack of progress, whereas when commitment is low, providing feedback emphasising the importance of the charity promotes more donations (Koo & Fishbach, 2008).

2.6.5.5 Future Plans and Optimistic Expectations

The model (Zhang et al., 2007) proposes that self-regulation feedback can not only come from past actions but can also be inferred from plans for future actions. Plans for the future can signal commitment to the current goal and promotes highlighting congruent goal actions in the present. However, if future plans indicate progress towards the goal they can promote balancing of actions in the present. Optimism is also expected to play a key role; it was inferred that individuals with high levels of optimism will place a larger emphasis on the expectation of their future plans. Thus, commitment or progress indicates the direction future plans will influence, while optimism predicts the magnitude of the effect. An elegant set of studies showed exactly this. Gym members were approached at the beginning of the year when hopes and expectation are high. They were then asked to consider their past year's performance or imagine this year's, followed by several framing questions that induced commitment or progress frames. Thinking the study was over they were then offered a healthy bottle of water or a can of soda. Results showed that progress-framed individuals chose more unhealthy cans of soda when they considered the planned future success over their past actions. Individuals with a commitment frame chose more healthy bottles of water when considering their future success compared to the past actions. Another study manipulated optimism levels and showed that low-optimism individuals will

choose healthy food in when in a progress frame and high-optimism individuals will choose more healthy foods in a commitment frame (Zhang et al., 2007).

2.6.5.6 Accomplished or Unaccomplished Goal Actions

The model proposes that focusing on accomplished actions signals partial goal completion (success feedback) whereas focusing on unaccomplished goal actions emphasises the discrepancy between the current and end goal states (failure feedback). Therefore, individuals with a commitment framework will highlight goal-congruent actions when focusing on accomplished actions compared to individuals with a progress framework. Conversely, individuals with a progress framework will increase their motivation towards their goal when focusing on unaccomplished actions compared to individuals with a commitment framework. Koo and Fishbach (2008) tested these hypotheses in a series of studies. One study took participants who were highly motivated in a core course and questionably motivated to an elective course. They then framed the work to complete the course as either 50% completed or 50% incomplete. Even though the amount achieved was the same as the amount to go, participants reported greater motivation for the core course when focusing on unaccomplished actions versus accomplished actions as it signalled a lack of progress. Conversely, participants reported greater motivation for the elective course when focusing on accomplished actions versus unaccomplished actions as it implied the course was important to them (Koo & Fishbach, 2008).

2.6.5.7 Group Identification

The model suggests (Fishbach et al., 2009) that individuals with high group identification are dedicated to the group and will adopt a commitment framework. These individuals will therefore experience the positive and negative group results as if they were their own success and failures. Individuals with low group identification infer low commitment and can question the virtues of the group goals (Fishbach et al., 2009). Group

identification, therefore, can be seen to operate in the same manner a committed and uncommitted factors (Koo & Fishbach, 2008), and highly devoted individuals will focus on group progress whereas uncertain individuals will tend to focus on existing contribution and commitment.

2.6.5.8 Mood

The model predicts that individuals' mood attribution can provide similar consequences as success or failures cues. Mood attribution is proposed as the mechanism that determines how the cues are interpreted and affect the motivational priority of goal congruent behaviours (Fishbach & Labroo, 2007). When a mood is attributed to unrelated goal actions, a positive mood is likely to increase commitment and highlighting compared to a negative mood. When a mood is attributed to goal-related actions, a positive mood is likely to induce a progress framework and promotes balancing compared to a negative mood. Motivation is increased for a positive mood when it signals commitment and for a negative mood when it indicates lack of sufficient progress towards a goal (Eyal et al., 2009; Fishbach & Labroo, 2007; Fishbach et al., 2009).

2.6.6 What can the Dynamics of Self-Regulation Offer Over Other Models?

The DSR model does not easily fit into other existing models of self-regulation. Cybernetic models of self-regulation (e.g. Carver & Scheier, 1998; Powers, 2005) can explain how progress feedback can prompt action as individuals respond to discrepancies from a reference value (i.e. goal) or but don't appear to have a mechanism to explain how the opposite effects of behaviour are implemented in a commitment framework.

The hot/cool system model (Metcalf & Mischel, 1999) has similar issues in that it can explain the depreciation of incongruent goals in one direction but does not support the opposite effects. It is difficult to explain how the hot (affect) system can be turned on in one condition and the cold (neutral and reflective) system be turned on in another, and then

explain why these systems would switch when faced with negative versus positive initial goal successes.

The ego depletion or strength model of self-control (Baumeister et al., 1998; Baumeister & Heatherton, 1996) cannot account for the opposite effects of behaviour. Specifically, how can negative feedback cause more incongruent goal behaviour for individuals with a commitment frame, but then cause less incongruent goal behaviour for individuals with a progress frame? This model cannot explain how negative feedback can deplete self-control resources in one instance and seemingly replenish them in another.

Construal level theory (Trope & Liberman, 2010) states that high level or abstract thinking gives rise to better self-control, whereas low level or concrete thinking decrease self-control. This is contradicted by evidence that participants holding abstract goal views or concrete goal views are shown to perform well or poorly simply by providing positive and negative feedback (Fishbach et al., 2006).

For these reasons, the Dynamics of Self-Regulation model appears to offer a more complete theory that can be applied to many real-world domains, including that of PIU (Billieux & Van der Linden, 2012; King & Delfabbro, 2014; World Health Organization, 2015; Zajac et al., 2017).

2.7 Rationale and Aim of Thesis

The overarching research aim was to examine whether the dynamics of self-regulation (DSR) model could be applied to a clinical domain and if it could be used to affect positive clinical outcomes.

The domain of problematic Internet usage seemed ideally suited, as PIU is broadly acknowledged as a worldwide public health concern and, notwithstanding the heterogeneity of prevalence rate values, there are millions of people affected and at risk; it is a new domain for psychology and there is need for good treatment and therapeutic approaches; and regardless of how it is conceptualised, all models agree that a key component of PIU are failures in self-regulation and self-control processes (Aboujaoude, 2010; Billieux & Van der Linden, 2012; King & Delfabbro, 2014; Muusses et al., 2014; Spada, 2014; World Health Organization, 2015; Zajac et al., 2017).

On this basis, the initial step was to assess the feasibility of situating the DSR model in a PIU context. A first study was created to test the DSR model by looking at the basic premise of highlighting (a commitment framework) or balancing (a progress framework), asking if they can be primed by presentation format, and determining if those two representations produce opposite behavioural outcomes as predicted by the model. Presentation format (presenting options as competing or complementing each other) was chosen as the first factor to test as it could be established with no interaction with other processes or variables in the model and thus allow us to answer the research question without other confounding interactions.

Upon the success of the first study, three further studies were designed to further test the model and to test elements that do interact: framing cues (questions on commitment or progress and pre-existing goal commitment); feedback cues (initial goal success or failure and unaccomplished or accomplished actions) and focusing on the abstract goal versus concrete plans. These three factors are fundamental components to the

theory and also have the potential to offer valuable insights about influencing goal directed behaviour, something that is of great importance to clinicians.


If the initial studies were successful, then an online randomised controlled trial would be conducted, including follow-up data post-intervention. This randomised controlled trial would specifically target a clinical population of individuals identified as suffering from PIU and would use an intervention driven by the DSR model to influence participants self-regulation and self-control processes on their Internet usage and produce positive outcomes such as a reduction in daily personal Internet use, PIU symptoms, and associated mental health issues of depression, anxiety, stress and social anxiety. Comparison to an active-control group would ensure the best chance of discovering if any positive effects were truly produced by the DSR model.

Chapter 3: Paper One – Problematic Internet Usage Self-Regulation Dilemmas: Effects of Presentation Format on Perceived Value of Behavior.

Statement of Authorship

Title of Paper	Problematic Internet Usage self-regulation dilemmas: effects of presentation format on perceived value of behavior.
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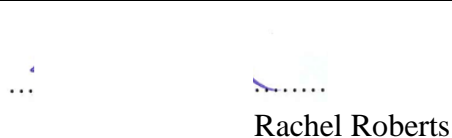
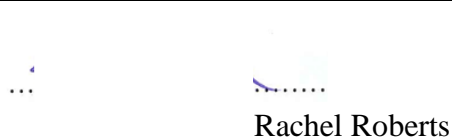
Principal Author

Name of Principal Author (Candidate)	David William Dunbar		
Contribution to the Paper	Reviewed the literature and formed the research idea. Planned, designed, and implemented the research, including gaining ethical approvals, obtaining informed consent from participants, data collection, and analysis. Responsible for writing and editing the manuscript in collaboration with research supervisors. Submitted the manuscript for publication and corresponding author for the paper.		
Overall percentage	85%		
Certification	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.		
Signature		Date	23/11/2020

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

- i. the candidate's stated contribution to the publication is accurate (as detailed above);
- ii. permission is granted for the candidate to include the publication in the thesis; and
- iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Dr Michael Proeve Associate Professor Rachel Roberts		
Contribution to the Paper	Supervisors of the PhD research program. Oversaw the research idea conceptualisation, methodology, planning and implementation. Collaborated in developing the content and structure of the publication manuscript, and reviewing drafts. Provided advice and guidance for responding to journal reviewer feedback.		
Signature Date	 26/11/2020	 ...	 Rachel Roberts

Abstract

A model of the dynamics of self-regulation describes two patterns of commitment or progress that individuals may follow when selecting goal directed behaviors. In the commitment pattern, individuals are more likely to highlight congruent goal behavior choices while in the progress pattern individuals are more likely to balance between incongruent and congruent goal behavior choices.

This study set out to test the model in the context of problematic Internet usage. After being primed about problematic Internet usage, a sample of 97 undergraduate University students completed an online survey rating the value of Internet, academic and social-related behaviors across three conditions. The three conditions paired behaviors so that they appeared to complement each other, appeared to compete against each other, and presented them individually.

Results showed that Internet behaviors were rated more highly when presented as complementary than when presented as competing, supporting the prediction that presentation format primes progress and commitment frameworks and leads to higher ratings of incongruent goal behavior in the progress condition. While results did not fully support the model's predictions regarding congruent goal behavior, they were in the predicted direction with small to moderate effect sizes.

This study may inform clinical interventions by suggesting that individuals experiencing issues with problematic Internet usage would benefit from framing self-regulatory dilemmas in a competing format.

Problematic Internet Usage Self-Regulation Dilemmas: Effects of Presentation Format on Perceived Value of Behavior.

3.1 Introduction

A research program conducted by Ayelet Fishbach and colleagues over the last decade has investigated a dual representation model of goal directed behavior (Fishbach & Shen, 2014; Fishbach et al., 2009). This novel research investigating the simultaneous pursuit of multiple goals and temptations and the effects on subsequent behavioral outcomes has uncovered many processes and variables contributing to the dynamics of self-regulation. At the heart of their research is the fundamental proposition that goals can be represented as commitment to, or progress towards, a desired end state, and that these two representation frameworks drive different behavioral choices (Fishbach & Dhar, 2005). For a brief overview see Table 3.1 and for a more comprehensive discussion see Fishbach and Zhang (2009).²

A commitment framework promotes highlighting of the focal goal instead of temptations (or incongruent goal behaviors) and leads to more goal congruent behavioral choices, whereas a progress framework promotes balancing choices between the focal goal and other goals or temptations, leading to the likelihood of fewer goal-congruent choices and more goal-incongruent outcomes (Fishbach & Dhar, 2005). These two representational frameworks can be primed by a variety of processes and factors (Fishbach et al., 2009). To date, the frameworks have been utilized in marketing and consumer studies (Campbell & Warren, 2015; Fitzsimons et al., 2008; Wilcox et al., 2009) but have yet to be applied in a

² The term model is used throughout the paper in reference to the overall concepts, hypotheses, and principles described by the self-regulation theories developed by Fishbach and colleagues. The term framework is used in reference to the two mental representation frames that an individual can adopt of commitment or progress; as predicted by the model.

clinical setting. The present study seeks to apply the theory in a clinical context: specifically, the domain of problematic Internet usage (PIU).

Table 3.1

Dynamics of Self-Regulation Model: Commitment and Progress Representations Overview

Representation	Commitment to the focal goal	Progress towards goal end state
Promotes	<i>Highlighting</i> of the focal goal	<i>Balancing</i> between all goals
Leads To	Emphasizing the focal goal at the cost of alternate goals (temptations).	Valuing alternate goals (temptations) as well as the focal goal.
Causing	Focal goal behaviors increase in perceived value. Alternate goal behaviors (temptations) consequently decrease in perceived value.	Alternate goal behaviors (temptations) increase in perceived value. Focal goal behaviors consequently decrease in perceived value.

3.1.1 Problematic Internet Use

Problematic Internet usage is a growing and global public health concern (Jelenchick et al., 2014; Spada, 2014) and despite the first published case being recorded in 1996 (Young, 1996), psychological research has not kept up with the technological advances (Aboujaoude, 2010) and growing popularity of Internet usage (2014). Mobile platform penetration has reached more than 90% worldwide with almost 7 billion mobile subscriptions (International Telecommunication Union, 2014). Mobile Internet usage recently surpassed desktop usage illustrating that individuals have more and more constant Internet access (Australian Communications and Media Authority, 2014; comScore, 2014).

Psychological research on PIU has blossomed in recent years, but there is still not enough known about PIU to draw anything other than preliminary conclusions (Winkler et al., 2013). New terms are being proposed for the Diagnostic and Statistical Manual of Mental Disorders (DSM), such as *nomophobia* (fear of being without a mobile device) to describe issues individuals are experiencing (Bragazzi & Del Puente, 2014) with

smartphone addiction a rising concern (Pavia et al., 2016; Samaha & Hawi, 2016; Sapacz et al., 2016; Wang et al., 2015). Even with the rise in research there is still yet to be consensus in the literature, with problematic Internet usage also known as Internet addiction, pathological Internet use and Internet dependence (Spada, 2014). Despite a lack of consensus overall, numerous studies have shown excessive use of the Internet is associated with poorer academic achievement and personal relationship quality for adolescents and young adults (Aboujaoude, 2010; Jelenchick et al., 2014; Lopez-Fernandez et al., 2014; Muusses et al., 2014; Wang et al., 2014; Yau et al., 2013).

3.1.2 Fishbach Research Program and Model

The research program conducted by Fishbach and colleagues identified many processes and variables that influence the dynamics of self-regulation. These include the following:

- the type of feedback that is sought and offered when under commitment or progress framings (Fishbach & Dhar, 2005; Fishbach et al., 2010);
- high versus uncertain commitment to a goal, and focusing on accomplished goal progress or unaccomplished goal progress (Koo & Fishbach, 2008, 2012);
- focusing on an abstract or high level goal versus an individual sub-goal or concrete action when receiving positive or negative feedback (Fishbach et al., 2006);
- future expectations of goal progress (Zhang et al., 2007);
- the influence of mood attribution towards success or failure of goal attainment (Fishbach & Labroo, 2007); and
- how presentation format can affect how two behaviors can be perceived (Fishbach & Zhang, 2008).

It is the last factor, presentation format, which will serve as the starting point for testing the theories in a clinical context. Presentation format can be established with no interaction with other processes or variables in the model, which allows us to test the fundamental principle of highlighting and balancing and the effect those dynamics have on subsequent behavioral choices in the new clinical context.

3.1.3 Current Study Context From Model

Previous research (Fishbach & Zhang, 2008) has found that presentation format can prime the two representational formats such that when different behavioral choices were presented and arranged so that they appeared to complement each other a pattern of balancing was promoted (a progress framework), but when the choices were arranged so that they appeared to compete against each other a pattern of highlighting (a commitment framework) was promoted. The respective primed progress and commitment representations then resulted in higher evaluations of goal-incongruent behavior compared to goal-congruent behavior in the progress group and lower goal-incongruent evaluations of behaviors compared to goal-congruent behaviors for the commitment group (Fishbach & Zhang, 2008).

3.1.4 Why Self-Regulation is Important

Self-regulation dilemmas are a common daily occurrence (Baumeister et al., 2007), for example: “Should I have the chocolate cake or do I go for the salad?” or “Should I surf the Internet right now and then study for my exam?” Given the ubiquity of the Internet in modern living (Internet World Stats, 2019) it seems unrealistic that the final goal for any treatment of problematic Internet usage would be complete abstinence. Therefore, a more likely intervention approach would be directed at some form of moderation training and this treatment would involve developing and implementing behavioral strategies for coping with self-regulation dilemmas (Rotgers, 2004). Factors that decrease the likelihood of incongruent goal actions and increase the likelihood of congruent goal actions would be promoted in such an intervention.

Throughout any intervention, clinicians ask questions and provide feedback to clients (Beck, 2011; Miller & Rollnick, 2012). If the presentation format of the question and feedback can sway later behavioral choices of the client then it is important for a

clinician to know how to present the questions and feedback in order to ensure the best possible results.

3.1.5 The Present Research

The present study sought to apply the dynamics of this self-regulation model in a clinical context by looking at the basic premise of highlighting (a commitment framework) or balancing (a progress framework), asking if they can be primed by presentation format, and determining if those two representations produce opposite behavioral outcomes as predicted by the model. A goal to reduce personal Internet usage was primed by way of reading a vignette on PIU (Förster et al., 2007; Laham & Kashima, 2013). Maladaptive outcomes for academic/work and social functions both result from PIU (Aboujaoude, 2010) and these two activities are likely to be important to individuals in general. Indeed, a pilot study testing the operationalization of variables and design used to test the model in a clinical context established these two activities as especially important to the target population of undergraduate university students. Therefore, the incongruent goal behavior for the study is personal Internet usage and two congruent goal behaviors are academic and social behaviors. Using the two domains of academic and social behaviors to test the model's predictions adds weight to the ability to generalize from the results and so both are included.

Adopting the approach of Fishbach and Zhang (2008) that an individual's motivational priority is reflected by the value placed on items (Brendl & Higgins, 1996; Ferguson & Bargh, 2004; Touré-Tillery & Fishbach, 2014), the present study tested the hypothesis that when behavior actions are presented in a complementary format this will prime a progress representational framework and individuals will rate incongruent goal behaviors more highly than when presented in a competing format. We also tested the hypothesis that when behavior actions are presented in a competing format this will prime

a commitment framework and individuals will rate congruent goal behaviors more highly than when presented in a complementary format.

3.2 Method

3.2.1 Participants

One hundred and five undergraduate psychology students (73 female, 32 male) participated in the study in exchange for course credit. Eight participants failed to complete the survey and were excluded from the final dataset leaving a final $N = 97$. The gender of participants did not yield any effects and is therefore omitted from further consideration. Participants ages ranged from 17 to 57 ($M = 20.97$, $SD = 7.42$). Ethical approval was granted by the University's Human Research Ethics Committee. No personal identifying information was collected.

3.2.2 Design

The current study's procedure and design was adapted from a study by Fishbach and Zhang (2008) that tested how the presentation format of goal congruent and goal incongruent items affected subsequent behavior evaluation and choice. Stimuli from Fishbach and Dhar (2005) that utilized academic and social behavior items were adapted and extended to form a set of behavior items mapping to Internet, academic and social domains.

The independent variable was presentation format and the dependent variables were the motivation to perform congruent goal actions or incongruent goal actions. In line with the problematic Internet usage context, incongruent goal behavior was operationalized as Internet behavior, and keeping in line with the target population and verified by a pilot study, congruent goal actions were operationalized as academic and social behaviors.

Presentation format was represented as *complementary*, with actions presented such that they appeared to complement each other, *competing*, with actions presented such that they appeared to compete against each other, and *single*, with actions presented

individually. Dependent variables of interest were the motivation to perform congruent goal actions or incongruent goal actions.

Motivation to perform congruent goal actions or incongruent goal actions was captured using perceived value of a behavior item using a 7-point Likert scale (1 – Very Negative to 7 – Very Positive) as used by Fishbach and Dhar (2005) and Fishbach and Zhang (2008).

3.2.3 Stimuli

Behavior items from Fishbach and Dhar (2005) that utilized academic and social behavior items were adapted and extended, thus creating a set of behavior items mapping to Internet, academic and social domains. Each statement was simple in nature and designed such that it clearly represented a behavior in the intended domain. In order to minimize the risk of some Internet actions being perceived by participants as social in nature, social networking sites, such as Facebook, were not used. The list of behavior action items is displayed in Table 3.2.

Table 3.2

Behavioral Action Item Stimuli Sets in Social, Academic and Internet Domains

Domain	Behavior Action Item
<i>Social</i>	<ul style="list-style-type: none"> · Hanging out with friends at a café, bar or restaurant. · Attending an event (e.g. movie, play, or concert) with friends. · Sitting with friends at lunch or during a break. · Helping a friend (or friends) celebrate a special achievement.
<i>Academic</i>	<ul style="list-style-type: none"> · Studying for a quiz for a key course you are taking. · Preparing for an upcoming tutorial for a key course you are taking. · Working on a paper for a key course you are taking. · Reading an important chapter or paper for a key course you are taking.
<i>Internet</i>	<ul style="list-style-type: none"> · Play your favorite online game. · Watching videos from your favorite channels, feeds or suggestions on YouTube or other similar sites. · Browsing through shopping websites that you like. · Surfing the net or using your favorite sites, or reading blogs, etc.

To conceal the purpose of the study nine filler behavior items such as “go to the supermarket to buy some groceries” and “do your weekly laundry” were created. This was done so that the final presented list of behavior action items would look like a normal set of actions that any student would encounter on a typical day. That is, study, socialize, use the Internet, do some chores, and other daily life activities.

In the Complementary condition the action statements were combined using the conjunction “and then”, were presented in a single sentence, but were combined in such a way as each behavior was always on its own line (see Figure 3.1). In the Competing condition the action statements were combined using the conjunction “or”, were presented in distinct statements, and notably separated from each other (see Figure 3.2).

Figure 3.1

Presentation Format: Complementary Condition

You spend some time hanging out with friends at a café, bar or restaurant
and then browse through shopping websites that you like.

Figure 3.2

Presentation Format: Competing Condition

You spend some time hanging out with friends at a café, bar or restaurant
OR
Browse through shopping websites that you like.

Each of the four Internet behavior action items were paired with the four academic items giving 16 pairs and each social behavior action item giving another 16 pairs. Another 28 pairs of filler behavior action item statements were created so that each participant received 60 pairs of action statements (16 Internet and Academic pairs, 16 Internet and Social Pairs, 28 Filler pairs). The order of action items was randomized such that half of

the time the Internet action item was presented first in the pairing and half of the time the Academic or Social action was presented first. The first two behavior pairs were always randomized filler pairs. The remaining behavior pairs were presented in random order. After reading each action statement pairing, participants were asked the question: “Please indicate how you would rate the value (from 1- Very Negative to 7 – Very Positive) of the following actions”. Participants then rated the value of each of the two actions on separate 7 point scales.

It can be noted that the only differences in stimuli between Complementary and Competing conditions was the conjunction used to combine the individual action statements and the space dividing them.

In the single condition each action statement was presented on its own page. The first two action items were always randomized filler behavior action items. The remaining order of the behavior action items was randomized. After reading each action statement participants were asked: “Please indicate how you would rate the value (from 1- Very Negative to 7 – Very Positive) of the following action”. Participants then rated the value of each action on a 7 point scales. The single condition presented the four Internet, Academic and Social action statements as well as eight filler action statements individually for a total of 20 actions statements.

3.2.4 Procedure

A between-participants design used three presentation formats (complementary, competing and single), the main dependent variables were incongruent goal behavior operationalized as Internet behavior ratings, and congruent goal behaviors were captured by ratings of academic and social behaviors.

Participants took the survey using SurveyMonkey at their convenience. The first part of the study gained consent and gathered basic demographic information. In order to prime participants’ goals they were asked to read a short (280 word) literature review on

problematic Internet usage. The literature review was presented as part of a pilot for an unrelated study and some simple questions were asked after reading to further enhance its image of being part of a separate research project. Participants were then instructed that the real experiment was about to begin and clicked a link which took them to a new window.

Two randomized filler stimuli were always presented first in each condition in order to help obscure the purpose of the study and all subsequent stimuli were presented randomly. After completing the rating portion, participants were asked to describe what they thought the study was investigating, were thanked for their participation and dismissed. Analysis of the provided descriptions revealed that none of the participants were able to determine the true intent of the study.

3.3 Results

The value ratings for responses to the 16 academic and Internet paired items as well as for the responses to the 16 social and Internet paired items were averaged to give a single mean rating or value for each participant on Internet actions (when paired with academic actions), academic actions, Internet actions (when paired with social action), and social actions. This was done in both the complementary and competing conditions. In the single condition, the four value ratings for Internet, social and academic items were averaged for each participant to give a single mean value for each participant across each domain. Descriptive statistics are presented in Table 3.3. Analysis is reported separately for Academic and Social domains for clarity.

Table 3.3*Descriptive Statistics for Internet, Academic and Social behavior value ratings*

Condition	<i>N</i>	Internet (Academic)		Internet (Social)		Academic		Social	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Complementary	34	5.05	1.07	5.04	1.11	4.09	1.56	6.11	0.84
Competing	32	4.29	1.39	4.18	1.28	4.80	1.49	5.95	0.76
Single	31	4.74	1.21	4.74	1.21	4.75	1.36	5.56	1.02

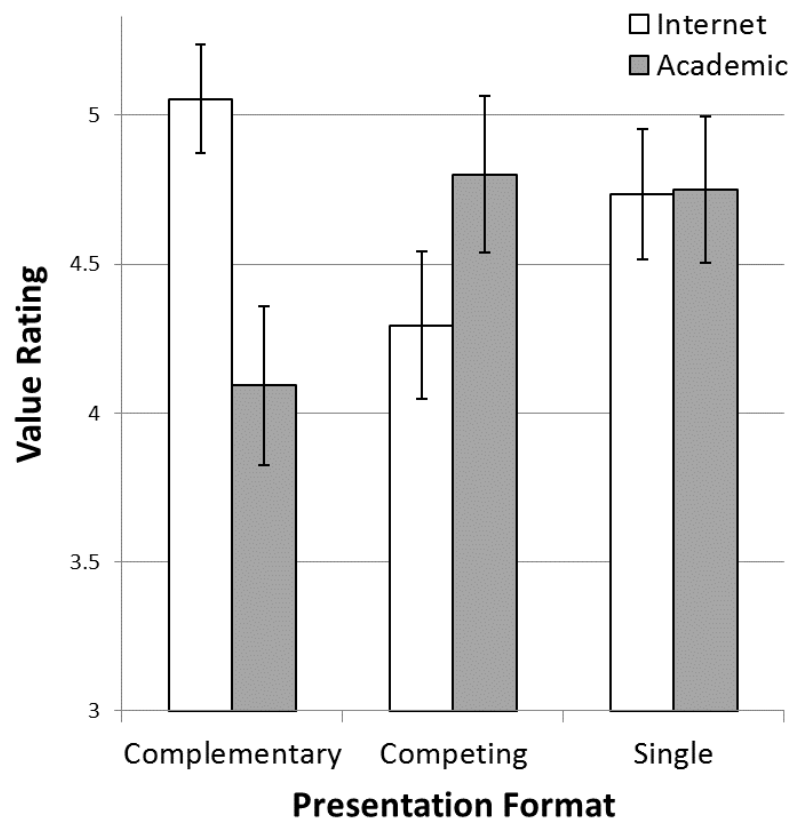
Note: In the Single condition there were no pairings of Internet behaviors. Therefore there is only a single data group for Internet ratings. This single value has been repeated in the table as Internet (Academic) and Internet (Social) values for completeness.

3.3.1 Academic Versus Internet Behavior

A one-way between subjects ANOVA was conducted to compare the effect of presentation format on Internet behavior value ratings in complementary, competing and single presentation format conditions. There was a significant effect of presentation format on Internet behavior value ratings at the $p < .05$ level for the three conditions, $F(2, 94) = 3.17, p = .047$. A contrast analysis revealed that in the complementary condition participants rated the value of Internet behaviors higher than in the competing condition, $t(64) = 2.50, p = .016$. Further, Cohen's effect size ($d = 0.62$) was moderate in size. There was no significant difference in the value of Internet behaviors between the single condition and either complementary or competing conditions, with Cohen's d values of 0.29 and -0.34 respectively, indicating small effects. Taken together, these results support the hypothesis that incongruent goal actions will be more highly valued when presented together than when presented apart (see Figure 3.3).

Figure 3.3

Internet and Academic Mean Value Ratings Across Conditions. Error bars represent standard errors.



A one-way between subjects ANOVA revealed no significant effect of presentation format on academic behavior value ratings, $F(2, 94) = 2.37, p = .10$. The values for each condition showed some support for the hypothesis (see Figure 3.3), with academic behaviors being valued less in the complementary condition than in the competing condition and the single condition. Cohen's effect size calculations showed these differences were both approaching a moderate size (complementary versus competing, $d = -0.47$ and complementary versus single, $d = -0.45$) and were in the predicted direction.

3.3.2 Social Versus Internet Behavior

A one-way between subjects ANOVA was conducted to compare the effect of presentation format on Internet behavior value ratings in complementary, competing and single presentation format conditions. There was a significant effect of presentation format

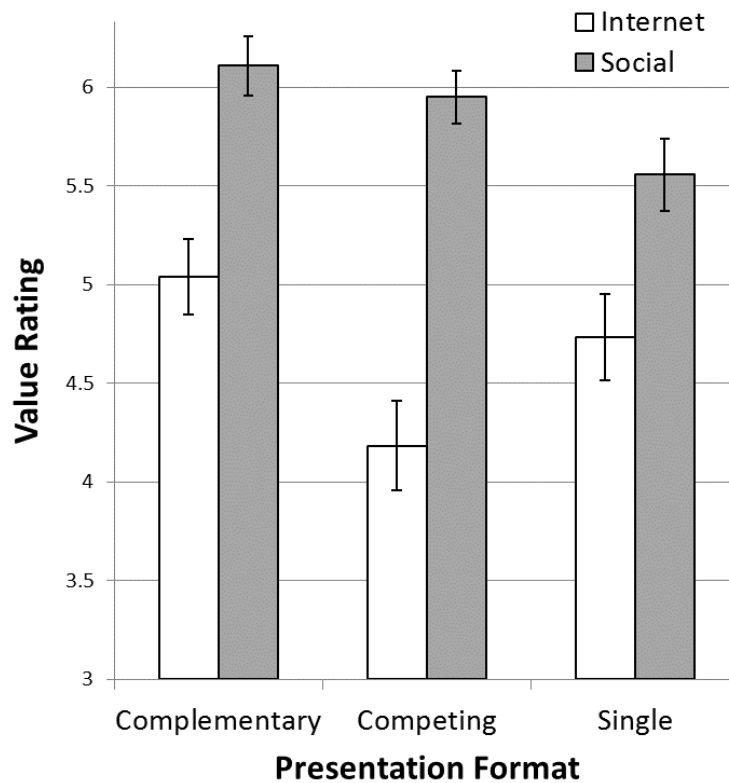
on Internet behavior value ratings at the $p < .05$ level for the three conditions, $F(2, 94) = 4.26, p = .017$. A contrast analysis revealed that in the complementary condition participants rated the value of Internet behaviors more highly than in the competing condition, $t(64) = 2.50, p = .005$. Further, Cohen's effect size value ($d = 0.74$) suggested this difference was moderate to large in size. There was no significant difference in the value of Internet behaviors between the single condition and either complementary or competing conditions, with Cohen's d values of 0.27 and -0.45 respectively indicating small effects. Taken together, these results support the hypothesis that incongruent goal actions will be more appealing when presented together than when presented apart (see Figure 3.4).

A one-way between-subjects ANOVA revealed a significant effect of presentation format on social behavior value ratings, $F(2, 94) = 3.31, p = .041$. A contrast analysis revealed that in the complementary condition participants rated the value of social behaviors higher than in the single condition, $t(63) = 2.36, p = .02$. Further, Cohen's effect size value ($d = 0.60$) suggested this difference was moderate in size.

There was no significant difference in the value of social behaviors between the competing condition and either complementary or single conditions, with Cohen's d values of 0.20 and 0.45 respectively indicating small effects. These results do not support the hypothesis that congruent goal actions will be more appealing when presented apart than when presented together (see Figure 3.4).

Figure 3.4

Internet and Social Mean Value Ratings Across Conditions. Error bars represent standard errors.



3.4 Discussion

Considerable research has been conducted into goal directed behavior and self-regulation but a recent model has been developed that deals with the more real world self-regulation dilemma of battling multiple goals and temptations simultaneously and over the course of many decisions (Fishbach et al., 2009). The model has primarily been applied to a consumer and marketing context and the present study set out to translate the model into a clinical context. Specifically, we set out to determine if the presentation format component of the model on the dynamics of self-regulation would translate into a context of problematic Internet usage.

The model predicted that when goal incongruent and congruent actions are presented together and appear to complement each other, goal incongruent actions will be

valued more highly than when the same actions are presented apart and appear to compete against each other. On the other hand, when goal incongruent and congruent actions are presented apart and appear to compete against each other, goal congruent actions will be valued more highly than when the same actions are presented together and appear to complement each other.

We tested these predictions across academic and social domains using Internet usage as the incongruent behavior. Results showed that the representational frameworks of commitment induced highlighting and progress induced balancing can be primed by presentation format. Further to this, these representational frameworks lead to different evaluations of behavior. Higher value ratings were given on Internet behaviors for the complementary condition compared to the competing condition, confirming the model predictions against both academic and social domains. The effect sizes were moderate to large, suggesting that the effect may have clinical utility.

The adaptive outcomes the model predicted for goal congruent behaviors were not supported, but neither were they rejected. The academic domain showed values in the predicted direction and effect sizes approaching moderate magnitude, but the differences were not statistically significant.

The social domain showed a positive effect in congruent goal behavior ratings for competing and complementary conditions compared against the single condition, but there was no difference between the complementary and competing formats. This does not appear to be due to a failure in the design or lack of priming as the predicted effects were found in the Internet and academic domains. It is therefore more likely that presentation format did not impact individual's appraisal of their social actions value. This perhaps implies that the participants were not actually in a self-control dilemma when considering the social behavior items (Fujita, 2011). Another possible explanation for this is that individuals awarded social behaviors both high immediate and high long term value.

Social behaviors would then be able to serve both as enjoyable short term temptations in the present as well as fulfilling long term goals and would therefore be immune to the effects of balancing and highlighting. Future research could consider how to investigate this discrepancy with the model.

From a clinical standpoint, resolving self-regulatory dilemmas in a constructive manner would include behavioral strategies for decreasing incongruent goal actions and increasing congruent goal actions (Beck, 2011; Harris, 2009). Results of this study suggest that individuals experiencing issues with problematic Internet usage may benefit from framing self-regulatory dilemmas in a competing format. These effects may generalize to other clinical domains such as problematic drinking or gambling.

3.4.1 Limitations of the Study

The effect predicted by the model was found for the incongruent Internet behavior. However, there was partial support for the congruent academic behavior and contradicting results in the social actions. The goal to reduce personal Internet usage was primed using a literature review on PIU which, while accurate, deliberately placed emphasis on the problems surrounding spending too much time and the detrimental effects that had on work, academic, social and other life outcomes. There may have been insufficient emphasis placed on positive academic and social outcomes in order to adequately prime them as goals for participants. Future work could ensure that equal weight was given to priming not only the incongruent goal behaviors but also the congruent goal behaviors.

The study was conducted via an online survey given to a general population of University undergraduates which limits the ability to generalize the results as being applicable to reducing actual problematic Internet usage behavior in a clinical population. Added to this, the presentation of the behaviors were distinguished by either an “or” or “and then” conjunction. It is unclear if these kinds of simple constructions and distinctions

can be delivered in a clinical practice or if they can be made within an individual dealing with problematic Internet usage. Future studies may address these concerns.

3.4.2 Future Research.

The current study has shown that fundamental components of the dynamics of self-regulation model proposed by Fishbach and colleagues can be applied in a clinical domain. The commitment and progress representation formats can be primed and this does lead to opposite effects in behavioral ratings. Future research could test this effect in a clinical population of individuals with problematic Internet usage. Future studies are also required to test other components of the model which could better inform clinical interventions. These might be additional progress or commitment framing cues, such as whether asking questions about goals can prime either a commitment or progress representations, whether focusing on accomplished or unaccomplished tasks affect the representation frameworks for a client, and how providing feedback on goal accomplishments may affect future behavior choices, depending on what representation framework the client holds. During the course of treatment clinicians provide much feedback to clients and this can take many forms (Beck, 2011; Miller & Rollnick, 2012; Page & Stritzke, 2006). If the words chosen when simply asking clients about their current state, summarizing progress towards a goal, emphasizing current accomplishments or future work influences subsequent behavioral choices a client makes then it is important for a clinician to know how to frame the questions and feedback in order to ensure the best possible outcome for the client that is in line with the client's stated goals.

3.5 Conclusion

This study has begun the investigation of the opposite effects of goal commitment and progress representational frameworks and their effects on behavioral choices in the context of the self-regulation dilemma of problematic Internet usage. Results showed that the representational frameworks of commitment induced highlighting of goal congruent

behaviors and progress induced balancing between goal congruent and incongruent behaviors can be primed by presentation format. These representational frameworks cause different evaluations for incongruent goal behaviors with undesirable outcomes for the complementary presentation format condition. The predicted effect for goal congruent behaviors was not supported but there was encouraging evidence in the academic domain. The model developed by Fishbach and colleagues explaining the dynamics of self-regulation shows potential to have positive influences on the processes for implementing psychological interventions. When faced with a self-regulation dilemma of goals versus temptations, framing behavior choices in a competing format will produce more goal behaviors and less succumbing to temptation.

Disclosure Statement

No competing financial interests exist.

Chapter 4: Paper Two – Problematic Internet Usage Self-Control Dilemmas: The Opposite Effects of Commitment and Progress Framing Cues on Perceived Value of Internet, Academic and Social Behaviors

Statement of Authorship

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- i. the candidate's stated contribution to the publication is accurate (as detailed above);
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Abstract

Problem Internet Usage (PIU) is a growing public health concern and despite an upsurge in research, there is limited information regarding effective psychological interventions. A model of the dynamics of self-regulation may provide a useful framework for psychological intervention with PIU. The model describes two patterns that individuals may follow when choosing goal directed behaviors, according to whether they hold commitment or progress frameworks. The model explains and predicts how opposite behavior outcomes can be achieved by holding commitment or progress frameworks.

Three online studies tested the model in the context of PIU using a student population. Incongruent goal behavior was operationalized as Internet activity and congruent goal behaviors as academic and social activities. Study 1 (N =173) tested priming of commitment or progress frameworks and examined what effects positive and negative feedback had on subsequent behavior intentions. Study 2 (N =167) examined high versus uncertain goal engagement priming effects and whether focusing on accomplished or unaccomplished actions produced the opposite behavior intentions. Study 3 (N =172) tested if focusing on an abstract goal versus concrete steps would prime commitment or progress frameworks.

Results supported the model's predictions for the framing cues and subsequent opposite behaviors for Internet and academic activities with moderate and large effects. No support was found for predictions of social activities. Results of the study provide support for the self-regulation model in a clinical domain. Results may inform clinical interventions for PIU, demonstrating how opposite behavior outcomes may be achieved for the same scenarios given different underlying mental frameworks, and indicating how those frameworks may be cued in the first place.

Problematic Internet Usage Self-Control Dilemmas: The Opposite Effects of Commitment and Progress Framing Cues on Perceived Value of Internet, Academic and Social Behaviors

4.1 Introduction

The ubiquity of Internet usage in our societies has given rise to a modern self-control dilemma of problematic Internet usage (PIU) and this is receiving much recent attention in the scientific community. Numerous studies have shown that excessive use of the Internet is associated with unfavourable consequences such as poorer academic achievement and personal relationship quality (Aboujaoude, 2010; Škařupová et al., 2015; Spada, 2014). A model of the dynamics of self-regulation developed by Ayelet Fishbach and colleagues over the last decade (Fishbach & Dhar, 2005; Fishbach et al., 2006; Fishbach & Zhang, 2008, 2009; Fishbach et al., 2009; Koo & Fishbach, 2008; Zhang et al., 2007) may be usefully applied to Problematic Internet Usage. This model describes contrasting patterns of commitment or progress frameworks that individuals may follow when selecting goal directed behaviors. To date, the model has mainly been applied in marketing and consumer research (Campbell & Warren, 2015; Fitzsimons et al., 2008; Wilcox et al., 2009). However, recent research by Dunbar et al. (2017) showed that fundamental components of the model can applied in the clinical domain of PIU. The present study seeks to develop application of the model further by conducting an investigation of additional aspects of the theory in the clinical context of PIU, in a series of three studies. The dynamics of self-regulation model has the potential to offer novel approaches for clinicians when dealing with individuals facing the self-control dilemma of PIU.

4.1.1 Problematic Internet Usage

Problematic Internet Use (PIU) is a growing and global public health concern (Jelenchick et al., 2014; Spada, 2014). Despite the first published case being recorded in 1996 (Young, 1996), psychological research has not kept up with technological advances

(Aboujaoude, 2010) and the growing popularity of Internet usage (2014). Mobile platform penetration has reached more than 90% worldwide with almost 7 billion mobile subscriptions (International Telecommunication Union, 2014). Mobile Internet usage recently surpassed desktop usage, illustrating that individuals have increased ability to access the Internet from anywhere and at any time (Australian Communications and Media Authority, 2014; comScore, 2014).

Psychological research on PIU has increased in recent years, but there is still not enough known about PIU to draw anything other than preliminary conclusions in regards to its underlying mechanisms and treatment approaches (Winkler et al., 2013). New terms are being proposed for the Diagnostic and Statistical Manual of Mental Disorders (DSM), such as nomophobia (fear of being without a mobile device) (Bragazzi & Del Puente, 2014) and smartphone addiction (Pavia et al., 2016; Samaha & Hawi, 2016; Sapacz et al., 2016; Wang et al., 2015), but there is yet to be consensus in the literature regarding PIU, also known as Internet addiction, pathological Internet use and Internet dependence (Spada, 2014). Despite a lack of consensus overall, numerous studies have shown that excessive use of the Internet is associated with poorer academic achievement and personal relationship quality for adolescents and adults (Aboujaoude, 2010; Jelenchick et al., 2014; Lopez-Fernandez et al., 2014; Muusses et al., 2014; Wang et al., 2014; Yau et al., 2013).

There is difficulty in attributing causality to the development of PIU given the large amount of comorbid conditions that exist with PIU (Beard, 2005; Jorgenson et al., 2016; Weinstein et al., 2014), such as depression, generalised anxiety disorder, social anxiety, obsessive compulsive disorder (OCD), and attention-deficit hyperactivity disorder (ADHD) (Ha et al., 2006a; Ko et al., 2012; Spada, 2014; Weinstein et al., 2015). However, the foremost theory of problematic and addictive Internet use is that Internet use acts on an operant conditioning variable ratio reward schedule, similar to problematic gambling (Beard, 2005; Cash et al., 2012; Davis, 2001; Kuss & Lopez-Fernandez, 2016; LaRose et

al., 2003; Yau et al., 2013). Unpredictable reward schedules and variable reward structures can be established with many different Internet activities. For example, continually checking for message or email replies can result in an arbitrary schedule with unpredictable results. When the reply finally comes, the behavior is reinforced with their reward. If this behaviour is coupled with mood enhancement, such as on a dating site, the return on their efforts can be strengthened even further (Beard, 2005; Cash et al., 2012).

From another perspective, many researchers have described problematic Internet usage as an impulse control disorder, implicating self-regulation processes as key factors in its progression and maintenance (Bernardi & Pallanti, 2009; Billieux & Van der Linden, 2012; Davis, 2001; Jorgenson et al., 2016; Pies, 2009; Pontes et al., 2015; Yau et al., 2013).

4.1.2 Defining Self-Regulation and Self-Control

It has been said that our most crucial characteristic as human beings is our capacity to self-regulate (Baumeister, 2003; Boekaerts et al., 2005). Indeed, healthy psychological function is built on successful self-regulation (Hoyle, 2010). Consequently, self-regulation failures have been regularly shown as responsible for a wide range of adverse outcomes across the lifespan such as emotional dysregulation, poor attentional control and lack of behavioural inhibition (Busch & Hofer, 2012; Eiesenberg et al., 1997; Spinrad et al., 2006). An important requirement for adaptive self-regulation and an appropriate response to avoiding temptations is the implementation of self-control (Baumeister & Heatherton, 1996; Carver & Scheier, 1998; de Ridder et al., 2012; Fishbach et al., 2003; Metcalfe & Mischel, 1999).

Several theories of human motivation emphasize goals and individual use of self-regulation processes to model one's behavior in pursuit of those goals (Bandura, 1991; Carver & Scheier, 1998; Deci & Ryan, 2000; Gollwitzer, 1999; James, 1890; Kruglanski et al., 2002; Locke & Latham, 2015). Self-regulation refers to the processes that allow

individuals to manage, monitor, assess and alter their cognitions, affect, feelings, attention, and behaviors (Fujita, 2011; Hofmann et al., 2009). In relation to goal directed behavior, self-regulation processes are the dynamic psychological mechanisms that allow individuals to direct their behavior, successfully or unsuccessfully, towards goals (Gendolla et al., 2015; Mann et al., 2013).

Self-control is defined as the capability to override, change or restrain urges, cravings, desires, impulses, or habitual responses (Bandura, 1991; Baumeister, 2003; Carver & Scheier, 1998; Metcalfe & Mischel, 1999). Self-control can be thought of as a specific self-regulatory challenge where an individual needs to protect a goal, which has long term benefits, against a temptation, which offers short term gains but that is in conflict with the goal (Baumeister et al., 2007; de Ridder et al., 2012; Fishbach & Shah, 2006; Hagger et al., 2010).

A self-control dilemma is defined as an internal conflict where the attainment of a higher order and typically longer-term goal is jeopardised by a shorter term goal or temptation (Fishbach & Labroo, 2007; Fishbach & Shah, 2006; Fujita et al., 2016; Hofmann et al., 2009). A self-control dilemma involves a dual motive conflict where only one of the motives can be fulfilled (Fujita, 2011). Self-control dilemmas are a common daily occurrence (Baumeister et al., 2007; Hofmann et al., 2009). For example: “Should I have *the chocolate cake* or do I go for the salad?” or “Should I surf the Internet right now or study for my exam?” are self-control dilemmas. Given the ubiquity of the Internet in modern day living (2014) it seems unrealistic that the final goal for any treatment of problematic Internet usage could be complete abstinence. Indeed, a non-abstinence approach is receiving support from researchers and clinicians alike who argue that a controlled and balanced use of the Internet and applications should be the goal of any therapy (Cash et al., 2012; Young, 2007). This approach is not only supported by researchers and clinicians but also from individuals experiencing PIU (O'Brien et al.,

2016). In order to achieve this therapeutic goal, individuals need to utilize their self-regulation skills to manage, monitor and alter their cognitions, attention, and behaviors (Carver & Scheier, 2011; Cash et al., 2012; Fujita et al., 2016; Przepiorka et al., 2014).

Despite the recent upsurge in studies, there has been limited success for psychological interventions dealing with PIU and there is not enough known about the efficacy and effectiveness of current treatments (Winkler et al., 2013). There is a pressing need for new effective approaches to deal with the issue of PIU (Przepiorka et al., 2014; Winkler et al., 2013). The dynamics of self-regulation model offers the possibility for new insights in how to effect these changes in a clinical population.

4.1.3 Dynamics of Self-Regulation Model

The model of the dynamics of self-regulation by Ayelet Fishbach and colleagues investigated a dual representation framework of goal-directed behavior (Fishbach & Shen, 2014; Fishbach et al., 2009). This research examined the simultaneous pursuit of multiple goals and temptations and their effects on subsequent behavioral outcomes, and uncovered many processes and variables contributing to the dynamics of self-regulation. For an overview see Table 4.1 and for a more comprehensive discussion see Fishbach and Zhang (2009). At the heart of the research is the fundamental proposition that when regulating multiple goals, individuals can evaluate their level of commitment to, or their progress in moving toward, a focal goal (Fishbach & Dhar, 2005).

Under a *progress* goal representational framework, individuals are motivated to monitor and regulate the discrepancy between the current and desired end state, a behavioral model that is equivalent to the cybernetic models of self-regulation (Carver & Scheier, 1998; Powers, 2005). Under this model, a successful goal behavior would indicate partial completion of the goal and signal to an individual that enough effort towards completion of the goal has been exerted for now. Consequently, other goals in the

environment become more salient as the individual disengages from the focal goal for the moment. The resulting dynamic of self-regulation is that of *balancing*.

Table 4.1

Dynamics of Self-Regulation Model: Commitment and Progress Representations Overview

Representation	<i>Commitment</i> to the focal goal	<i>Progress</i> towards goal end state
Promotes	Highlighting of the focal goal	Balancing between all goals
Leads To	Emphasizing the focal goal at the cost of alternate goals (temptations).	Valuing alternate goals (temptations) as well as the focal goal.
Causing	Focal goal behaviors increase in perceived value. Alternate goal behaviors (temptations) consequently decrease in perceived value. The selection of focal goal actions is more probable. Decision is likely to be focal goal behavior over temptation behavior.	Alternate goal behaviors (temptations) increase in perceived value. Focal goal behaviors consequently decrease in perceived value. Temptations more inclined to be acted on. Decision is likely to be Temptation behavior and then focal goal behavior.

Using a *commitment* goal representational framework, individuals are motivated to monitor and regulate their level of commitment to the goal end state. A successful goal behavior suggests a strong commitment to the focal goal and increases motivation to ensure completion of this highly committed goal by undertaking related and complementary behaviors at the expense of opposing behaviors. This is in line with work by Dreze and Nunes (2006), who found that individuals work harder towards a goal after experiencing initial goal success and Shah et al. (2002) who found that commitment to a focal goal impedes the availability of alternate goals. The resulting dynamic of self-regulation is *highlighting* congruent goal behaviors.

In sum, this dual representational framework model of self-regulation states that individuals utilise either a commitment or progress mode when regulating their behavior, which produces opposite effects. After successful initial goal pursuit, commitment-focused

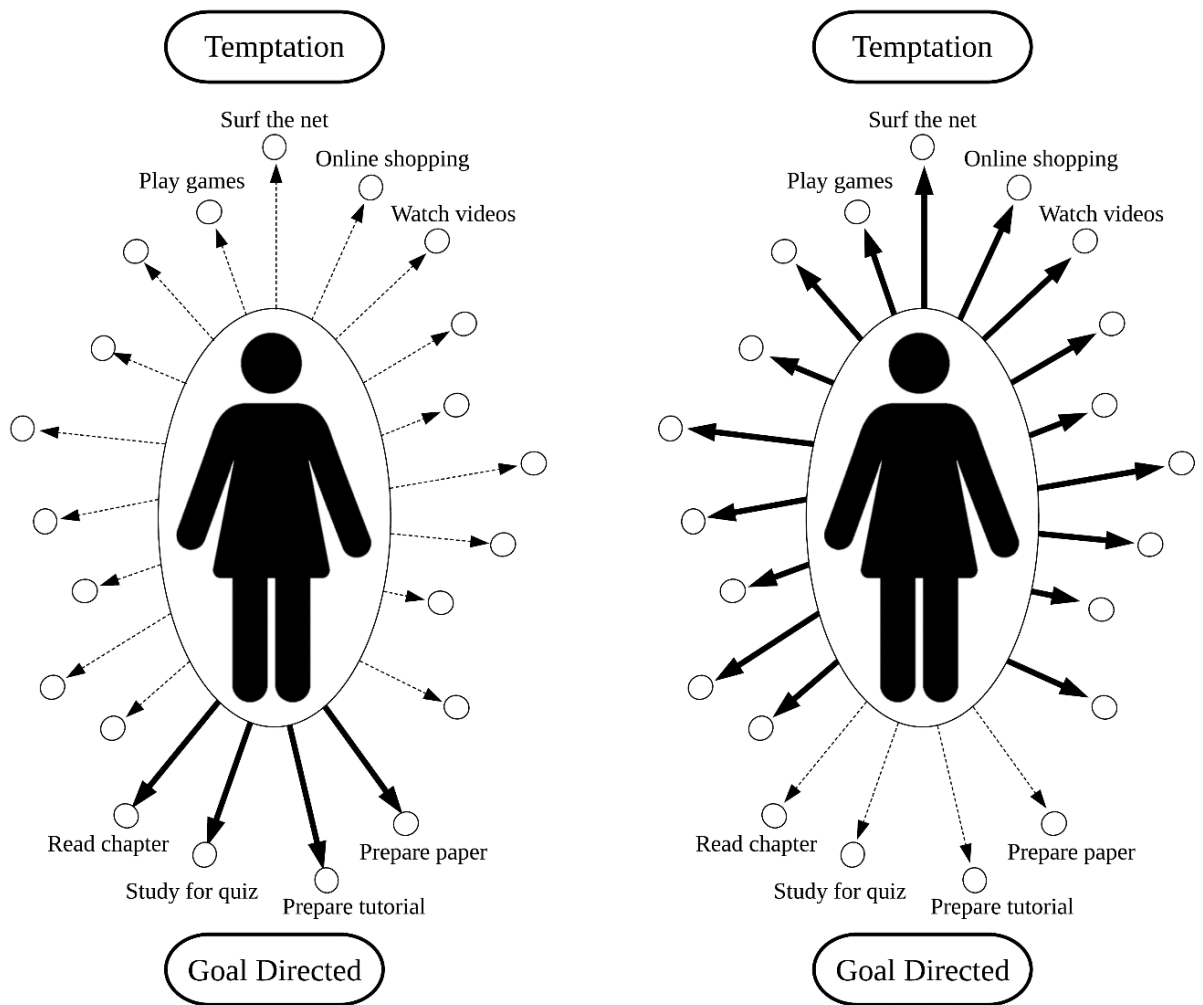
individuals adopt a highlighting pattern and are more likely to choose goal congruent behaviors, while progress-focused individuals adopt a balancing pattern and are more likely to choose temptations over focal goal actions.

Interestingly, the opposite effects occur when an individual fails at a goal behavior or fails to act upon a goal. Under a mental representation of *progress*, a goal failure signals a discrepancy between the current and desired end states and motivates action on the goal in order to remove the discrepancy (Carver & Scheier, 1998). With a *commitment* frame, however, goal failure indicates a low level of commitment to the goal and individuals are likely to disengage from the goal altogether, leading them to choose other behaviors (Soman & Cheema, 2004). A visual representation of how the model might work in the context of PIU is shown in Figure 4.1.

The research program conducted by Fishbach and colleagues identified many processes and variables that influence the dynamics of self-regulation. These include the following: the impact of initial goal success or failure on subsequent behavior choices (Fishbach et al., 2006; Koo & Fishbach, 2008); the type of feedback that is sought and offered when under commitment or progress framings (Fishbach & Dhar, 2005; Fishbach et al., 2010); pre-existing commitment to a goal (Koo & Fishbach, 2008); focusing on accomplished goal progress or unaccomplished goal progress (Koo & Fishbach, 2008, 2012); focusing on an abstract or high level goal versus an individual sub-goal or concrete actions (Fishbach et al., 2006); future expectations of goal progress (Zhang et al., 2007); group identification (Koo et al., 2009); the influence of mood attribution towards success or failure of goal attainment (Fishbach & Labroo, 2007); and how presentation format can affect how two behaviors can be perceived (Fishbach & Zhang, 2008)

Figure 4.1

Visual overview of dynamics of self-regulation model in action.



Factors that promote congruent goal behavior

Progress frame with **negative** feedback:

- A discrepancy is observed between actual and desired goal attainment
- Congruent goal behaviors are more attractive

Commitment frame with **positive** feedback:

- Highlighting occurs
- Congruent goal behaviors are more attractive

Factors that promote incongruent goal behavior

Progress frame with **positive** feedback:

- Balancing occurs
- Enough has been done pursuing the goal for now, others behaviors seen as more attractive

Commitment frame with **negative** feedback:

- Commitment to goal is questioned, the goal is seen as less important
- Other behaviors are now more attractive

Note: *Circles represent the multiple behavior choices that are available at any time. Goal directed actions in the figure are operationalized as academic behaviors while incongruent goal actions (temptations) are operationalized as Internet behaviors.*

4.1.4 The Current Study

Dunbar et al. (2017) tested presentation format and showed that the principal commitment and progress framing components of the dynamics of self-regulation model proposed by Fishbach and colleagues can be applied in a clinical domain of PIU. Presentation format was chosen as the first factor to test as it could be established with no interaction with other processes or variables in the model (Dunbar et al., 2017).

The current study set out to test elements of the model that do interact: framing cues (questions on commitment or progress and pre-existing goal commitment); feedback cues (initial goal success or failure and unaccomplished or accomplished actions) and focusing on the abstract goal versus concrete plans. These three factors were chosen as they are fundamental elements to the theory (Fishbach et al., 2009) which can be established with the least interaction from other components and confounding variables while still exercising the model, and have the potential to offer important insights for clinicians when attempting to influence goal directed client behavior.

Maladaptive outcomes for academic/work and social functions both result from PIU (Aboujaoude, 2010) and these two activities are likely to be important to individuals in general. Indeed, the study by Dunbar et al. (2017) established these two activities as especially important to the target population of undergraduate university students. Therefore, the incongruent goal behavior for the studies is personal Internet usage and two congruent goal behaviors are academic and social behaviors. Including the two domains of academic and social behavior to test the model's predictions adds weight to the ability to generalize from the results.

We tested the predictions from the model in three experimental studies. In the first study we tested whether framing questions can prime the mental representation frameworks of commitment and progress and what effect positive and negative feedback has on subsequent behavior ratings. In study two, we examined the dynamics of high

commitment versus low commitment and if they do indeed induce the progress and commitment frameworks as suggested by the theory. Finally, in study three, we examined the effects of focusing on a higher level or abstract goal compared to focusing on concrete goal actions.

4.1.5 Statistical Analyses, Power, and Data

All three studies employed 2 x 2 between-participants designs. As each study was testing direct evaluations of theoretically-driven predictions, individual 1-tailed *t*-tests were conducted with effect sizes on planned contrasts, an approach defined by Furr and Rosenthal (2003). A priori power analysis was carried out before data collection to determine required sample sizes and based on previous research (e.g. Fishbach & Dhar, 2005) a moderate effect size was used. The required sample sizes were computed using the GPower computer program (Faul et al., 2007) with α of 0.05, moderate effect size, and power of .80 resulting in an estimated 42 participants per group. Given the repeated use of *t*-tests, the Bonferroni-Holm method for correction of multiple comparisons (Holm, 1979) was applied to the *p*-value in each respective study before considering significance. All reported *p*-values for hypotheses testing are adjusted Bonferroni-Holm values. Normality of the data was assessed using Kolmogorov–Smirnov tests and examining Q-Q plots and histograms. All skewness and kurtosis scores were within ± 1 and the results demonstrated that data were within acceptable limits for a normal distribution (Pallant, 2013) indicating that the planned statistical analyses could be undertaken.

4.2 Study 1 – Commitment and Progress Questions and Feedback

4.2.1 Introduction

Fishbach and Dhar (2005) and Zhang et al. (2007) found that simply by asking gym members about whether they were expressing their commitment to healthy living by working out induced a commitment framework, so that they increased their interest in future goal congruent behaviors. However, asking gym members if their workout was

helping them make progress towards their goal of staying fit produced a progress framework. These individuals decreased their interest in subsequent goal congruent behaviors. Questions about goal commitment or goal progress provide cues to individuals and can induce a pattern of highlighting or balancing.

Initial goal achievement is a fundamental dynamic of the self-regulation model. Numerous studies (e.g., Fishbach et al., 2006) found that positive feedback was inferred from a successful initial goal pursuit and this causes individuals with commitment framings to highlight subsequent congruent goal behaviors, while individuals with progress framings balance across congruent and incongruent goal behaviors. On the other hand, negative feedback is inferred from unsuccessful initial goal pursuits and this causes individuals with commitment framings to reject the goal and rate incongruent goal behaviors higher, while individuals with progress framings infer a discrepancy and rate congruent goal behaviors higher. This study set out to determine if commitment and progress mental representations could be framed by asking questions about commitment or progress. We further tested whether a feedback cue of positive initial goal action engenders opposite behavior effects in the commitment and progress groups. The transposed opposite effects after a feedback cue of negative initial goal action were also investigated. The following hypotheses were generated from the dynamics of self-regulation model:

H1. Participants with a Commitment framework will rate their interest in incongruent (Internet) behaviors *lower* than participants with a Progress framework when given positive feedback (success condition).

H2. Participants with a Commitment framework will rate their interest in congruent (academic and social) behaviors *higher* than participants with a Progress framework when given positive feedback (success condition).

H3. Participants with a Commitment framework will rate their interest in incongruent (Internet) behaviors *higher* than participants with a Progress framework when given negative feedback (failure condition).

H4. Participants with a Commitment framework will rate their interest in congruent (academic and social) behaviors *lower* than participants with a Progress framework when given negative feedback (failure condition).

4.2.2 Method

4.2.2.1 Participants

Eighty five undergraduate University Psychology students (51 female, 34 male) participated in the study in exchange for course credit. Because the psychology student participation pool was closed before the required numbers of participants for each condition were collected, the survey was opened to all undergraduate students. A further 126 students then participated in exchange for the chance to win one of two \$50 gift vouchers. For recruitment of the second participant group, we collected demographic data such as type of degree, faculty of the university, and whether English was a second language. English speaking status was seen as an important factor as the study relies on priming mental representation frameworks via the common understandings and social constructs of the English words commitment and progress. It was not considered an issue for students recruited from the Psychology group, as the entry requirements for Psychology at the University demand a high level of English ability.

Manipulation checks on participants with English as a second language compared their level of commitment ratings in the commitment success ($M = 4.80$, $SD = 1.32$) and commitment failure ($M = 4.18$, $SD = 1.60$) conditions, $t(19) = .96$, $p = .35$, and their sense of progress towards their goal in the progress success ($M = 4.25$, $SD = 1.83$) and progress failure ($M = 4.33$, $SD = 1.50$) conditions, $t(15) = .10$, $p = .92$. These results determined that the manipulation was not effective for those participants. Therefore, they ($N = 38$) were excluded from the final dataset.

A final group of 173 participants (101 Female, 73 Male) was analyzed. The gender of participants did not yield any effects and is therefore omitted from further consideration. Participants ages ranged from 17 to 63 ($M = 23.34$, $SD = 9.08$).

4.2.2.2 Stimuli

Behavior items in Internet, social and academic domains developed by Dunbar et al. (2017) were used and there were four actions in each of the three domains (see Table

4.2). Each statement was simple in nature and designed such that it clearly represented a behavior in the intended domain. In order to minimize the risk of some Internet actions being perceived by participants as social in nature, social networking sites, such as Facebook, were deliberately not used.

To conceal the purpose of the study eight filler behavior items such as “go to the supermarket to buy some groceries” and “do your weekly laundry” were created. This was done so that the final presented list of behavior action items would look like a normal set of actions that any student would encounter on a typical day; that is, studying, socializing, using the Internet, performing chores, and other daily life activities.

Table 4.2

Behavioral Action Item Stimuli Sets in Social, Academic and Internet Domains

Domain	Behavior Action Item
<i>Social</i>	Hanging out with friends at a café, bar or restaurant. Attending an event (e.g. movie, play, or concert) with friends. Sitting with friends at lunch or during a break. Helping a friend (or friends) celebrate a special achievement.
<i>Academic</i>	Studying for a quiz for a key course you are taking. Preparing for an upcoming tutorial for a key course you are taking. Working on a paper for a key course you are taking. Reading an important chapter or paper for a key course you are taking.
<i>Internet</i>	Play your favourite online game. Watching videos from your favourite channels, feeds or suggestions on YouTube or other similar sites. Browsing through shopping websites that you like. Surfing the net or using your favourite sites, or reading blogs, etc.

4.2.2.3 *Design*

The current study was adapted from the general theories described in Fishbach et al. (2009). The initial design was based on the work of Fishbach and Dhar (2005) that tested the priming of commitment and progress mental framings by asking respondents to infer either the level of commitment or the level of progress based on questions on initial goal pursuit. The design was further extended using work produced by Fishbach et al.

(2006) that combined failure of initial goal pursuit to the already tested success condition, and by the work of Dunbar et al. (2017) that took the theories of Fishbach and colleagues from the marketing and consumer research field into the clinical domain of PIU.

A between-groups design was used. The independent variables were mental representation (commitment or progress) and the result of initial goal pursuit (success or failure). The main dependent variables were incongruent goal behavior operationalized as rating of Internet behaviors, and congruent goal behavior operationalized as ratings of academic and social behaviors. Motivation to perform the actions was captured by asking participants to rate their interest in pursuing each action on a seven-point scale ranging from (1 – Not at all to 7 – A lot). As predicted by the theory, planned contrasts were made between participants in the commitment success and progress success conditions and between participants in the commitment failure and progress failure conditions.

4.2.2.4 Procedure

Ethical approval was granted by The University's Human Research Ethics Subcommittee for the School of Psychology. Participants provided consent and were informed that they were free to withdraw at any time.

Participants took the survey using SurveyMonkey at their convenience. The first part of the survey collected basic demographic information. In order to prime participants' goals they were asked to read a short (280 word) literature review about Problematic Internet Usage. To further strengthen the priming, a short three-minute video on Problematic Internet Usage was also presented straight after.

Participants were then presented with a vignette describing a person who has just learned about PIU and has concerns that it may apply to them. They were worried that they were spending too much personal time (not counting time spent for study or work) on the Internet to the detriment of their academic work and social relationships. The goal for the person in the vignette was to reduce their Internet usage to a certain amount. The amount

was deliberately vague so as not to bring in value judgments by participants about what might be a small or large amount of personal time that would be acceptable to spend using the Internet.

Participants were then randomly assigned to one of the four conditions. In the *success* conditions, participants were asked to put themselves in the place of the person in the vignette and imagine that they had a very productive day and accrued near enough to zero hours of personal Internet usage. In the *failure* conditions, participants were asked to imagine that they had not had a very productive day and had already accrued near enough to their maximum allowable hours of personal Internet usage.

Commitment or Progress representation formats were then primed, for both success and failure scenarios, by asking participants if they felt they were committed to their goal (commitment) or had made progress towards their goal (progress) when they had a very productive day and accrued zero hours (or had not had a very productive day and had already accrued near enough to their maximum allowable hours). This technique of priming commitment and progress representational formats is in line with a previous method utilized by Fishbach and Dhar (2005). The 20 behavior actions were then presented in random order and participants were asked to rate their level of interest in pursuing them on a seven-point scale (1 – not at all interested to 7 – very much interested). After completing the rating portion, participants were asked further questions: how interested and motivated they were in regards to the goal to reduce personal Internet hours in the vignette scenario; how important academic success and maintaining long lasting relationships was to them in general. Finally, participants were asked to describe what they thought the study was investigating, were thanked for their participation and dismissed. Analysis of the provided descriptions revealed that none of the participants were able to determine the true intent of the study.

4.2.2.5 Manipulation Checks

The success of the participants adopting the goal to reduce personal Internet usage hours was assessed by asking how important they viewed the goal and how motivated they were to achieve it in the vignette scenario. Participants gave ratings on a seven-point scales for the level of importance (1 – no at all important to 7 – very much important) and for their level of motivation to engage in it (1 – no at all motivated to 7 – very much motivated). The importance of achieving academic and social success was assessed by asking participants to rate how important it was for them to achieve academic and social success on a seven-point scale (1 – not at all important to 7 – extremely important). To check the effectiveness of the success and failure manipulations we compared participants' scores when rating their level of commitment to the goal of reducing personal Internet hours on a seven-point scale (1 – no commitment to 7 – a lot of commitment).

4.2.3 Results

4.2.3.1 Manipulation Checks

The level of importance of adopting the goal ($M = 5.14$, $SD = 1.28$) was compared to the mid-point of the seven point scale (value of 4), $t(172) = 11.73$, $p < .001$. Motivation ($M = 4.79$, $SD = 1.36$) was also compared to the mid-point of the seven point scale (value of 4), $t(172) = 7.59$, $p < .001$. These results support the assumption that participants were engaged with the goal to reduce their level of personal Internet usage and therefore perceived Internet actions as incongruent to their focal goal. The level of importance of academic success ($M = 6.40$, $SD = .85$) and social success ($M = 6.29$, $SD = 1.01$) indicated that participants placed high importance on these goals. Results showed a significant difference in the level of commitment ratings between the commitment success ($M = 5.23$, $SD = 1.36$) and commitment failure ($M = 4.09$, $SD = 1.51$) conditions, $t(84) = 3.68$, $p < .001$, as well as a significant difference in the progress success ($M = 5.13$, $SD = 1.36$) and progress failure ($M = 3.45$, $SD = 1.76$) conditions, $t(83) = 4.97$, $p < .001$, with respective

large effect sizes (Cohen's $d = .80$ and 1.09). Taken together these results indicate that the manipulation between success and failure conditions was effective.

4.2.3.2 Opposite Effects of Commitment and Progress After Successful Goal Accomplishment

To investigate the opposite effects of commitment and progress representational frameworks in the success groups, participants' value ratings were averaged for the four Internet, academic and social behavior action items and the resultant mean scores were compared. Descriptive statistics can be found in Table 4.3.

Participants in the commitment condition rated the value of Internet behaviors lower than in the progress condition, $t(86) = -2.31, p = .045$. A Cohen's d of $-.49$ indicated an effect size approaching moderate magnitude. This supports H1, that after a successful goal action progress- focused individuals will rate their interest in pursuing goal incongruent actions higher than commitment-focused individuals (see Figure 4.2). For academic actions, the commitment condition participants rated their interest higher than the progress condition participants, $t(86) = 2.11, p = .048$. The magnitude of this effect was small (Cohen's $d = .46$). This result supports H2, that after a successful goal action commitment-focused individuals will rate their interest in pursuing goal congruent actions higher than progress-focused individuals (see Figure 4.3). Participants rated the value of social actions lower in the commitment condition compared to those in the progress condition, $t(86) = -0.26, p = .40$, with a negligible effect size (Cohen's $d = -.06$), offering no support for H2 in a social domain (see Figure 4.4).

Table 4.3

Study 1 Descriptive statistics for Internet, academic and social behavior value ratings

	Goal Success			Goal Failure		
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>
Internet Domain						
Commitment	43	3.38	1.39	43	4.59	1.47
Progress	45	4.06	1.36	42	3.61	1.39
Academic Domain						
Commitment	43	5.02	1.13	43	4.13	1.34
Progress	45	4.46	1.40	42	4.89	1.56
Social Domain						
Commitment	43	5.28	1.03	43	4.69	1.62
Progress	45	5.34	1.16	42	5.02	1.34

Figure 4.2

Internet behavior value ratings for competing and progress representation formats after successful and unsuccessful initial goal actions.

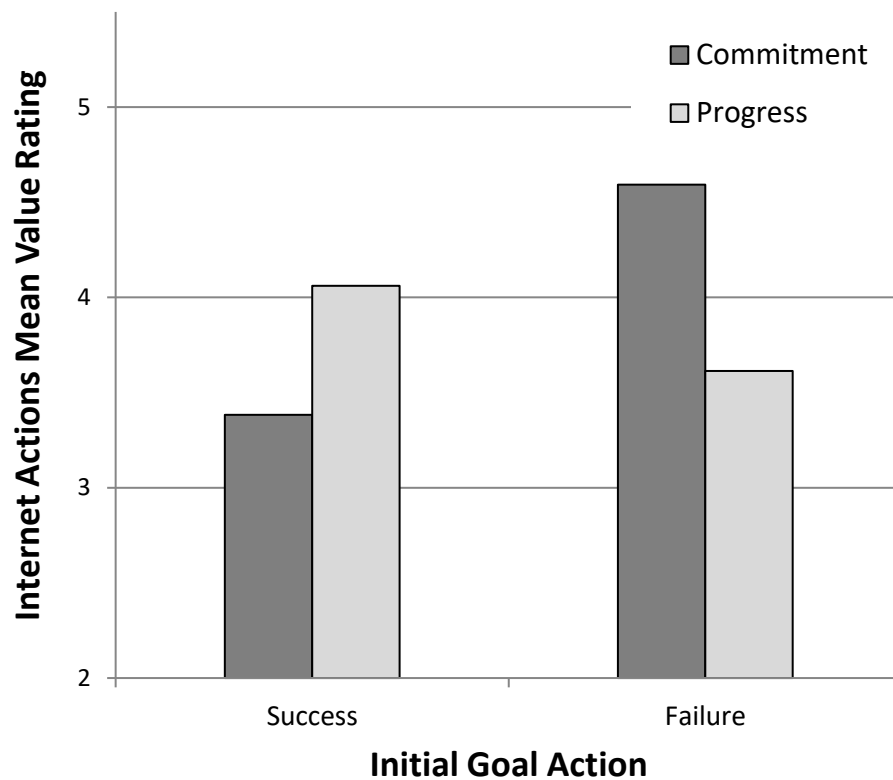


Figure 4.3

Academic behavior value ratings for competing and progress representation formats after successful and unsuccessful initial goal actions.

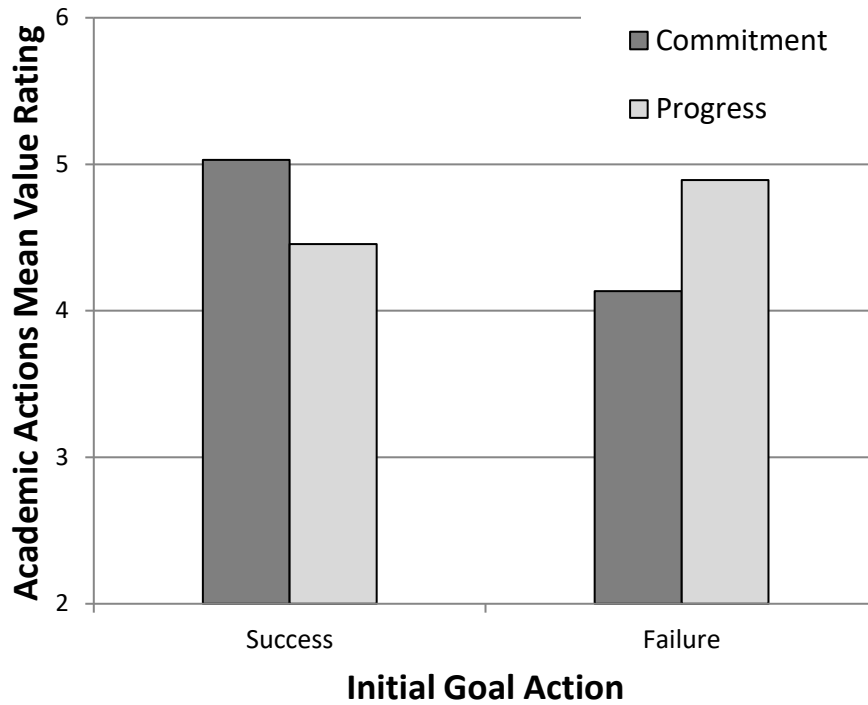
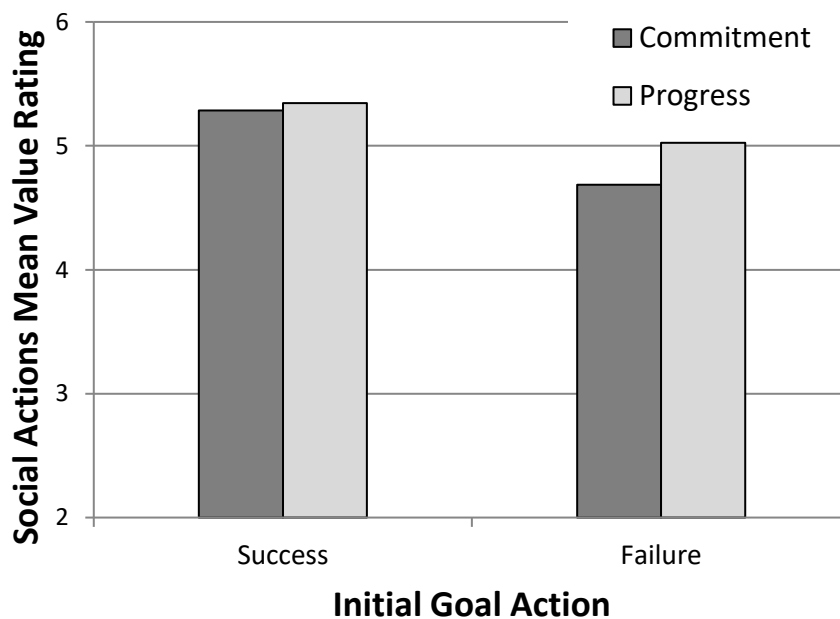


Figure 4.4

Social behavior value ratings for competing and progress representation formats after successful and unsuccessful initial goal actions.



4.2.3.3 *Opposite Effects of Commitment and Progress After Unsuccessful Goal Action*

To investigate the opposite effects of commitment and progress representational frameworks in the failure groups, participants' value ratings were averaged for the four Internet, academic and social behavior action items and the resultant mean scores were compared.

Participants in the commitment failure condition rated their interest in pursuing Internet behaviors higher than participants in the progress failure condition, $t(83) = 3.16$, $p = .006$, a moderate effect, $d = .69$. This result supports H3, that after an unsuccessful goal action, Commitment-focused individuals will rate their interest in pursuing goal incongruent actions higher than Progress focused individuals (see Figure 4.2). For academic actions, the commitment condition participants rated their interest lower than the progress condition participants, $t(83) = -2.40$, $p = .048$. The magnitude of this effect was moderate (Cohen's $d = .53$). This result supports H4, that after a successful goal action Commitment focused individuals will rate their interest in pursuing goal congruent actions higher than Progress focused individuals (see Figure 4.3). Participants rated the value of social actions lower in commitment condition compared to those in the progress condition. The difference was non-significant, $t(83) = -1.05$, $p = .30$, with a small effect (Cohen's $d = -.23$) which offers little support for H4 in a social domain (see Figure 4.4).

4.2.4 Discussion

Results supported the predictions of the dynamics of self-regulation model in the Internet domain, as participants in the commitment group rated their interest in incongruent goal (Internet) behaviors lower than those in the progress group after a successful goal action. As well, when the initial goal action was unsuccessful the progress group rated their level of interest in incongruent goal (Internet) behaviors lower than those in the commitment group. The academic domain results also supported the model but this time individuals rated their level of interest in congruent (academic) behaviors. Both Internet

and academic domains showed results similar to those found by Fishbach and Dhar (2005). The social domain offered some support, with a small effect in the failure condition although the success condition produced results in the opposite direction to the model's prediction. Overall, the results of the study add further evidence to support the model's application in a clinical domain.

Study 1 continued the work begun by Dunbar et al. (2017) in applying the dynamics of self-regulation model set out by Fishbach and colleagues in a clinical domain. Results showed that the mental representations of commitment and progress focus can be primed with a simple question and that these mental frameworks produce opposite effects for the value individuals assign to future behaviors combined with positive feedback. Individuals with a commitment framework rate congruent goal behaviors higher than those with a progress framework, and rate incongruent goal behaviors lower than those with a progress framework, emphasising patterns of highlighting and balancing. These opposite effects are transposed for the mental frameworks when combined with negative feedback. When given negative feedback on goal success, individuals with a progress framework appear to perceive the discrepancy in their goal progress and consequently rate congruent goal behaviors higher than those with a commitment framework, and rate incongruent goal behaviors lower than those with a commitment framework.

During the course of treatment, clinicians provide considerable feedback to clients and this can take many forms, including summarising a client's improvement or non-improvement towards a certain behavioral goal (Beck, 2011; Harris, 2009; Sommers-Flanagan & Sommers-Flanagan, 2015; Wright et al., 2006). If the words chosen when summarising progress towards a goal influences subsequent behavioral choices a client makes – and indeed, can have opposite effects given a self-regulation framing – then it is important for a clinician to know how to frame the feedback in order to ensure the best possible outcome for the client that is in line with the client's stated goals. For example,

consider a clinician who starts the session asking the client how they have progressed since they last met and after receiving information from the client about their achievement follows that up with a statement praising the client's achievement. Will the original question from the clinician induce a progress frame in the client and will the positive feedback then signal partial goal attainment leading the client to adopt a balancing pattern? Should the clinician rather phrase the feedback to focus on the outstanding and unaccomplished work in order to emphasise a discrepancy? In Study 2, we investigated these questions by testing additional feedback and framing cues from the dynamics of self-regulation model.

4.3 Study 2 – High Versus Low Engagement

4.3.1 Introduction

Koo and Fishbach (2008) asked questions about individuals' levels of engagement to their goals. They reasoned that when engagement is high and assured, individuals tend not to worry about their commitment but tend to focus on their progress, however when engagement levels are low or unsure, individuals question if the goal is essential or even achievable. They proposed that high levels of engagement towards a goal promote internal questions that induce a progress framework, while low levels of engagement trigger internal questions that induce a commitment framework. Koo and Fishbach (2008) also found that focusing on accomplished actions signalled partial goal completion to the progress-framed individuals and high engagement to the commitment framed individuals. Conversely, focusing on unaccomplished actions signalled a discrepancy in the progress-framed groups and a lack of engagement in the commitment framed groups. Accomplished actions acted like goal achievement or positive feedback whereas unaccomplished actions act like incomplete goal action or negative feedback.

This study set out to determine if the framing cues of high and low goal engagement activate progress and commitment mental representations respectively. After

the framings had been activated, we tested whether focusing on accomplished or unaccomplished actions produces the opposite behavior effects in the commitment and progress groups. The following hypotheses were generated from the dynamics of self-regulation model.

H5. For participants with high goal engagement (who will seek Progress feedback on a goal) those who focus on accomplished (To-Date condition) actions will rate their interest in incongruent (Internet) goal behaviors *higher* than participants who focus on unaccomplished (To-Go condition) actions.

H6. For participants with high goal engagement (who will seek Progress feedback on a goal) those who focus on accomplished (To-Date condition) actions will rate their interest in congruent (Academic and Social) goal behaviors *lower* than participants who focus on unaccomplished (To-Go condition).

H7. For participants with low goal engagement (who will seek Commitment feedback on a goal) those who focus on accomplished (To-Date condition) actions will rate their interest in incongruent (Internet) goal behaviors *lower* than participants who focus on unaccomplished (To-Go condition) actions.

H8. For participants with low goal engagement (who will seek Commitment feedback on a goal) those who focus on accomplished (To-Date condition) actions will rate their interest in congruent (Academic and Social) goal behaviors *higher* than participants who focus on unaccomplished (To-Go condition) actions.

4.3.2 Method

4.3.2.1 Participants

One hundred and eighty one undergraduate University students (118 female, 63 male) participated in the study in exchange for a chance to win one of two \$50 gift vouchers. Fourteen participants failed to complete the survey and were excluded from the final dataset leaving $N = 167$. The gender of participants did not yield any effects and is therefore omitted from further consideration. In line with results from Study 1, only participants with English as their first language were included in the study. Participants ages ranged from 18 to 59 ($M = 23.75$, $SD = 6.76$).

4.3.2.2 Stimuli

The behavior items from study 1 and developed by Dunbar et al. (2017) were used (see Table 4.2). In order to manipulate participants' focus towards completed or remaining

actions, two figures were created based on the work by Koo and Fishbach (2008). These can be seen in Figure 4.5 and Figure 4.6. The bar represented the total amount of work required to complete the goal and the arrow reflected either the work completed or the work remaining. In line with the argument by Koo and Fishbach (2008) the current level of performance was represented at 48% so that participants would not easily flip the manipulation in their mind; for example, changing a 50% to-date condition into a 50% to go condition.

Figure 4.5

To-Date condition stimulus

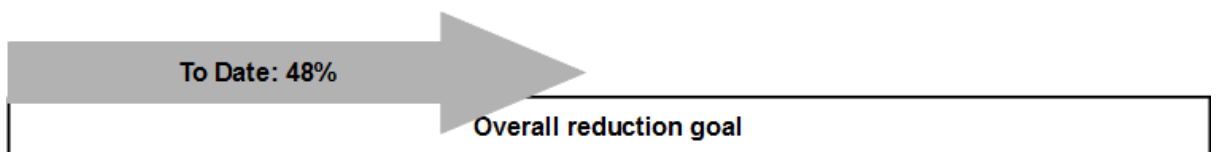
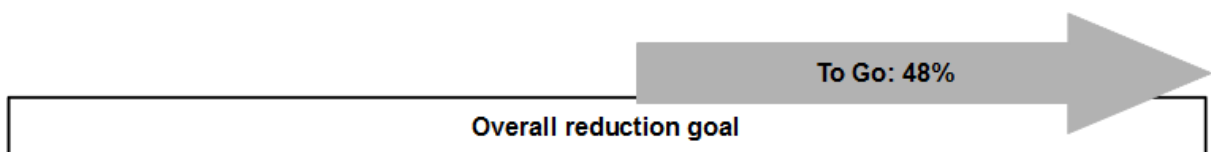


Figure 4.6

To-Go condition stimulus



4.3.2.3 Design

The current study was adapted from the general theories described in Fishbach et al. (2009). The initial design was based on the work of Koo and Fishbach (2008) that examined how focusing on already accomplished (to-date) goal actions versus unaccomplished and remaining (to-go) goal actions are affected by commitment and progress representation frameworks.

A between-participants design was used. The independent variables were mental representation (commitment or progress) and focus of goal progress (to-date or to-go). The main dependent variables were incongruent goal behavior operationalized as rating of

Internet behaviors, and congruent goal behavior operationalized as ratings of academic and social behaviors. Motivation to perform the actions was captured by asking participants to rate their interest in pursuing each action on a 7-point scale ranging from (1 – Not at all to 7 – A lot). As predicted by the theory, comparisons were made between participants in the commitment to-date and to-go conditions and between participants in the progress to-date and to-go conditions.

4.3.2.4 Procedure

Ethical approval was granted by The University's Human Research Ethics Subcommittee for the School of Psychology. Participants provided consent and were informed that they were free to withdraw at any time.

Participants took the survey using SurveyMonkey at their convenience. The first part of the study gained consent and gathered basic demographic information. Participants were randomly assigned into either high engagement or low engagement groups. The high engagement group was given a short (280 word) literature review on Problematic Internet Usage (PIU) to read in order to prime a goal of reducing Internet usage. To further strengthen the priming, a short three-minute video on Problematic Internet Usage was also presented straight after. Participants in the low commitment condition received no information on PIU.

A vignette describing a person who has concerns that they may be spending too much personal time (not counting time spent for study or work) on the Internet to the detriment of their academic work and social relationships was presented. The goal for the person in the vignette was to reduce their Internet usage to a certain amount. The amount was deliberately vague so as not to bring in any value judgments by participants about what might be a small or large amount of time that would be acceptable to spend using the Internet.

Participants in each group were split again and randomly assigned to either to-date or to-go action conditions. After being asked to keep in mind the person in the vignette participants in the to-date condition read: “To date, you have reduced your level of personal Internet usage by about 48%.” and were presented with Figure 4.5, while the to-go condition read: “You have about 48% more reduction in your personal Internet usage to go.” and were presented with Figure 4.6.

The 20 behavior actions were then presented in random order and participants were asked to rate their level of interest in pursuing them on a seven point scale (1 – not at all interested to 7 – very much interested). After completing the rating portion, participants were asked further questions such as how important academic success and maintaining long lasting relationships was to them. Finally, participants were asked to describe what they thought the study was investigating, were thanked for their participation and dismissed. Analysis of the provided descriptions revealed that none of the participants were able to determine the true intent of the study.

4.3.2.5 Manipulation Check

The level of engagement to the focal goal of reducing personal Internet usage was measured by asking participants to rate how important they viewed the goal and how motivated they were to achieve it in the vignette scenario. Participants gave ratings on a seven point scales for the level of importance (1 – no at all important to 7 – very much important) and for their level of motivation to engage in it (1 – no at all motivated to 7 – very much motivated).

4.3.3 Results

4.3.3.1 Manipulation Check

Values for participants in both high engagement groups were averaged and compared to values for participants in both low engagement groups. Participants in the high engagement conditions ($M = 5.48$, $SD = 1.18$) rated the level of importance for the

goal higher than in the low conditions ($M = 5.11, SD = 1.52$), although the difference was non-significant, $t(165) = 1.78, p = .08$. Cohen's d of .27 indicated a small effect. However, participants in the high conditions ($M = 4.52, SD = 1.24$) rated their level of motivation significantly higher than participants in the low conditions ($M = 3.80, SD = 1.44$), $t(165) = 3.46, p = .001$. The magnitude of this effect was moderate (Cohen's $d = .54$). Taken together, these results suggest that the participants in the high engagement groups had a greater engagement to the goal than those in the low groups.

4.3.3.2 Factors That Increase or Reduce Goal Adherence Hypotheses

To investigate the factors that increase or reduce goal adherence, participants' value ratings were averaged for the four Internet, academic and social behavior action items in the four conditions: high commitment and to-date focus, high commitment and to-go focus, low commitment and to-date focus, and low commitment and to-go focus groups. The resultant mean scores were compared. Descriptive statistics can be found in Table 4.4.

Table 4.4

Study 2 descriptive statistics for Internet, academic and social behavior value ratings

	High Engagement			Low Engagement		
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>
Internet Domain						
To Date	43	4.34	1.23	41	3.06	1.26
To Go	41	3.63	1.21	42	3.98	1.27
Academic Domain						
To Date	43	3.96	1.16	41	5.08	1.31
To Go	41	5.19	.99	42	4.44	1.26
Social Domain						
To Date	43	5.37	1.04	41	5.13	1.19
To Go	41	5.22	1.25	42	5.37	1.00

4.3.3.3 *High Goal Engagement Groups*

Participants in the high goal engagement to-date condition rated the value of Internet behaviors higher than those in the high goal commitment to-go condition, $t(81) = -2.65, p = .02$. A Cohen's d of .59 indicated an effect size of moderate magnitude. This result supports H5 (see Figure 4.7).

Participants in the high goal engagement to-date condition rated the value of Academic behaviors lower than those in the high goal engagement to-go condition, $t(81) = -5.21, p < .001$. A Cohen's d of 1.16 indicated a large effect size. This result supports H6 for the academic domain (see Figure 4.8). Participants in the high goal engagement to-date condition rated the value of Social behaviors higher, against the predicted direction, than those in the high goal engagement to-go condition, although the difference was non-significant, $t(81) = 0.60, p = .68$. A Cohen's d of .16 indicated a negligible effect size. This result does not support H6 in the social domain (see Figure 4.9).

4.3.3.4 *Low (Uncertain) Goal Engagement Groups*

Participants in the low goal engagement to-date condition rated the value of Internet behaviors lower than those in the low goal engagement to-go condition, $t(82) = -3.32, p = .001$. A Cohen's d of -.73 indicated an effect size of moderate magnitude. This result supports H7 (see Figure 4.7).

Participants in the low goal engagement to-date condition rated the value of academic behaviors higher than those in the low goal engagement to-go condition, $t(82) = 3.02, p = .02$. A Cohen's d of .51 indicated a moderate effect size. This result supports H8 for the academic domain (see Figure 4.8). Participants in the high goal engagement to-date condition rated the value of social behaviors lower, again against the predicted direction, than those in the low goal engagement to-go condition, although the difference was non-significant, $t(82) = -0.97, p = .68$. A Cohen's d of .21 indicated a small effect size. This result does not support H8 in the social domain (see Figure 4.9).

Figure 4.7

Internet behavior value ratings for low and high engagement participants comparing to-date and to-go groups.

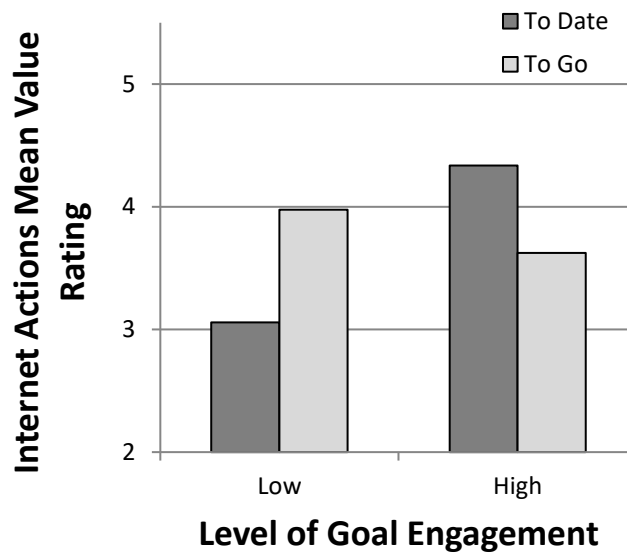


Figure 4.8

Academic behavior value ratings for low and high engagement participants comparing to-date and to-go groups.

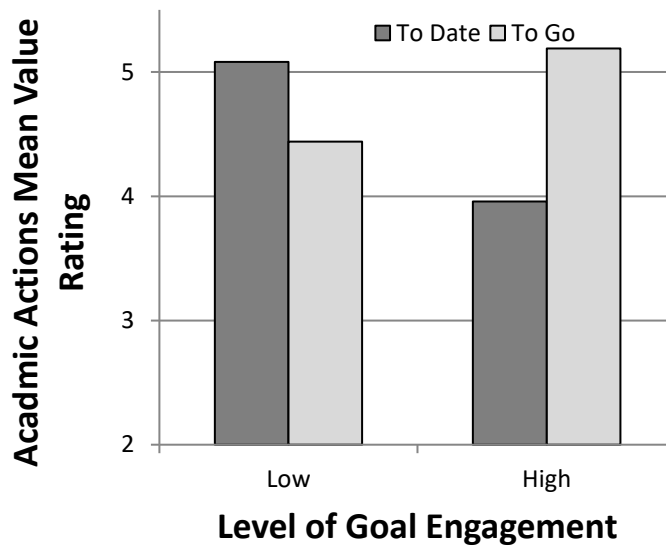
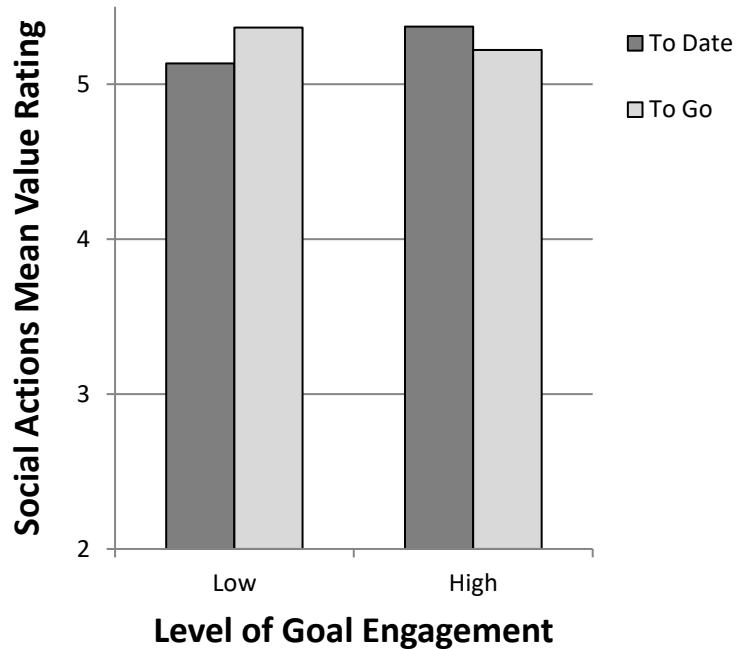


Figure 4.9

Social behavior value ratings for low and high engagement participants comparing to-date and to-go groups.



4.3.4 Discussion

Results supported the predictions of the dynamics of self-regulation model in the Internet domain with participants in the high engagement group appearing to attend to the progress of their goal pursuit and those in the low engagement group appearing to attend to their commitment to their focal goal to reduce personal Internet usage. Further, focusing on accomplished (the 'To Date' condition) versus unaccomplished actions (the 'To Go' condition) induced a sense of goal accomplishment as opposed to goal failure. The resulting behavioral ratings were as predicted by the model in the Internet and academic domains with moderate to large effect sizes, supporting the work done by Koo and Fishbach (2008).

The results for the social domain offered no support for the hypotheses, with both results opposite to the predicted directions, although the results were not significant with negligible or small effect sizes. The study design meant that each participant rated Internet,

academic and social behaviors; and the effects of engagement and progress framings were evident in the Internet and academic behavior item ratings. It is therefore unlikely that failure to prime the commitment and progress frameworks is a plausible explanation for the results. The to-go and to-date manipulations also produced the results predicted by the model in the Internet and academic domains. However, while the manipulation of high and low engagement was effective, we did not really manipulate participants to be uncertain about their goal. We only made the uncertain groups less motivated than the high engagement groups. Perhaps, the level of manipulation was not strong enough to produce the predicted effect in the social domain. Study 1 showed clear support of the model in the Internet and academic domains but almost no support in the social domain. Taken with the results from Study 2, this does indicate that there is potentially something different between the social and academic domains and how they are interpreted by participants. While they are clearly important to individuals in the target population, actions in each domain do not appear to be interpreted in the same manner.

Results showed that focusing on goal actions completed to-date does engender a sense of accomplishment equivalent to positive feedback. However, focusing on outstanding goal actions still to-go engenders a sense of discrepancy and disappointment in goal achievement, comparable to receiving negative feedback. Study 2 then, did shed some light on questions raised in Study 1. Directing someone's attention to accomplished or unaccomplished actions can be equivalent to providing positive or negative feedback and the behavior evaluations will be dependent on the mental framework held by the individual.

Clients seek treatment with varying degrees of willingness and engagement, and many are often ambivalent about change (Miller & Rollnick, 2012). Results from this study show that engaged individuals favour a progress focus and will have more motivation to complete a goal if they focus on the unaccomplished actions to go ("I still

have work to do”, “I need to action this”, etc.) versus focusing on accomplished actions (“I have already completed a lot”, “I can balance my actions for the moment”, etc.).

Disengaged individuals, on the other hand, favour a commitment focus and will have more motivation to complete a goal if they focus on completed actions (“having already done so much, it must be important”) versus focusing on actions yet to be completed (“there is still lots to do, it can’t be that important to me”). Clinicians should ascertain their client’s level of engagement to their goal before presenting feedback.

Studies 1 and 2 have shown how framing and feedback cues can prime commitment and progress frameworks and interact to cause opposite behaviors. The third study investigated the effects of holding to a high-level goal or focusing on step by step actions on values of future behaviors.

4.4 Study 3 – Abstract Goal Versus Concrete Goal Actions

4.4.1 Introduction

Additional studies by Fishbach et al. (2006) and Zhang et al. (2007) investigated outcomes when individuals break a high level goal into concrete behavior steps. They explored differences in self-regulation after an initial goal behavior has been performed, if they focus on the high level or abstract goal that initiated the behavior or on the specific behavior step itself. The results demonstrated that when individuals focus on the abstract or higher-level goal, a commitment framework is formed and when initial goal achievement is positive it induces a highlighting pattern resulting in an increase in interest in goal congruent behavior. However when initial goal achievement is negative, there is disengagement from the goal, resulting in a decrease in interest in goal congruent behavior. Conversely, when the focus is on concrete behavior steps, a progress framework is formed and when initial goal achievement is positive it induces a balancing pattern resulting in a decrease in interest in goal congruent behavior. When initial goal achievement is negative,

this signifies a discrepancy and in an increase in interest in goal congruent behavior (Fishbach et al., 2006; Zhang et al., 2007).

This study set out to test the framing cues of focusing on a high-level goal versus the concrete steps required to achieve the goal. The theory predicts that focusing on a high level or abstract goal forms a commitment framework, leading to the pattern of highlighting, whereas focusing on the concrete goal actions forms a progress framework, leading to a pattern of balancing. After the framings had been activated, positive and negative feedback on goal success was given to test if this produced opposite behavior effects in the commitment and progress groups, as predicted by the model. The following hypotheses were constructed from the dynamics of self-regulation model.

H9. Participants who consider abstract goals and receive positive feedback about goal achievement will rate their interest in incongruent (Internet) goal behaviors *lower* than participants who consider concrete goal actions and receive positive feedback.

H10. Participants who consider abstract goals and receive positive feedback about goal achievement will rate their interest in congruent (Academic and Social) goal behaviors *higher* than participants who consider concrete goal actions and receive positive feedback.

H11. Participants who consider abstract goals and receive negative feedback about goal achievement will rate their interest in incongruent (Internet) goal behaviors *higher* than participants who consider concrete goal actions and receive negative feedback.

H12. Participants who consider abstract goals and receive negative feedback about goal achievement will rate their interest in congruent (Academic and Social) goal behaviors *lower* than participants who consider concrete goal actions and receive negative feedback.

4.4.2 Method

4.4.2.1 Participants

One hundred and ninety four undergraduate University students (122 female, 72 male) participated in the study in exchange for a chance to win one of two \$50 gift vouchers. Twenty two participants failed to complete the survey and were excluded from the final dataset leaving a final N = 172. The gender of participants did not yield any effects and is therefore omitted from further consideration. In line with results from Study

1, only participants with English as their first language were included in the study.

Participants ages ranged from 17 to 75 ($M = 24.96$, $SD = 8.61$).

4.4.2.2 *Stimuli*

The behavior items from study 1 and developed by Dunbar et al. (2017) were used (see Table 4.2).

4.4.2.3 *Design*

The current study was adapted from the general theories described in Fishbach et al. (2009). The initial design was based on the work of Fishbach et al. (2006) that examined how focusing on abstract or higher level goals versus concrete goal actions and positive or negative feedback on goal performance affected subsequent goal choices.

A between-participants design was used. The independent variables were goal saliency (focusing on an abstract goal or concrete goal actions) and initial goal outcome (success or failure). The main dependent variables were incongruent goal behavior operationalized as rating of Internet behaviors, and congruent goal behavior operationalized as ratings of academic and social behaviors. Motivation to perform the actions was captured by asking participants to rate their interest in pursuing each action on a seven point scale ranging from (1 – Not at all to 7 – A lot). As predicted by the theory, comparisons were made between participants in the success outcome groups comparing abstract versus concrete conditions and between participants in the failure outcome groups comparing abstract versus concrete conditions

4.4.2.4 *Procedure*

Ethical approval was granted by The University's Human Research Ethics Subcommittee for the School of Psychology. Participants provided consent and were informed that they were free to withdraw at any time.

Participants took the survey using SurveyMonkey at their convenience. The first part of the study gained consent and gathered basic demographic information. In order to

prime participants' goals they were asked to read a short (280 word) literature review on Problematic Internet Usage. To further strengthen the priming, a short three-minute video on Problematic Internet Usage was also presented straight after.

Participants were randomly assigned to one of four conditions: Abstract Goal and Positive Feedback, Abstract Goal and Negative Feedback, Concrete Goal Actions and Positive Feedback, and Concrete Goal Actions and Negative Feedback.

A vignette was presented describing a person who has just learned about PIU and has concerns that it may apply to them. The person was worried that they are spending too much personal time (not counting time spent for study or work) on the Internet to the detriment of their academic work and social relationships.

Participants were randomly assigned into abstract goal or concrete steps groups. The abstract goal group then read that the person in the vignette was setting a higher-level goal to reduce their personal Internet usage to a certain amount. The amount was deliberately vague so as not to bring in any value judgments by participants about what might be a small or large amount of time that would be acceptable to spend using the Internet. The abstract goal group was split again and randomly assigned into positive or negative feedback groups. Positive and negative feedback was then provided by describing some time later when a reduction in hours was achieved and that was either well below the norm (negative feedback) or well above the norm (positive feedback) of what was to be expected at that time.

The concrete steps groups read that the person was setting a goal to reduce their personal Internet usage to a certain amount. Again, the amount was deliberately vague so as not to bring in any value judgments by participants about what might be a small or large amount of time that would be acceptable to spend using the Internet. They then read the person had come across a program designed to reduce their personal Internet usage that was composed of a number of discrete steps and they were going to follow the program

step by step. The concrete steps group was split again and randomly assigned into positive or negative feedback groups. Positive and negative feedback was provided by describing some time later when a reduction in hours was achieved and that achievement was either well below the norm (negative feedback) or well above the norm (positive feedback) of what was to be expected at that time.

The 20 behavior actions were then presented in random order and participants were asked to rate their level of interest in pursuing them on a seven-point scale (1 – not at all interested to 7 – very much interested). After completing the rating portion, participants were asked further questions such as how interested and motivated they were in regards to the goal to reduce personal Internet hours in the vignette scenario, how important academic success and maintaining long lasting relationships was to them in general. Finally, participants were asked to describe what they thought the study was investigating, were thanked for their participation and dismissed. Analysis of the provided descriptions revealed that none of the participants were able to determine the true intent of the study.

4.4.3 Results

4.4.3.1 *Effects of Highlighting Abstract Goal or Concrete Actions and Initial Goal Achievement*

To investigate the opposite effects of abstract goal or concrete actions in the success groups, participants' value ratings were averaged for the four Internet, academic and social behavior action items and the resultant mean scores were compared. Descriptive statistics can be found in Table 4.5.

4.4.3.2 *Successful Initial Goal Pursuit Group*

Participants in the abstract goal commitment and positive feedback condition rated the value of Internet behaviors lower than those in the concrete goal actions and positive feedback condition, $t(83) = -2.76, p = .02$. A Cohen's d of $-.61$ indicated an effect size of moderate magnitude. This result supports H9 (see Figure 4.10).

Participants in the abstract goal commitment and positive feedback condition rated the value of Academic behaviors higher than those in the concrete goal actions and positive feedback condition, although the result was non-significant, $t(83) = 1.58, p = .18$. A Cohen's d of .35 indicated a small effect size. This result is in the predicted direction but not statistically significant, offering some support for H10 (see Figure 4.11).

Participants in the abstract goal commitment and positive feedback condition rated the value of Social behaviors lower than those in the concrete goal actions and positive feedback condition, which is in the opposite direction and does not support H10 in the social domain (see Figure 4.12). The result is non-significant, $t(83) = -.56, p = .33$ and a Cohen's d of -.12 indicates a negligible effect size.

Table 4.5

Study 3 descriptive statistics for Internet, academic and social behavior value ratings

	Positive Feedback			Negative Feedback		
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>
Internet Domain						
Abstract Goal	42	3.69	1.35	45	4.65	1.19
Concrete Actions	43	4.46	1.21	42	3.77	1.34
Academic Domain						
Abstract Goal	42	5.10	1.24	45	4.49	1.40
Concrete Actions	43	4.62	1.53	42	5.13	1.34
Social Domain						
Abstract Goal	42	5.30	1.33	45	5.27	1.06
Concrete Actions	43	5.45	1.04	42	5.49	.99

Figure 4.10

Internet behavior value ratings for abstract goal and concrete action conditions with positive and negative feedback on initial goal actions.

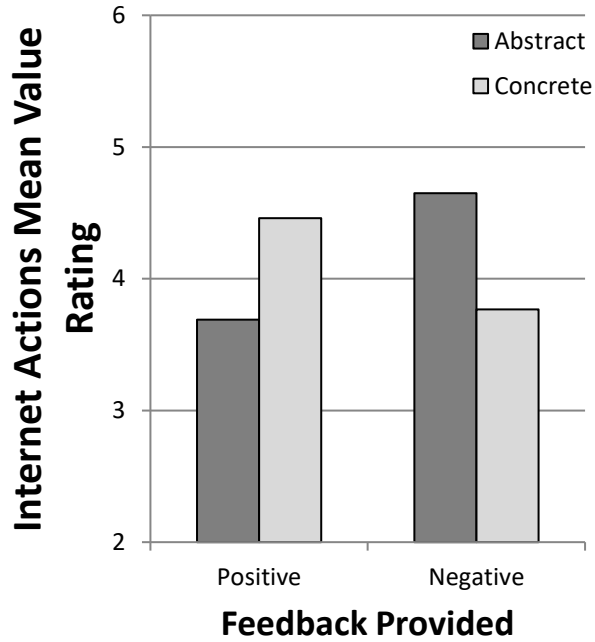


Figure 4.11

Academic behavior value ratings for abstract goal and concrete action conditions with positive and negative feedback on initial goal actions.

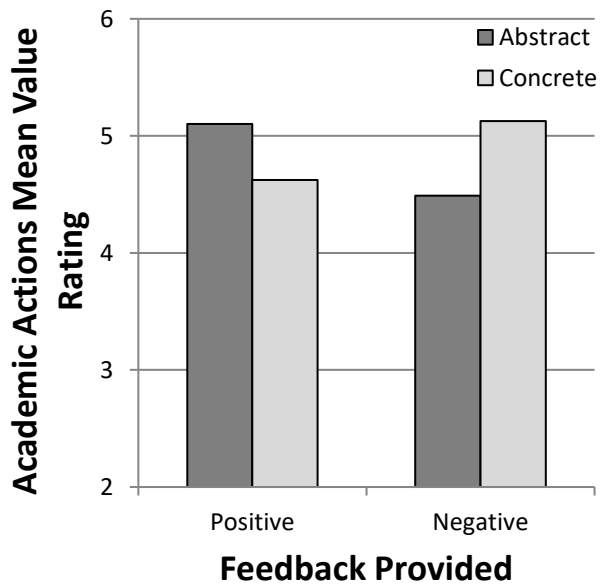
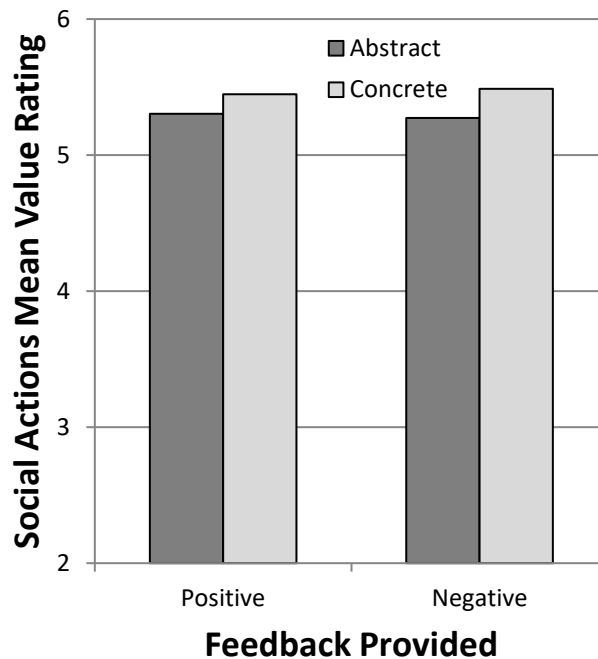


Figure 4.12

Social behavior value ratings for abstract goal and concrete action conditions with positive and negative feedback on initial goal actions.



4.4.3.3 Unsuccessful Initial Goal Pursuit Group

Participants in the abstract goal commitment and negative feedback condition rated the value of Internet behaviors higher than those in the concrete goal actions and negative feedback condition, $t(85) = 3.25, p = .003$. A Cohen's d of .71 indicated an effect size of moderate magnitude. This result supports H11 (see Figure 4.10).

Participants in the abstract goal commitment and negative feedback condition rated the value of Academic behaviors lower than those in the concrete goal actions and negative feedback condition, $t(85) = -2.16, p = .03$. A Cohen's d of .47 indicated a small effect size. This result supports H12 in the academic domain (see Figure 4.11).

Participants in the abstract goal commitment and negative feedback condition rated the value of Social behaviors lower than those in the concrete goal actions and negative feedback condition, although the result is non-significant, $t(85) = -0.98, p = .33$. A Cohen's

d of $-.21$ indicated a small effect size. This result is in the predicted direction but not statistically significant, again offering some support for H12 in the social domain (see Figure 4.12).

4.4.4 Discussion

Results supported the predictions of the dynamics of self-regulation model in the Internet domain with participants in the abstract goal group appearing to form a commitment framework and participants who focused on concrete steps appearing to form a progress framework. Positive and negative feedback on initial goal pursuit produced the opposite effects on behavior ratings for future goal actions, as predicted by the model. The Internet domain again showed the strongest support with moderate effect sizes for both conditions. The academic domain showed some support with both differences in the predicted direction and one condition showing a significant difference. The effect sizes were small in both cases. This data supports the work done by Fishbach et al. (2006) and adds to the results in Studies 1 and 2 of the current paper. The results for the social domain were again non-significant and not in the predicted direction for one condition.

As for studies 1 and 2, the study manipulations cannot account for the failure to support the hypotheses in the social domain as the results for the Internet and Academic domains were as predicted by the model, albeit the academic domain this time offered less support than in the first two studies. The repeated failure to produce results predicted by the model in the social domain indicates that there may be something fundamentally different from the Internet and Academic domains. A broader exploration is offered in the General Discussion section.

During the course of treatment, clinicians and clients develop a treatment plan and goals; assignments, tasks, and homework are also set as steps for clients to undertake as part of therapy (Beck, 2011; Harris, 2009; Wright et al., 2006). Clients, then, can concentrate on concrete tasks for treatment as well as have a high level and abstract goal or

plan in place for the whole process. If focusing on concrete actions has a different effect than focusing on a high-level goal then clinicians need to be aware of how best to provide feedback in relation to specific tasks as well as the ongoing treatment plan in order to best serve the client's needs for the topic under discussion and develop the best outcome for treatment.

Results from this study show that individuals who focus on concrete actions will form a progress framework. When presented with feedback on performance, individuals who get high performance feedback will focus on balancing their goals and will be more likely to choose more goal incongruent actions whereas individuals who get low performance feedback will focus on the discrepancy between the feedback and their goal and will more likely choose more goal congruent actions than individuals with a commitment framework. Results also indicate that individuals who focus on abstract goals will form a commitment framework. When presented with feedback on performance, individuals who get high performance feedback will highlight focal goal behaviors at the expense of temptations and will be more likely to choose more goal congruent actions whereas individuals who get low performance feedback will focus on the low importance of the goal, likely reducing the goal's weight in the process and subsequently choose more goal incongruent actions than individuals with a progress framework.

4.5 General Discussion

A recent model of goal-directed behavior and self-regulation deals with the self-regulation dilemma of battling multiple goals and temptations simultaneously and over the course of many decisions (Fishbach et al., 2009). The model has primarily been applied to a consumer and marketing context but seems suited to a clinical domain. A recent study by Dunbar et al. (2017) began the investigation of applying the model in a clinical context with promising results. The current research sought to test additional components of the model in a clinical domain of Problematic Internet Usage (PIU). All three studies used

goal-congruent behaviors of academic and social achievement and incongruent goal behaviors of personal time spent on the Internet. The studies tested various cues and constructs that the model predicts will produce commitment or progress mental frameworks and continued to investigate how they affect future behavior choices. Successful self-regulation is a fundamental tenet of mental well-being (Hoyle, 2010), is the target of many clinical therapies (Beck, 2011; Harris, 2009; Hayes, 2004; Kuyken et al., 2010) and furthering the understanding the dynamics of self-regulation holds significant clinical importance.

Overall, the commitment and progress frameworks were produced and their opposite effects on subsequent behavior evaluations were observed as predicted by the model (Fishbach et al., 2009). The first study showed that questions about commitment or progress can prime the associated mental frameworks (Fishbach & Dhar, 2005); the second study showed that level of goal commitment can determine the framework (commitment or progress) that an individual will adopt when evaluating goal actions (Koo & Fishbach, 2008); and the third study demonstrated that focusing on the high-level goal will establish a commitment frame whereas focusing on concrete goal steps will establish a progress framework (Fishbach et al., 2006). The studies demonstrated the effects of how successful and unsuccessful goal actions are interpreted under commitment or progress mental representations and produce opposite outcomes in behavior evaluations (Fishbach et al., 2009). Study 1 used specific positive and negative feedback relating to a single day's outcome regarding the goal directed behavior. Study 2 focused participants on the accomplished tasks to-date or unaccomplished tasks which were inferred as successful and unsuccessful goal accomplishments respectively. Study 3 also used specific positive and negative feedback but this time relating to goal outcomes over a period of time. Results showed that predictions of the dynamics of self-regulation model held t in the Internet and academic domains, but there was little support found in the social domain (See Limitations

section for further discussion). The study adds more evidence to confirm that the dynamics of self-regulation model can be successfully applied in a clinical domain.

The results do not easily lend themselves to other current models of self-regulation. For example, the ego depletion or strength model of self-control (Baumeister et al., 1998; Baumeister & Heatherton, 1996) cannot account for the opposite effects of behavior. Specifically, how can negative feedback cause more incongruent goal behavior in the Study 1 commitment group, but then cause less incongruent goal behavior in the Study 1 progress group. Negative feedback cannot seemingly deplete self-control resources in one instance and replenish them in another. The cybernetic models of self-regulation (e.g. Carver & Scheier, 1998; Powers, 2005) can explain the progress groups' behaviors as responding to discrepancies from a reference value (i.e. goal) but have little to say about how the commitment groups perform. Similarly, the hot/cool system of willpower (Metcalf & Mischel, 1999) can explain the devaluation of incongruent goals in one direction but cannot support the opposite effects. It is difficult to explain how the hot (emotional and impulsive) system can be turned on in one condition and the cold (neutral and reflective) system be turned on in another, and then explain why these systems would switch when faced with negative versus positive initial goal action. Construal level theory (Trope & Liberman, 2010), in simple terms, states that high level or abstract thinking gives rise to better self-control, whereas low level or concrete thinking decrease self-control. This is specifically contradicted by Study 3 where the abstract participants are shown to perform well and poorly and concrete participant shown to perform poorly and well simply by providing positive and negative feedback.

The dynamics of self-regulation model is one of cognitive reconstrual (e.g. Fujita et al., 2006; Magen & Gross, 2007), with commitment and progress mental frameworks providing the mechanisms to support how individuals can reconstrue or interpret the same events with opposite outcomes. The results from the current study support the assertion of

the dynamics of self-regulation model that commitment and progress are competing mental representational frameworks with opposite motivational and behavioral outcomes (Fishbach et al., 2009).

4.6 Implications for Clinical Practice

4.6.1 Questions on Commitment and Progress Combined With Positive or Negative Feedback

Questions about goals can prime either a commitment or progress representation framework (Fishbach & Dhar, 2005). When individuals have a commitment representation they are more likely to highlight goal congruent actions and less likely to pursue competing goals whereas when individuals have a progress representation they are more likely to balance between actions and are more likely to seek a balance between the focal goal and competing ones.

During the course of treatment clinicians provide considerable feedback to clients and this can take many forms including summarising a client's improvement or non-improvement towards a certain behavioral goal (Beck, 2011; Harris, 2009; Sommers-Flanagan & Sommers-Flanagan, 2015; Wright et al., 2006). If the words chosen when summarising progress towards a goal influences subsequent behavioral choices a client makes – and indeed, can have opposite effects given a self-regulation framing – then it is important for a clinician to know how to frame the feedback in order to ensure the best possible outcome for the client that is in line with the client's stated goals. For example, consider a clinician who starts the session asking the client how they have progressed since they last met and after receiving information from the client about their achievement follows that up with a statement praising the client's achievement. Will the original question from the clinician induce a progress frame in the client and will the positive feedback then signal partial goal attainment leading the client to adopt a balancing pattern? Should the clinician phrase the feedback to focus on the outstanding and unaccomplished work in order to emphasise a discrepancy? Should the clinician open with a question about

commitment instead? Would any of it make a difference? These questions would be of interest to a clinician.

Results from the present study indicate that simple questions about commitment or progress do invoke commitment and progress frameworks respectively. Furthermore, positive feedback activates a highlighting pattern in committed individuals and a balancing pattern in progress-oriented individuals which produces opposite effects in congruent and incongruent behavior ratings. Conversely, negative feedback causes committed individuals to disengage from the focal goal and progress-oriented individuals to act on the discrepancy between their current and desired focal goal states; again producing opposite effects in congruent and incongruent behavior ratings.

It would appear that clinicians should construct their conversations with these results in mind, especially when it is clear that a client will undergo a self-control dilemma in regards to the congruent and incongruent behaviors at hand. Importantly, clinicians should identify if clients indeed hold these goals (or automatic behaviors or cognitions that activate them) as clients will not benefit from the construction of questions and feedback as dictated by the model if the internal self-control dilemma does not exist.

4.6.2 Engaged Versus Ambivalent Clients

Clients seek treatment with varying degrees of engagement and willingness. Some clients come highly willing to engage and complete treatment, while others may have little interest or desire and may perceive coercion by a well-meaning partner, a government service provider or even a court authority. Regardless of the reason for seeking treatment, clients are often ambivalent about change (Miller & Rollnick, 2012) and it would seem reasonable that clients could have low or high levels of engagement. This is supported by the approach of Motivational Interviewing that is designed to elicit change talk and evoke motivation to take individuals from being uncommitted and ambivalent to being ready and committed to change (Miller & Rollnick, 2012).

Feedback provided by clinicians can take many forms, including providing feedback on the client's level of progress so far and/or the amount of work left to go (Beck, 2011; Sommers-Flanagan & Sommers-Flanagan, 2015). If having a high or low level of engagement and then choosing to focus on the progress done so far or progress that is yet to be completed influences subsequent behavioral choices a client makes, then it is important for a clinician to know how to frame the feedback in order to ensure the best possible outcome for the client.

When clients have a low level of engagement or are uncertain about their level of engagement towards treatment, homework, or behavioral changes, emphasis should be placed on accomplished actions, or the achievements to-date. This will emphasize their engagement to therapy and increase the likelihood of compliance to future work.

Conversely, when clients are certain or have a high level of engagement, emphasis should be placed on the remaining work, or tasks to-go as that will emphasize their remaining tasks to be completed and increase the likelihood of compliance to complete them.

Results show that engaged individuals display a progress focus and will have more motivation to complete a goal if they focus on progress to go ("I still have work to do", "I need to action this", etc.) versus focusing on completed progress ("I have already completed a lot", "I can balance my actions for the moment", etc.). Unengaged individuals, on the other hand, display a commitment focus and will have more motivation to complete a goal if they focus on completed progress ("have already done so much, it must be important") versus focusing on progress to be completed ("there is still lots to do, it can't be that important to me"). Engagement to therapy may be assessed and developed with motivational interviewing techniques (Miller & Rollnick, 2002).

4.6.3 Abstract Goal Versus Concrete Goal Actions

Clinicians and clients can work together to develop a plan, vision and goals for treatment; assignments, tasks, and homework are also set as steps for clients to undertake

as part of therapy (Beck, 2011; Harris, 2009; Wright et al., 2006). Clients, then, can work on concrete tasks for treatment as well as have a high level and abstract goal or plan in place for the whole process. If focusing on concrete actions has a different effect than focusing on a high-level goal then clinicians need to be aware of how best to provide feedback in relation to specific tasks as well as the ongoing treatment plan in order to best serve the client's needs for the topic under discussion and develop the best outcome for treatment.

Individuals who focus on concrete actions will form a progress framework. When presented with feedback on performance, individuals who get high performance feedback will focus on balancing their goals and will be more likely to choose more goal incongruent actions. Individuals who get low performance feedback will focus on the discrepancy between the feedback and their goal and will more likely choose more goal congruent actions than individuals with a commitment framework.

Individuals who focus on abstract goals will form a commitment framework. When presented with feedback on performance, individuals who get high performance feedback will highlight focal goal behaviors at the expense of temptations and will be more likely to choose more goal congruent actions whereas individuals who get low performance feedback will focus on the low importance of the goal, likely rejecting the goal in the process and subsequently choose more goal incongruent actions than individuals with a progress framework.

4.6.4 Clinician Practice Outcomes Summary

The results from the current study suggest teaching clients to appropriately frame and construe the outcomes of their current goal results would be helpful for progress towards their stated goals. If individuals have experienced goal failure then they should frame their thinking in terms of progress, such that they notice the discrepancy between their current and desired end goal states. This should lead to the likelihood of higher

evaluations of future goal congruent behaviors. An example of self talk to promote after goal failure might be: “Have I made progress towards my goal? I want to achieve my (concrete) steps towards my goal. I still have more to do.” However, if individuals experience goal success they should frame their thinking in terms of their commitment to their desired goal which should lead to the likelihood of higher evaluations for goal congruent behaviors in the immediate future. An example of self talk to encourage after goal success might be: “How committed to my goal do I feel? I have accomplished much already. I want to achieve my (high level) goal.”

4.7 Limitations

Throughout the three studies, the social domain failed to provide results that supported the model. Indeed, on many occasions the results were opposite to the predicted direction. All three studies used very similar methods, stimuli and population samples, and all three studies consistently produced the predicted results for the Internet and academic domains. Limitations of the individual studies have been discussed above, but it is unlikely that separate issues in each study produced the same effect of working for Internet and academic domains but failing for the social. The study designs and manipulations are an unlikely source for this phenomenon.

A possible explanation is that, in relation to the social domain, individuals did not actually consider themselves to be in a self-control dilemma to begin with. Fujita (2011) gave the example of a dieter and the self-control dilemma of a chocolate cake. The dieter has a dilemma because there is a conflict between their higher and long-term goal and the lower and proximal temptation and the dieter can only satisfy one of the goals. Fujita (2011) noted that a non-dieter has no such self-control dilemma because they hold no higher and long-term goal to stick to a diet. The non-dieter then is free to choose the chocolate cake or not. According to this argument, participants, in general, held no concerns about their Internet actions in order for them to hold a high level and long-term

goal to succeed in their social domain. The studies presented a literature review and video on PIU and the relationship to poorer academic and social outcomes in order to prime a motivational conflict, but this appears to have not been effective in the social domain. Examination of the priming vignette and video revealed that the information presented established that PIU correlates negatively to social relationships rather than stating that increasing real-life social contact would aid in the reduction of PIU. The same message was delivered for academic behaviors. It is possible that participants were implicitly aware that increasing academic actions would reduce PIU but did not hold the same implicit awareness for the social behaviours and this difference is what caused the indistinct results in the social domain. This phenomena might be specific to a younger student population. If the above interpretation is correct, then clinicians will need to ascertain that a motivational conflict exists between whatever incongruent behavior is desired to be decreased and the congruent goal behavior that is desired to be enhanced.

Previous research (Fishbach & Dhar, 2005; Fishbach & Shah, 2006; Trope & Fishbach, 2000) has successfully used social behavior items and found the effect predicted by the model, but those studies were constructed such that academic actions conflicted with social actions. For example, Fishbach and Dhar (2005) primed academic achievement as the focal goal and used social behavior actions (e.g. hang out with friends at night) as incongruent goal behaviors. There was little potential for social behaviors to be confused as congruent and incongruent goal behaviors in those studies. The current study took special care to separate socialization and Internet use, but given the ubiquity of the Internet in our daily and social lives (Correa et al., 2010) it is possible that this was not successful. Future research could consider what makes the social domain different in this context.

Readers would note that the present studies dealt with an individual's interest to behave rather than real behaviour. Numerous meta-analyses (e.g. Sheeran, 2002; Webb & Sheeran, 2006) have shown that intention to behave in a certain manner is a good predictor

of behavior, but generalising to actual behaviors must be done with caution. Future studies will need to test the model with real world behaviors. The present studies also operated on a general population rather than one identified to have PIU. Future studies could test if the effects exist in a clinical population of individuals classified with PIU.

4.8 Future Research and Clinical Directions

Dunbar et al. (2017) began the testing the model on the dynamics of self-regulation in a clinical context and the current paper has taken this further by testing additional components of the model. The research has demonstrated that consistent effects can be found in general student populations for Internet and academic domains. While remaining components of the model could be tested in a clinical domain, there appears to be enough evidence of support for the model to justify further application to a clinical population. It would be important to see if the strong effects found for Internet behavior evaluations would translate into real life behavior decisions and applying the theory in a PIU population would put its clinical utility to the test.

Results from the current research and the Dunbar et al. (2017) study have shown that the dynamics of self-regulation theory can be applied in the clinical domain of PIU. Those results could inform the development of new interventions to support behavioural change. Ironically, Internet or smartphone application interventions would seem ideally suited to those who experience PIU, as they are already engaged with the platforms. An example of such an application could be tracking an individual's personal Internet usage on a daily basis and comparing it against a pre-set desired goal amount. If the result for the day was positive, then the application could provide a commitment framework response that would put the individual in a highlighting frame such that they would then be more likely to choose congruent behaviors and avoid the temptation of other Internet use. Whereas, if there was too much personal Internet usage the application could give a response to prime a progress framework that would highlight the discrepancy between the

current and desired end goal state. This should also encourage more congruent goal behaviors. Future research could consider these possibilities.

Disclosure Statement

No competing financial interests exist.

Chapter 5: Paper Three – Problematic Internet Usage: Can Commitment and Progress Frameworks Help Regulate Daily Personal Internet Use?

Statement of Authorship

Title of Paper	Problematic Internet Usage: Can Commitment and Progress Frameworks Help Regulate Daily Personal Internet Use?
Publication Status	Submitted for publication
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Name of Principal Author (Candidate)	David William Dunbar		
Contribution to the Paper	Reviewed the literature and formed the research idea. Planned, designed, and implemented the research, including gaining ethical approvals, obtaining informed consent from participants, data collection, and analysis. Responsible for writing and editing the manuscript in collaboration with research supervisors. Submitted the manuscript for publication and corresponding author for the paper.		
Overall percentage	85%		
Certification	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.		
Signature		Date	23/11/2020

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

- i. the candidate's stated contribution to the publication is accurate (as detailed above);
- ii. permission is granted for the candidate to include the publication in the thesis; and
- iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Dr Michael Proeve Associate Professor Rachel Roberts		
Contribution to the Paper	Supervisors of the PhD research program. Oversaw the research idea conceptualisation, methodology, planning and implementation. Collaborated in developing the content and structure of the publication manuscript, and reviewing drafts. Provided advice and guidance for responding to journal reviewer feedback.		
Signature			
Date: 26/11/2020	Michael Proeve		Rachel Roberts

Abstract

Problem Internet Usage (PIU) is a growing and global public health concern. A model of the dynamics of self-regulation may provide a useful framework for psychological interventions with PIU with previous research showing it can be successfully applied to PIU behaviors.

The aim of this randomized controlled trial (RCT) was to evaluate the efficacy of an Internet-based intervention targeted at reducing the amount of daily personal Internet hours, PIU symptoms, and associated mental health issues for University students classified with PIU issues. Assessments were undertaken at baseline, each day of the 21 day intervention, and 6-week follow-up.

A total of 74 participants completed the intervention and 38 completed follow-up assessments. Results indicated the experimental group reduced daily personal Internet usage significantly more than the active control group at the end of the intervention. Findings also demonstrated a greater reduction in Internet Addiction Test (IAT) scores for the experimental group compared to the active control. Limited effects were found for depression, anxiety, stress and social anxiety scores. A third of participants in the experimental condition reduced IAT scores below the threshold by day 21, demonstrating a clinically significant change in PIU symptoms.

The research suggests the dynamics of self-regulation framework may provide a promising approach to control PIU, leading to a reduction of negative life outcomes for individuals.

Problematic Internet Usage Self-Regulation Dilemmas: Can Commitment and Progress Frameworks Help Regulate Problematic Internet Use?

5.1 Introduction

The rise of the Internet and smartphones over the past decade (American Psychological Association, 2017; International Telecommunication Union, 2019; Internet World Stats, 2019; Taylor & Silver, 2019) has given rise to a self-control issue of Problematic Internet Usage (PIU). This modern phenomenon has received much attention in the scientific research community and numerous studies have displayed direct links between excessive Internet use and unfavorable outcomes for individuals across a range of psychological areas of psychological functioning (Aboujaoude, 2010; Kuss & Lopez-Fernandez, 2016; Muusses et al., 2014; Pontes et al., 2015; Spada, 2014; Weinstein et al., 2014; Young, 1998b).

Psychological research on PIU has increased substantially in recent years, but there is still no consensus on its classification with researchers viewing it as a pathology or addiction (Ha et al., 2006b; Poli & Agrimi, 2012; Young, 1996, 1998b), a cognitive-behavioral problem (Caplan, 2002; Davis, 2001), a socio-cognitive construct (LaRose & Eastin, 2004; LaRose et al., 2003), or as self-regulation failures in controlling mood and behaviors (Tokunaga, 2016).

Psychological interventions have reported limited success in dealing with PIU and there is not enough known about the value of current treatments which have mainly consisted of medications (usually prescribed for depression or ADHD), cognitive behavioral therapy (individual or group), or family based therapy (Cash et al., 2012; King et al., 2011; Kuss et al., 2014; Winkler et al., 2013). Meta-analyses have raised serious issues including low numbers of published studies, as well as methodological limitations such as no randomization, lack of control groups for comparison, and no common diagnostic assessments or measures (King et al., 2011; Winkler et al., 2013).

A model of the dynamics of self-regulation developed by Ayelet Fishbach and colleagues over the last decade (Fishbach & Dhar, 2005; Fishbach et al., 2006; Fishbach & Zhang, 2008, 2009; Fishbach et al., 2009; Koo & Fishbach, 2008; Zhang et al., 2007) has the potential to be applied to PIU. This novel model describes contrasting patterns of commitment or progress frameworks that individuals may follow when selecting goal directed behaviors. To date, the model has mainly been applied in marketing and consumer studies (Campbell & Warren, 2015; Fitzsimons et al., 2008; Wilcox et al., 2009) but recent research (Dunbar et al., 2017, 2018) showed that fundamental components of the model can applied to the domain of PIU. The dynamics of self-regulation model developed by Fishbach and colleagues has the potential to offer novel approaches for clinicians when dealing with individuals facing the self-control issue of PIU (Dunbar et al., 2018).

The present study seeks to develop the application of the model further by taking the research from the laboratory, measuring intention to behave questionnaires in a general population, to measuring real-world daily Internet use in a population of individuals experiencing problematic Internet use.

5.1.1 Problematic Internet Usage

Problematic Internet Use (PIU) is a growing and global public health concern (Jelenchick et al., 2014; Spada, 2014). Despite the first published case being recorded in 1996 (Young, 1996), psychological research has not kept up with technological advances; the use of the Internet has proliferated but there is still yet to be agreement on some fundamental issues such as how to define, classify and assess dysregulated Internet use (Aboujaoude, 2010). The ever-growing popularity of the Internet, with over 4 billion people now connected to the Internet worldwide (International Telecommunication Union, 2019) and mobile Internet use recently surpassing desktop usage, illustrates that individuals have increased ability to access the Internet from anywhere and at any time (Australian Communications and Media Authority, 2014; comScore, 2014).

Psychological research on PIU has increased in recent years, but there is still not enough known about PIU to draw anything other than preliminary conclusions in regards to its underlying mechanisms and treatment approaches (Winkler et al., 2013). The latest versions of the World Health Organization International Classification of Diseases (ICD-11) and the American Psychiatric Association Diagnostic and Statistical Manual of Mental Disorders (DSM-5) are yet to include PIU as a condition (American Psychiatric Association, 2013; World Health Organization, 2018). A reason for this may be that there is little consensus in the literature regarding PIU (Petry & O'Brien, 2013), also known as Internet addiction, Internet addiction disorder, pathological Internet use, excessive Internet use, Internet dependence, compulsive computer use, and virtual addiction (McIntyre et al., 2015; Shaw & Black, 2008; Spada, 2014).

Despite this lack of general consensus, numerous studies have shown that excessive use of the Internet is associated with various mental health concerns such as depression, generalized anxiety disorder, social anxiety, obsessive compulsive disorder (OCD), attention-deficit hyperactivity disorder (ADHD), poorer academic achievement and personal relationship quality for adolescents and adults (Aboujaoude, 2010; Ha et al., 2006a; Ko et al., 2012; Lopez-Fernandez et al., 2014; Muusses et al., 2014; Spada, 2014; Wang et al., 2014; Weinstein et al., 2015; Weinstein et al., 2014; Yau et al., 2013).

The large number of comorbid conditions that exist with PIU, the lack of clarity and conformity in definitions, classifications and designs, and the fact that most studies are cross-sectional, make it difficult to tease out causality (Beard, 2005; Jorgenson et al., 2016; Weinstein et al., 2014). For example, does a depressed person spend more time on the Internet in order to alleviate their symptoms or do they become depressed because of all the time they spend on the Internet? (Caplan, 2002; Elavarasan et al., 2018; Tokunaga, 2017). Regardless of how it is conceptualized or defined, all models implicate self-regulation processes and self-control failures as fundamental factors in the development

and maintenance of problematic Internet use (Bernardi & Pallanti, 2009; Billieux & Van der Linden, 2012; Davis, 2001; Jorgenson et al., 2016; Kuss & Lopez-Fernandez, 2016; LaRose et al., 2003; Pies, 2009; Pontes et al., 2015; Yau et al., 2013).

5.1.2 Defining Self-Regulation and Self-Control

Our ability to self-regulate is seen by many as our most vital attribute as human beings (Baumeister, 2003; Boekaerts et al., 2005) and successful self-regulation is a cornerstone of healthy psychological function (Hoyle, 2010). Subsequently, breakdowns in self-regulation are shown to contribute to a wide range of adverse outcomes across the lifespan, including issues such as lack of behavioral inhibition, emotional dysregulation and poor attentional control (Busch & Hofer, 2012; Eiesnberg et al., 1997; Spinrad et al., 2006). An important requirement for adaptive self-regulation and an appropriate response to avoiding temptations is the implementation of self-control (Baumeister & Heatherton, 1996; Carver & Scheier, 1998; de Ridder et al., 2012; Fishbach et al., 2003; Metcalfe & Mischel, 1999).

Several theories of human motivation emphasize goals and individual use of self-regulation processes to model one's behavior in pursuit of those goals (Bandura, 1991; Carver & Scheier, 1998; Deci & Ryan, 2000; Gollwitzer, 1999; James, 1890; Kruglanski et al., 2002; Locke & Latham, 2015). Self-regulation refers to the processes that allow individuals to manage, monitor, assess and alter their cognitions, affect, feelings, attention, and behaviors (Fujita, 2011; Hofmann et al., 2009). In relation to goal directed behavior, self-regulation processes are the dynamic psychological mechanisms that allow individuals to direct their behavior, successfully or unsuccessfully, towards goals (Gendolla et al., 2015; Mann et al., 2013).

Self-control is defined as the capability to override, change or restrain urges, cravings, desires, impulses, or habitual responses (Bandura, 1991; Baumeister, 2003; Carver & Scheier, 1998; Metcalfe & Mischel, 1999). Self-control can be thought of as a

specific self-regulatory challenge where an individual needs to protect a goal, which has long term benefits, against a temptation, which offers short term gains but that is in conflict with the goal (Baumeister et al., 2007; de Ridder et al., 2012; Fishbach & Shah, 2006; Hagger et al., 2010).

A self-control dilemma is defined as an internal conflict where the attainment of a higher order and typically longer-term goal is jeopardized by a shorter term goal or temptation (Fishbach & Labroo, 2007; Fishbach & Shah, 2006; Fujita et al., 2016; Hofmann et al., 2009). A self-control dilemma involves a dual motive conflict where only one of the motives can be fulfilled (Fujita, 2011). Self-control dilemmas are a common daily occurrence (Baumeister et al., 2007; Hofmann et al., 2009). For example: “Should I have the chocolate cake or do I go for the salad?” or “Should I surf the Internet right now or study for my exam?” are self-control dilemmas.

Given the ubiquity of the Internet in modern day living (International Telecommunication Union, 2019; Internet World Stats, 2019; Taylor & Silver, 2019) it seems unrealistic that the final goal for any intervention for problematic Internet usage could be complete abstinence. Indeed, a non-abstinence approach is receiving support from researchers and clinicians alike who argue that a controlled and balanced use of the Internet and applications should be the goal of any therapy (Cash et al., 2012; Young, 2007). This approach is not only supported by researchers and clinicians but also from individuals experiencing PIU (O'Brien et al., 2016). In order to achieve this therapeutic goal, individuals need to utilize their self-regulation skills to manage, monitor and alter their cognitions, attention, and behaviors (Carver & Scheier, 2011; Cash et al., 2012; Fujita et al., 2016; Przepiorka et al., 2014).

Despite the recent upsurge in studies, there has been limited success for psychological interventions dealing with PIU and there is not enough known about the efficacy and effectiveness of current treatments (Winkler et al., 2013). There is a pressing

need for new effective approaches to deal with the issue of PIU (Przepiorka et al., 2014; Winkler et al., 2013). The dynamics of self-regulation model offers the possibility for new insights in how to effect these changes in a population of individuals exhibiting problematic Internet use.

5.1.3 Dynamics of Self-Regulation Model

The model of the dynamics of self-regulation by Ayelet Fishbach and colleagues investigated a dual representation framework of goal-directed behavior (Fishbach & Shen, 2014; Fishbach et al., 2009). This research examined the simultaneous pursuit of multiple goals and temptations and their effects on subsequent behavioral outcomes, and uncovered many processes and variables contributing to the dynamics of self-regulation. For an overview see Fishbach and Zhang (2009). At the heart of the research is the fundamental proposition that when regulating multiple goals, individuals can evaluate their level of commitment to, or their progress in moving toward, a focal goal (Fishbach & Dhar, 2005).

Under a *progress* goal representational framework, individuals are motivated to monitor and regulate the difference between the current and desired end state, a behavioral model that is equivalent to the cybernetic models of self-regulation (Carver & Scheier, 1998; Powers, 2005). Under this model, a successful goal behavior would indicate partial completion of the goal and signal to an individual that enough effort towards completion of the goal has been exerted for now. Consequently, other goals in the environment become more salient as the individual disengages from the focal goal for the moment. The resulting dynamic of self-regulation is that of *balancing*. An unsuccessful goal behavior, however, indicates a discrepancy between the current and desired end states and motivates the individual to find congruent goal behaviors more attractive.

Using a *commitment* goal representational framework, individuals are motivated to monitor and regulate their level of commitment to the goal end state. A successful goal behavior suggests a strong commitment to the focal goal and increases motivation to

ensure completion of this highly committed goal by undertaking related and complementary behaviors at the expense of opposing behaviors. This is in line with work by Dreze and Nunes (2006), who found that individuals work harder towards a goal after experiencing initial goal success and Shah et al. (2002) who found that commitment to a focal goal impedes the availability of alternative goals. The resulting dynamic of self-regulation is *highlighting* congruent goal behaviors. An unsuccessful goal behavior, however, indicates a lack of commitment to the goal, bringing into doubt the goal importance, and leads to incongruent goal behaviors becoming more attractive.

In sum, this dual representational framework model of self-regulation states that individuals utilize either a commitment or progress mode when regulating their behavior, which produces opposite effects. After successful initial goal pursuit, commitment-focused individuals adopt a highlighting pattern and are more likely to choose goal congruent behaviors, while progress-focused individuals adopt a balancing pattern and are more likely to choose temptations over focal goal actions. Interestingly, the opposite effects occur when an individual fails at a goal behavior or fails to act upon a goal. Under a mental representation of *progress*, a goal failure signals a discrepancy between the current and desired end states and motivates action on the goal in order to remove the discrepancy (Carver & Scheier, 1998). With a *commitment* frame, however, goal failure indicates a low level of commitment to the goal and individuals are likely to disengage from the goal altogether, leading them to choose other behaviors (Soman & Cheema, 2004).

The research program conducted by Fishbach and colleagues identified many processes and variables that influence the dynamics of self-regulation. These include the following: the impact of initial goal success or failure on subsequent behavior choices (Fishbach et al., 2006; Koo & Fishbach, 2008); the type of feedback that is sought and offered when under commitment or progress framings (Fishbach & Dhar, 2005; Fishbach et al., 2010); pre-existing commitment to a goal (Koo & Fishbach, 2008); focusing on

accomplished goal progress or unaccomplished goal progress (Koo & Fishbach, 2008, 2012); focusing on an abstract or high level goal versus an individual sub-goal or concrete actions (Fishbach et al., 2006); future expectations of goal progress (Zhang et al., 2007); group identification (Koo et al., 2009); the influence of mood attribution towards success or failure of goal attainment (Fishbach & Labroo, 2007); and how presentation format can affect how two behaviors can be perceived (Fishbach & Zhang, 2008)

The dynamics of self-regulation model does not easily fit into other existing models of self-regulation. Cybernetic models of self-regulation (e.g. Carver & Scheier, 1998; Powers, 2005) can explain how progress feedback can prompt action as individuals respond to discrepancies from a reference value (i.e. goal) but have little to say about how the commitment groups perform. The hot/cool system of willpower (Metcalfe & Mischel, 1999) has similar issues in that it can explain the depreciation of incongruent goals in one direction but cannot support the increase in congruent goals. It is difficult to explain how the hot (emotional and impulsive) system can be turned on in one condition and the cold (neutral and reflective) system be turned on in another, and then explain why these systems would switch when faced with negative versus positive initial goal successes. The ego depletion or strength model of self-control (Baumeister et al., 1998; Baumeister & Heatherton, 1996) cannot account for the opposite effects of behavior. Construal level theory (Trope & Liberman, 2010), in simple terms, states that high level or abstract thinking gives rise to better self-control, whereas low level or concrete thinking decrease self-control. This is contradicted by evidence that participants holding abstract goal views or concrete goal views are shown to perform well or poorly simply by providing positive and negative feedback (Fishbach et al., 2006). For these reasons, the Dynamics of Self-Regulation model appears to offer a more complete theory that can be applied to many real-world domains.

5.1.4 The Current Study

Previous research tested several key factors of the Dynamics of Self-Regulation theory (Fishbach & Dhar, 2005; Fishbach & Zhang, 2009; Fishbach et al., 2009), presentation format (presenting choices as competing or complementary), framing cues (questions on commitment or progress and pre-existing goal commitment), feedback cues (initial goal success or failure and unaccomplished or accomplished actions) and focusing on the abstract goal versus concrete plans, and demonstrated that the model could be applied in a clinical domain of PIU showing that intended behaviors for individuals could be primed and influenced (Dunbar et al., 2017, 2018). Dunbar et al. (2017) showed that when temptations (Internet behaviors) and goal congruent actions (academic behaviors) are presented together and appear to *complement* each other, university students value temptations more highly than when the same actions are presented apart and appear to compete against each other. On the other hand, when temptations and goal congruent actions are presented apart and appear to *compete* against each other, university students value goal congruent actions more highly than when the same actions are presented together and appear to complement each other. In three separate studies, Dunbar et al. (2018) showed that various types of processes could induce either a commitment or progress framework in university students. Asking questions about levels of commitment or progress, priming high or low engagement in a goal, and focusing on an abstract (high level) goal versus the concrete steps needed to implement a goal can all induce a commitment or progress framework. Following that, commitment and progress framing leads to opposite valuing of goal congruent (academic) and temptation (Internet) behaviors in success or failure conditions. Students with a commitment framework valued goal (academic) over temptation (Internet) behaviors more than those with a progress framework when positive feedback was received. The opposite effect occurred following negative feedback and progress framed students valued goal (academic) over temptation

(Internet) behaviors more than those with a commitment framework. The current research sets out to expand on those studies by applying the theory to actual behaviors in a real world setting using a randomized controlled trial design. We further extend the previous research by moving from a general population to a specific population of individuals classified with PIU.

A major limitation of randomized controlled trials is the choice of an appropriate control group. Active control groups, rather than wait list groups, are essential to ensure that expectations, motivation, attention, and beliefs do not account for improvements in the experimental condition (Boot et al., 2013; Christensen et al., 2004; Simons et al., 2016). Recent reviews of self-monitoring have found it is an effective behavior change technique across a variety of domains (Harkin et al., 2016; Rose et al., 2017). In order to balance the environments and expectations for both groups an active control group that employed self-monitoring was established.

The aim of this study is to evaluate the effectiveness of an online intervention targeting university students with problematic Internet usage. It was hypothesized that the experimental intervention would be more effective in reducing personal Internet hours compared with an active control group intervention employing self-monitoring. It was also posited that participants in the experimental group would show a greater change in scores on the Internet Addiction Test compared to those in the active control group. Following from this, secondary objectives were created to investigate the effects on some key mental health outcomes that are associated with PIU; namely depression, anxiety, stress and social anxiety (Aboujaoude, 2010; Spada, 2014; Weinstein et al., 2015). It was predicted that the experimental group would see a greater reduction in measures when compared to the active control group. A six-week follow up was conducted to explore any lasting effects of the intervention over time.

5.1.5 Hypotheses

The following hypotheses were generated from the dynamics of self-regulation model and previous research (Dunbar et al., 2017, 2018; Fishbach et al., 2009) :

H1. Participants in the experimental group will have a greater reduction in daily personal Internet (DPI) hours than those in the active control group at the end of the intervention.

H2. Participants in the experimental group will reduce their Internet Addiction Test (IAT) score significantly more than those in the active control group at the end of the intervention.

H3. Participants in the experimental group will reduce their depression score significantly more than those in the active control group at the end of the intervention.

H4. Participants in the experimental group will have a greater reduction in anxiety score than those in the active control group at the end of the intervention.

H5. Participants in the experimental group will reduce their stress score significantly more than those in the active control group at the end of the intervention.

H6. Participants in the experimental group will reduce their social anxiety score significantly more than those in the active control group at the end of the intervention.

H7. Participants in the experimental group will have a greater reduction in daily personal Internet (DPI) hours than those in the active control group at six-week follow up.

H8. Participants in the experimental group will reduce their Internet Addiction Test (IAT) score significantly more than those in the active control group at six-week follow up.

5.2 Method

5.2.1 Design

The study design is a parallel group, 21-day randomized controlled trial (RCT) with a six-week follow up. All participants who met the inclusion criteria were allocated into an intervention or active control group using a block allocation method (Altman & Bland, 1999; Kang et al., 2008) so that the groups never differed by more than two participants. Participants were blind to their group allocation. The primary outcome measures were changes from baseline in self-reported daily personal Internet (DPI) hours and Internet Addiction Test (IAT) scores, and secondary outcomes were changes in self-reported depression, anxiety, stress and social anxiety measures. The study was conducted in accordance with the CONSORT standards (Eysenbach & Group, 2011; Moher et al., 2012) and the flow of participants progress through the phases of the study are shown in Figure

5.1. In order to balance the expectations, motivation, attention, and beliefs for both groups an active control group that employed self-monitoring was established.

5.2.2 Participants and Procedure

Ethical approval was granted by the University's Human Research Ethics Sub-Committee for the School of Psychology. Participants provided consent and were informed that they were free to withdraw at any time. Participants who expressed interest in reducing their daily Internet usage were recruited and needed to meet criteria for having issues regulating their personal Internet time. Further to this, every participant was informed that the study was about determining if people could reduce their personal Internet usage hours. It was therefore assumed that each participant was interested in reducing their personal Internet use and this was a focal goal for them during the study.

Undergraduate and postgraduate University students (N=247; 53% female, 47% male, $M_{age} = 25.01$ year, $SD = 7.88$) were recruited via the University web portal with an advertisement asking for individuals interested in decreasing their amount of personal Internet usage. Individuals who clicked on the link were taken to the screening survey where they were given information relating to the study, were asked for consent, entered demographic information, completed the IAT and gave an estimate of their daily personal Internet hours. Finally, participants were asked if they were interested in undertaking a 21-day study and informed that withdrawal from the study was possible at any time without consequence.

5.2.2.1 Inclusion/Exclusion Criteria

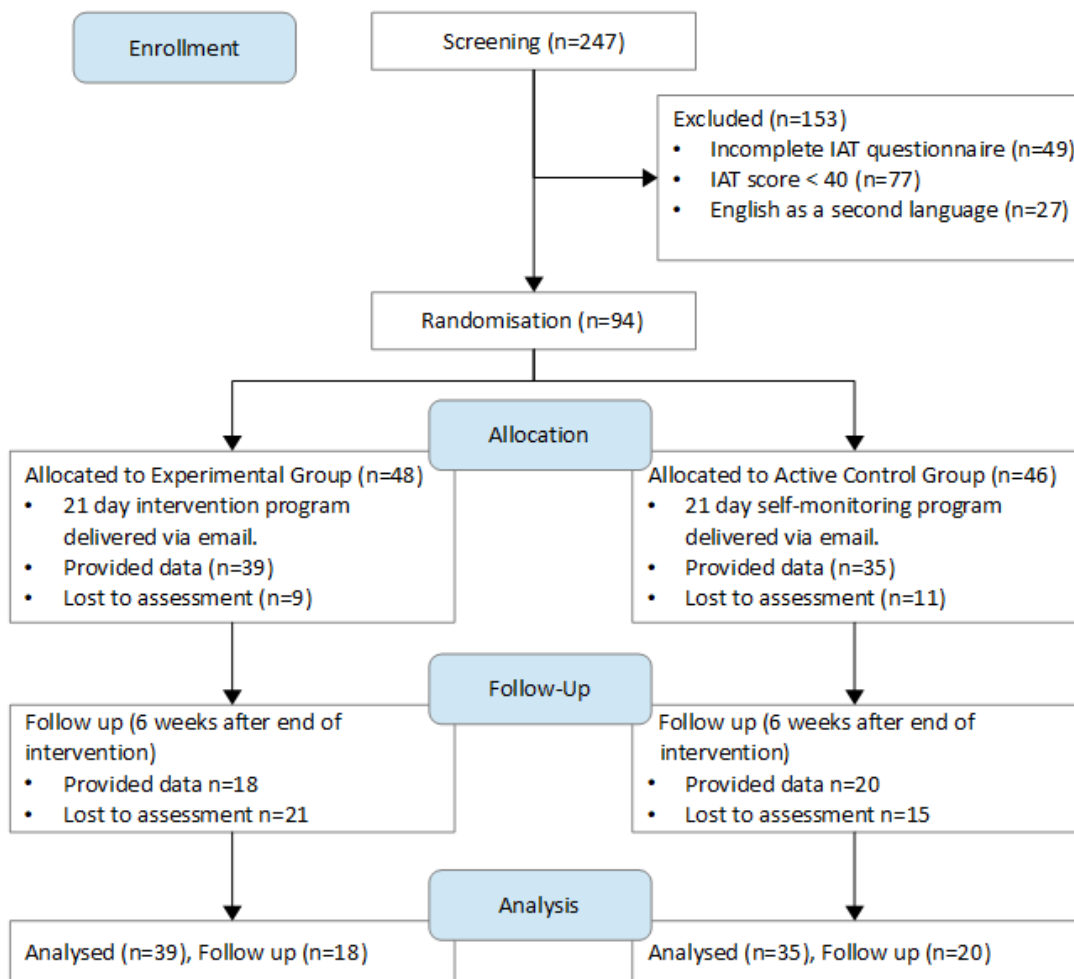
The intervention is designed to target self-regulation functions around personal Internet use. The target population for these behavior changes are individuals who experience difficulties regulating their time on the Internet. Scores of 40-69 on the Internet Addiction Test (IAT) are indicative of individuals who have frequent problems and scores of 70-100 are indicative of significant issues (Kuss & Lopez-Fernandez, 2016; Laconi et

al., 2014). The intervention relies on priming mental representation frameworks via the common understandings and social constructs of the English words *commitment* and *progress* and previous research (Dunbar et al., 2018) has found that this does not occur reliably with participants for whom English is a second language. Therefore, any students for whom English is not their first language were excluded.

Therefore, participants who scored 40 or higher on the IAT, for whom English was not a second language, gave consent and indicated they would be willing to participate in a 21-day study were included in the next phase. All other participants were thanked for their time and not invited into the next phase of the study.

Figure 5.1

Flow of participants (CONSORT flow chart). IAT: Internet Addiction Test.



5.2.2.2 Intervention Phase

A total of 94 participants were randomly allocated to the intervention group or active control group. On day one, participants were welcomed to the study and provided with an incentive of being able to win one of four \$100 gift vouchers if they completed the 21 days in full. Baseline IAT and daily personal Internet hours were collected during the screening phase.

Each day at 7am participants were emailed and asked to report their daily personal Internet hours from the previous day. Participants in the intervention group were given theory driven (Dunbar et al., 2017, 2018; Fishbach & Zhang, 2009; Fishbach et al., 2009) feedback depending on the outcome of the comparison of their last two days personal Internet hours. If there was a reduction in daily personal Internet hours it was considered a *success* and *commitment* feedback was provided. If the value was the same or worse than previously it was considered a *failure* and *progress* feedback was provided. Feedback was constructed using the results from previous research (Dunbar et al., 2017, 2018). Presentation format (presenting choices as competing or complementary), framing cues (questions on commitment or progress and pre-existing goal commitment), feedback cues (initial goal success or failures and unaccomplished or accomplished actions) and focusing on the abstract goal versus concrete plans were combined to form the feedback provided to participants in the experimental group (Dunbar et al., 2017, 2018; Fishbach & Dhar, 2005; Fishbach et al., 2006; Fishbach & Zhang, 2008; Koo & Fishbach, 2008; Zhang et al., 2007). It can be noted that the feedback cue of focusing on accomplished or unaccomplished actions performs like positive or negative feedback and the study design used participants' actual positive or negative performance to generate this feedback. Therefore, that component was redundant in the design and in order to reduce the risk on introducing a possible confounding variable, it was not used in the intervention.

Examples of commitment feedback are “Congratulations. Your *commitment* to reduce your Internet usage is evident.”, “After the success of the previous day, how *committed* do you feel to your goal to reduce your personal Internet usage?” and “Consider when faced with a dilemma whether to use the Internet for personal use, you can use the Internet for personal use OR do something much more productive”. Progress feedback was similar except delivered for a failure condition. Examples of progress feedback are “Your results indicate you failed to *progress* towards your goal to reduce your personal Internet usage. This indicates that improvement is required.” and “How much *progress* towards your goal do you feel you have made after the disappointment of yesterday?”. In order to prevent repetition and participants discovering the theory, four variations of each feedback scenario of commitment and progress conditions were created and randomly selected for each participant on each occasion.

Participants in the active control group were given self-monitoring feedback which included showing them their hours for the last two days. Again, four versions were created and randomly presented to each participant. Examples of self-monitoring feedback are “Yesterday you spent XXX hours on personal Internet usage while the day before you spent XXX hours on the Internet for personal use.” and “After the results of yesterday, how much motivation towards pursuing your goal do you feel?” The text presented to the experimental and active control groups were approximately equal in length.

On days 1, 7, 14 and 21 of the 21-day intervention, the Depression, Anxiety and Stress Scale (DASS-21), Social Interaction Anxiety Scale (SIAS-6) and Social Phobia Scale (SPS-6) were administered. On the final day (day 21) the IAT was also administered. On the final day, participants were thanked for their time and informed that they would be contacted in 6 weeks’ time for a final follow-up.

5.2.2.3 *Six-Week Follow-Up*

For the follow up phase, daily personal Internet hours, DASS-21, SIAS-6, SPS-6, and the IAT scales were all collected at six weeks from the final day of the intervention phase. A six-week period was chosen due to limited project resources and to fit with the University calendar. In order to maximize the likelihood of participant adherence and to keep the conditions as similar as possible it was decided to fully conduct the study during a semester to ensure participants were not busy with exam preparations or on holiday for the final follow up. Participants were again thanked for their time and informed that they would not need to be contacted again.

5.2.3 *Materials*

On each morning of the study, participants self-reported their daily personal Internet (DPI) hours for the previous day. Participants were explicitly instructed to exclude time spent on the Internet for academic or work purposes.

A recent meta-analysis identified there have been at least 45 different measures developed and employed in Internet use research which has led to issues when to aggregating research across studies (Laconi et al., 2014; Tokunaga & Rains, 2016). In order to limit this possibility we have chosen to use the Internet Addiction Test (IAT; Young, 1998a) which is a widely accepted and validated tool and provides cut off scores distinguishing individuals with problematic Internet usage from those without (Kuss & Lopez-Fernandez, 2016; Pontes et al., 2016; Škařupová et al., 2015; Weinstein et al., 2014). The IAT has excellent internal consistency with Cronbach's alpha typically above 0.90 across studies, has good to excellent concurrent validity with many other PIU scales, and has convergent validity with time spent online (Laconi et al., 2014). The IAT is a self-report 20-item scale using a five-point Likert scale ranging from 1 ("Rarely") to 5 ("Always"). Scores of 20-39 indicate normal Internet use, whereas scores of 40-69 indicate

frequent problems and scores of 70-100 indicate significant problems with Internet usage (Kuss & Lopez-Fernandez, 2016; Laconi et al., 2014).

The IAT is not without criticisms as it can sometimes tend to over pathologize internet use, lacks any items to measure craving, and there is debate about different cut-off scores (D. King et al., 2020; D. L. King et al., 2020; Rothen et al., 2018).

Depression Anxiety and Stress Scale (DASS-21) (Osman et al., 2012) is a set of three self-report scales designed to measure the negative emotional states of depression, anxiety and stress. Each of the three DASS-21 scales contains 7 items. Participants are asked to use 4-point severity/frequency scales to rate the extent to which they have experienced each state over the past week. The total scale score has been normed with an adult population, has very good internal consistency and construct validity (Henry & Crawford, 2005). The DASS-21 does not provide a clinical diagnosis but rather a quantitative assessment along the three axes of depression, anxiety and stress.

The short form Social Interaction Anxiety Scale (SIAS-6) and Social Phobia Scale (SPS-6) are companion scales that are commonly used in research on social anxiety (Peters et al., 2012). The SIAS-6/SPS-6 measures social anxiety symptoms on 5-point scale with subjects indicating the degree to which they feel the statements are characteristic of themselves from not at all (0 score) to extremely (4 score). Scores ≥ 7 on the SIAS-6 and ≥ 2 on the SPS-6 are associated with a social anxiety disorder diagnosis. The 12 question short form has been demonstrated to have good consistency and validity, and their diagnostic sensitivity makes them a good screening tool for social phobia (Le Blanc et al., 2014; Peters et al., 2012).

5.2.4 Statistical Methods

A linear mixed effects model was constructed to assess the effect of the intervention on daily personal Internet hours. A linear mixed effects model gives more statistical power than other techniques such as ANCOVA, can handle unbalanced

longitudinal data, is better equipped to accommodate instances where some participants are missing values at the various time-points at which the data was collected, and results in minimal loss of information as every PIU value recorded for every participant contributes to the analysis (Egbewale et al., 2014; Magezi, 2015; Meteyard & Davies, 2020; O'Connell et al., 2017).

Analysis of covariance (ANCOVA) was used to assess the effect of the intervention on Internet Addiction Test (IAT) scores, controlling for pre-intervention IAT score. The effect was also adjusted for age and gender. Estimates of adjusted mean post-intervention IAT scores for each group were obtained from the model post-hoc.

The Depression, Anxiety, Stress, and Social Anxiety instruments were administered at 4 time-points throughout the intervention period (on days 1, 7, 14 and 21). Linear mixed-effects models were used to assess the effects of the intervention on each of the outcomes of depression, stress, anxiety and social anxiety. Entered as fixed factors were condition (experimental or control), time (in days, analyzed as a continuous measure) and a condition-by-time interaction, in addition to age and gender. A random effect (random intercept) for participant was specified to account for repeated measurements from the same participant. For each outcome, differences between groups at Day 21 were investigated post-hoc. For the follow-up phase, daily personal Internet hours, DASS-21, SIAS-6, SPS-6, and the IAT scales were all collected six-weeks from the end of the intervention. In order to allow for attrition rates, linear mixed-effects models were used to assess if any intervention effects were carried through to post 6-week follow up. The model was constructed to control for baseline values, as well as age and gender.

All statistical analyses were conducted using Stata (StataCorp. 2017. Stata Statistical Software: Release 15. College Station, TX: StataCorp LLC.). The level of statistical significance was set at 0.05.

5.2.5 Power Analysis

A priori power analysis was carried out before data collection to determine required sample sizes and based on previous research (e.g. Dunbar et al., 2017, 2018; Fishbach & Dhar, 2005) a moderate effect size of 0.60 was used. The required sample sizes were computed using the GPower computer program (Faul et al., 2007) with α of 0.05, moderate effect size, and power of .80 resulting in an estimated 90 participants in total or 45 per group.

5.3 Results

The final sample entering the experiment comprised $n=74$ participants. Participant characteristics by intervention group are summarized in Table 5.1. No differences were found between experimental and active control groups on Phase 1 (Baseline) IAT scores, $t(72) = 1.20, p = 0.23, 95\% \text{ CI} [-6.99, 1.73], \text{Cohen's } d = 0.27$, Phase 1 (Baseline) daily personal Internet (DPI) Hours, $t(72) = 0.48, p = 0.63, 95\% \text{ CI} [-0.70, 1.14], \text{Cohen's } d = 0.11$, Day-1 DPI hours, $t(57) = 0.47, p = 0.64, 95\% \text{ CI} [-0.73, 1.17], \text{Cohen's } d = 0.12$, Day-1 Depression $t(49) = 0.48, p = 0.63, 95\% \text{ CI} [-2.56, 1.56], \text{Cohen's } d = 0.14$, Day-1-21 Anxiety $t(49) = 0.48, p = 0.31, 95\% \text{ CI} [-0.75, 2.35], \text{Cohen's } d = 0.29$, Day-1 Stress $t(49) = 1.19, p = 0.24, 95\% \text{ CI} [-0.85, 3.33], \text{Cohen's } d = 0.33$, or Day-1 Social Anxiety $t(47) = 0.79, p = 0.43, 95\% \text{ CI} [-3.35, 7.69], \text{Cohen's } d = 0.23$.

Table 5.1*Baseline participant characteristics by intervention group*

	Experimental Group			Self-Monitoring Group		
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>
Age in years	39	25.30	6.90	35	23.90	7.40
Gender (n, %)						
Male	18 (46.15)			15 (42.86)		
Female	21 (53.85)			20 (57.14)		
Phase 1 IAT score	39	51.08	8.15	35	53.71	10.60
Phase 1 DPI hours	39	5.85	1.80	35	5.63	2.16
Day 1 DPI hours	33	4.20	1.88	26	3.98	1.70
Day 1 DASS-21	25			26		
Depression		5.80	2.80		6.30	4.40
Anxiety		5.20	3.00		4.40	2.50
Stress		8.32	3.91		7.08	3.52
Day 1 Social Anxiety	25	15.96	9.76	24	13.79	9.45

IAT: Internet Addiction Test, **DPI hours:** daily personal Internet hours

5.3.1 Primary Outcomes

Participant characteristics at baseline were summarized using frequencies and percentages for categorical variables, and means and standard deviations for continuously-measured variables. The effect of the experiment on daily personal Internet hours (DPI) over the 21-day intervention period was assessed using linear mixed-effects modelling. Random intercepts were specified to account for the dependency of repeated DPI measurements from the same participant. As mixed effects models can handle unbalanced longitudinal data, all participants who recorded DPI on at least one occasion were included in the model. The model included fixed effects for time (in days; analyzed continuously), condition (experimental or active control) and a condition-by-time interaction to determine if the change in DPI hours over time differed according to intervention group. Age and gender were included as adjustment factors. Differences in adjusted mean DPI hours between groups at Day 21 were assessed post-hoc.

On each of the 21 days of the intervention, participants were asked to report the number of DPI hours for the previous day. The mean reported DPI hours, at each time-point, for each group, are reported in Table 5.2 and illustrated graphically in Figure 5.2.

DPI hours were measured on 21 occasions. Not all participants recorded DPI at every time point. Table 5.3 reports the distribution of number of DPI values reported per participant, for each group and overall. The number of DPI values recorded per participant ranged from 0 (n=1 participant) to 21 (complete DPI data, n=17 participants).

Table 5.2

Mean Daily Personal Internet (DPI) hours each day by intervention group

Day	Experimental Group			Self-Monitoring Group		
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>
1	33	4.2	1.9	26	4.0	1.7
2	35	4.0	2.2	29	3.7	1.7
3	24	4.1	2.3	26	4.2	1.9
4	24	4.2	2.1	26	4.3	2.2
5	28	3.4	2.1	26	4.1	2.2
6	33	3.5	2.3	25	3.3	1.8
7	33	3.2	2.3	25	3.2	2.1
8	28	3.3	1.8	23	3.1	1.7
9	26	3.1	1.7	24	3.0	1.8
10	25	3.1	2.2	26	3.3	1.5
11	24	2.7	2.3	24	3.6	1.9
12	26	3.0	2.2	27	3.9	2.2
13	23	3.0	1.6	27	3.3	2.2
14	27	2.9	2.0	25	3.6	1.6
15	22	2.6	2.0	25	3.4	1.6
16	24	3.0	2.4	24	3.7	2.1
17	26	3.1	2.0	24	3.4	1.6
18	20	3.2	2.1	21	4.1	2.2
19	20	3.6	2.8	23	3.2	2.2
20	24	2.4	1.5	23	3.5	2.2
21	24	2.4	1.5	24	3.4	2.1

Figure 5.2

Mean reported Daily Personal Internet (DPI) hours at each day by intervention group

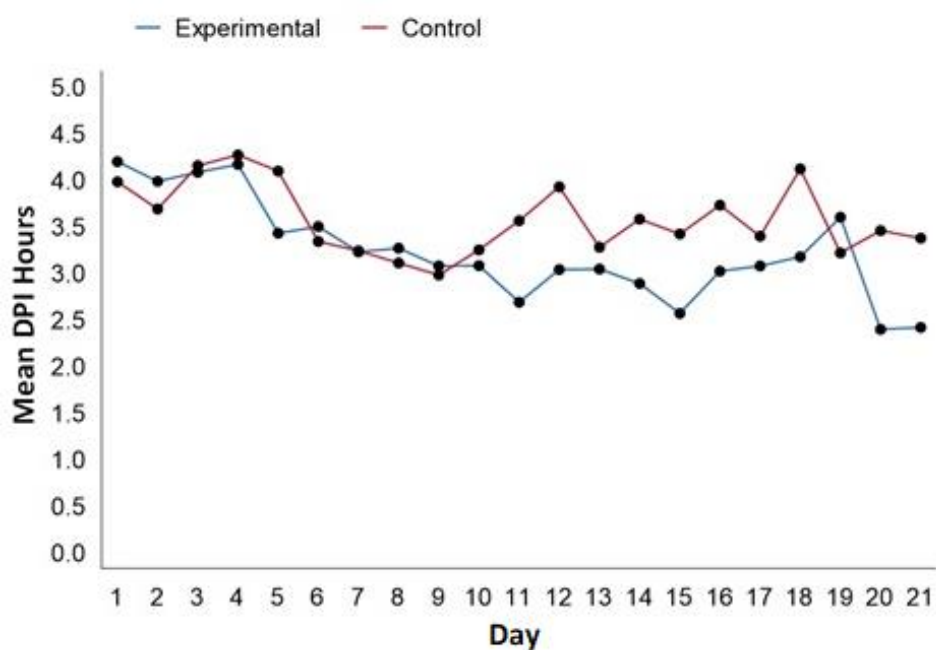


Table 5.3

Number of Daily Personal Internet (DPI) Hours values recorded per participant, by intervention group and overall

Number of DPI values recorded	Experimental Group (n=39)		Self-Monitoring Group (n=35)		Overall (n=74)	
	<i>Frequency</i>	<i>(%)</i>	<i>Frequency</i>	<i>(%)</i>	<i>Frequency</i>	<i>(%)</i>
0	0	(0.00)	1	(2.86)	1	(1.35)
1	1	(2.56)	2	(5.71)	3	(4.05)
2	3	(7.69)	2	(5.71)	5	(6.76)
3	1	(2.56)	2	(5.71)	3	(4.05)
4	1	(2.56)	0	(0.00)	1	(1.35)
5	2	(5.13)	0	(0.00)	2	(2.70)
6	0	(0.00)	0	(0.00)	0	(0.00)
7	0	(0.00)	0	(0.00)	0	(0.00)
8	2	(5.13)	1	(2.86)	3	(4.05)
9	3	(7.69)	0	(0.00)	3	(4.05)
10	0	(0.00)	0	(0.00)	0	(0.00)
11	0	(0.00)	0	(0.00)	0	(0.00)
12	0	(0.00)	2	(5.71)	2	(2.70)
13	2	(5.13)	1	(2.86)	3	(4.05)
14	0	(0.00)	1	(2.86)	1	(1.35)
15	2	(5.13)	2	(5.71)	4	(5.41)
16	0	(0.00)	0	(0.00)	0	(0.00)
17	3	(7.69)	0	(0.00)	3	(4.05)
18	3	(7.69)	3	(8.57)	6	(8.11)
19	6	(15.38)	2	(5.71)	8	(10.81)
20	3	(7.69)	6	(17.14)	9	(12.16)
21	7	(17.95)	10	(28.57)	17	(22.97)

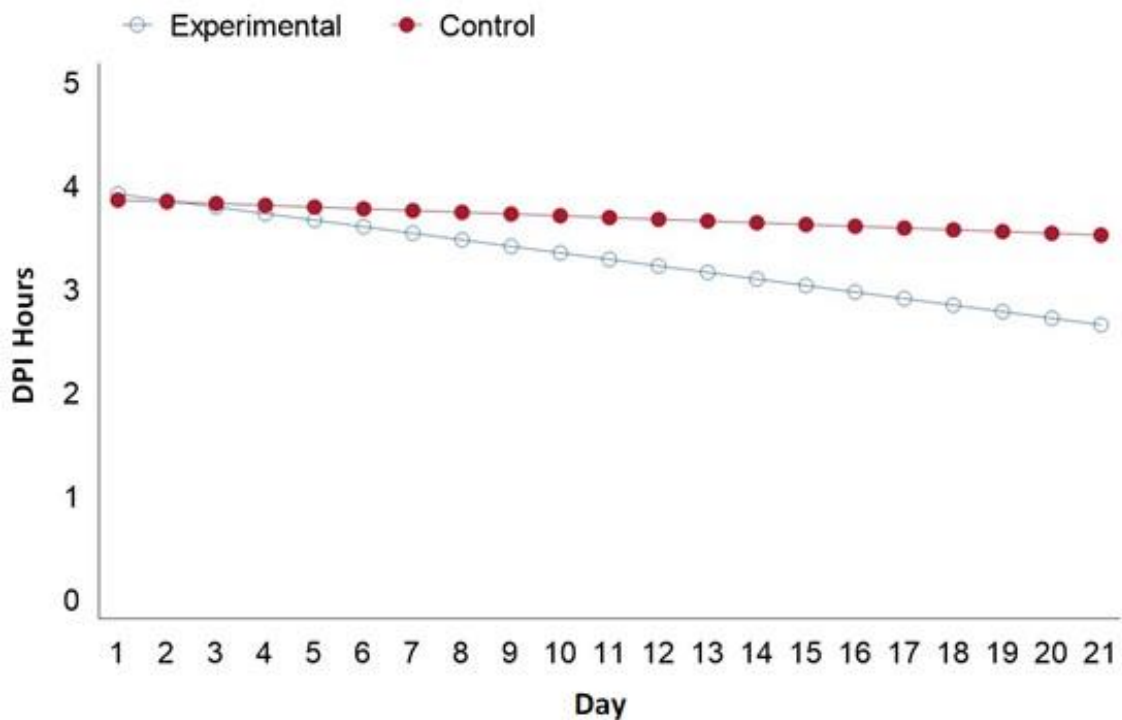
The model's main fixed factor was the intervention condition: Experimental or Active Control. Figure 5.2 shows that DPI hours in both groups changed over time. In order to disentangle the effect of time from each group on the DPI hours effect, time was added as an interaction effect. Age and gender were also set as fixed effects in the model. To account for repeated measures participants were modelled as a random effect.

The estimated change in DPI hours over the 21 days as predicted by the model are presented in Figure 5.3. For the experimental group, PIU decreases by 0.063 hours per

day, $p < .0001$, whereas the active control group PIU decreases by 0.017 hours per day, $p = 0.133$.

Figure 5.3

Predictive Margins of Condition: the estimated change in Daily Personal Internet (DPI) hours controlling for the effects of age, gender and time.



In order to determine if there is a difference between the slopes, the interaction term, time by group, was examined. The coefficient for the interaction term is -0.046 , $p = 0.003$, meaning that on average, relative to the active control group, PIU hours decreased by 0.046 hours per day. In other words, DPI hours decreased by an extra 0.046 hours per day in the experimental group compared to the active control group, 95% CI [0.015, 0.077]. This supports Hypothesis 1 that the change in PIU over time is significantly greater in the experimental group relative to the active control group.

The size of the difference in DPI hours between groups at any particular time point was also examined. Table 5.4 shows the estimated mean DPI hours by day for each group and the difference between the groups by day.

Figure 5.4 shows the marginal effect of the experimental condition at each day. The y-axis describes DPI hours in the experimental group relative to the active control group. Negative values mean lower DPI hours in the Experimental group relative to active control. Positive values mean higher DPI hours in the Experimental group relative to active control. A value of zero indicates no difference in DPI hours between groups.

As predicted, the difference between groups increases over time and the gap widens as the intervention continues. For example, at Day 2, the difference in groups is almost negligible and DPI hours are 0.012 hours higher in the Experimental group relative to the active control group, a difference of approximately about 42 seconds, $p = 0.98$. As the intervention continues, though, the gap widens and by Day 21, DPI hours are on average 52 minutes (0.87 hours) lower in the Experimental group relative to the control group, $p = 0.026$, indicating there is evidence against the null hypothesis of no difference between groups. This also shows support for Hypothesis 1.

Table 5.4

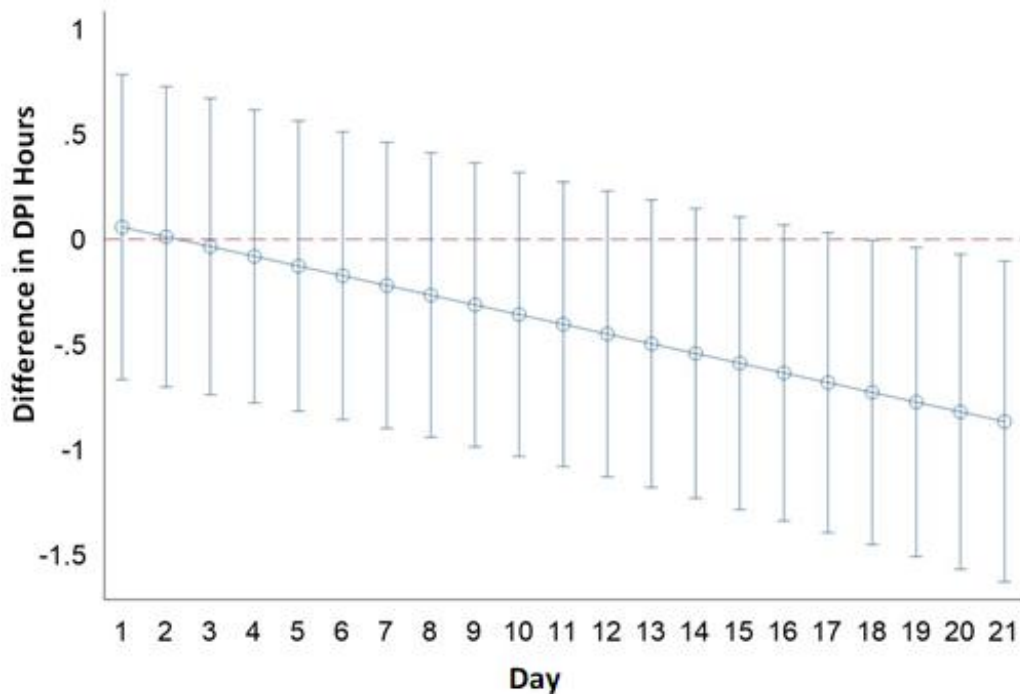
Estimated Mean Group Daily Personal Internet (DPI) hours and Differences at each Day, adjusted for Age and Gender.

Day	Estimated DPI Hours by Group				DPI Hours difference between groups		
	Experimental		Active Control		Difference	95% CI	p-value
	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>			
1	3.89	(0.25)	3.89	(0.27)	0.06	[-0.67, 0.78]	0.876
2	3.83	(0.25)	3.87	(0.27)	0.01	[-0.70, 0.73]	0.975
3	3.77	(0.24)	3.85	(0.26)	-0.03	[-0.74, 0.67]	0.923
4	3.70	(0.24)	3.84	(0.26)	-0.08	[-0.78, 0.62]	0.820
5	3.64	(0.24)	3.82	(0.26)	-0.13	[-0.82, 0.56]	0.718
6	3.58	(0.24)	3.80	(0.25)	-0.17	[-0.86, 0.51]	0.620
7	3.52	(0.24)	3.78	(0.25)	-0.22	[-0.90, 0.46]	0.527
8	3.45	(0.23)	3.77	(0.25)	-0.27	[-0.94, 0.41]	0.442
9	3.39	(0.23)	3.75	(0.25)	-0.31	[-0.99, 0.36]	0.365
10	3.33	(0.23)	3.73	(0.25)	-0.36	[-1.03, 0.32]	0.299
11	3.26	(0.24)	3.72	(0.25)	-0.40	[-1.08, 0.27]	0.241
12	3.20	(0.24)	3.70	(0.25)	-0.45	[-1.13, 0.23]	0.194
13	3.14	(0.24)	3.68	(0.25)	-0.50	[-1.18, 0.19]	0.154
14	3.07	(0.24)	3.67	(0.26)	-0.54	[-1.23, 0.15]	0.122
15	3.01	(0.24)	3.65	(0.26)	-0.59	[-1.29, 0.11]	0.097
16	2.95	(0.25)	3.63	(0.26)	-0.64	[-1.34, 0.07]	0.077
17	2.88	(0.25)	3.62	(0.26)	-0.68	[-1.40, 0.03]	0.061
18	2.82	(0.25)	3.60	(0.27)	-0.73	[-1.45, 0.004]	0.049
19	2.76	(0.26)	3.58	(0.27)	-0.77	[-1.51, -0.04]	0.039
20	2.69	(0.26)	3.56	(0.28)	-0.82	[-1.57, -0.07]	0.032
21	2.63	(0.27)	3.55	(0.28)	-0.87	[-1.63, -0.10]	0.026

Figure 5.4

Average Marginal Effects of Experimental Condition Compared to Active Control

Condition 95% Confidence Intervals



IAT data was measured at two time-points, namely baseline (pre-intervention) and Day 21 (post-intervention). Table 5.1 shows that the two groups differed slightly, but not significantly, with respect to their baseline IAT scores, as well as age and gender.

ANCOVA with the post measurement as the response variable, adjusting for the pre-intervention measurement is generally regarded as the preferred method of analysis for pre-post-intervention measurement data. In particular, ANCOVA estimates will remain unbiased in the presence of baseline imbalance (Egbewale et al., 2014; O'Connell et al., 2017). The outcome is IAT score at Day 21 and the predictors of interest are condition, age and gender. It was expected that IAT scores at baseline would be strongly associated with IAT scores at Day 21, so it was included as a predictor as well.

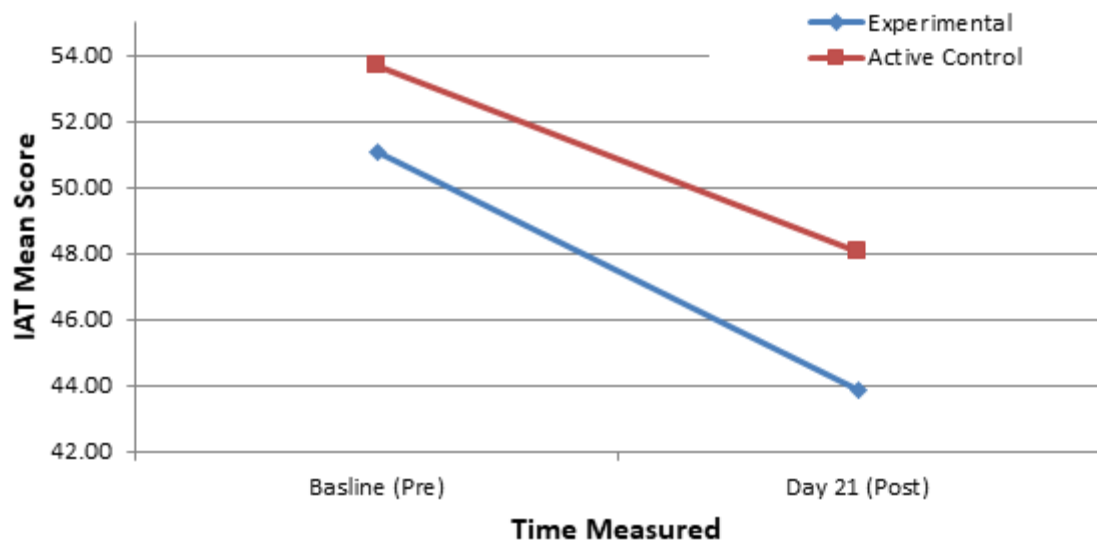
Results indicated that there was a collective significant effect between baseline IAT, intervention condition, gender, and age, $F(4, 60) = 12.76, p < .0001, R^2 = 0.46$. As expected, baseline IAT score, $t(64) = 6.14, p < 0.001, 95\% \text{ CI } [0.41, 0.80]$ was a

significant predictor in the model. Intervention group was examined and also found to be a significant predictor, $t(64) = -2.39, p = 0.02, 95\% \text{ CI } [-7.71, -0.68]$. Its coefficient in the model is -4.20 , indicating that on average the Experimental Group scores for IAT were 4.20 units lower than that of the Active Control Group. Data were controlled for age and gender. This gives support for Hypothesis 2 that participants in the Experimental Group will have a lower IAT score than those in the Active Control Group at the end of Day 21. Figure 5.5 displays Pre and Post IAT scores for Experimental and Active Control groups and shows that both groups demonstrated a reduction in IAT scores across the intervention.

Scores in the IAT at Day-21 indicated that 19 of the participants, 13 (33.3%) from the experimental group and 6 (17.1%) from the self-monitoring active control group, had reduced their scores to be below the frequent to significant problem ranges and were now in the normal Internet use range.

Figure 5.5

Pre (Baseline) and Post (Day 21) IAT scores by intervention group.



5.3.2 Secondary Outcomes

The DASS 21 and Social Anxiety measures were administered on Days 1, 7, 14 and 21. Scores and descriptive statistics for each subscale, at each time-point are summarized in Table 5.5, Table 5.7, Table 5.9, and Table 5.11.

Not all participants recorded DASS 21 and/or Social Anxiety measures at every time point. For example, just 39 out of 74 participants (53%) have complete responses recorded for both Day 1 and Day 21. To assess the effect of the intervention on DASS 21 and Social Anxiety measures a linear mixed effects model was constructed.

A mixed model for effect of condition on Depression sub-scale score, controlling for age and gender was constructed. The interaction between condition and day (-0.06) was not significant, $p = 0.218$, 95% CI [-0.15, 0.03], meaning that the change in depression scores over time does not significantly differ between the experimental and active control groups. The model was used to estimate slopes for each group and is shown in Figure 5.6. For the experimental group, depression scores decreased by -0.031, $p = 0.35$, 95% CI [-0.10, 0.03] while the scores increased in the active control group by 0.027, $p = 0.41$, 95% CI [-0.38, 0.93]. Both these results are non-significant and therefore offer no support for Hypothesis 3.

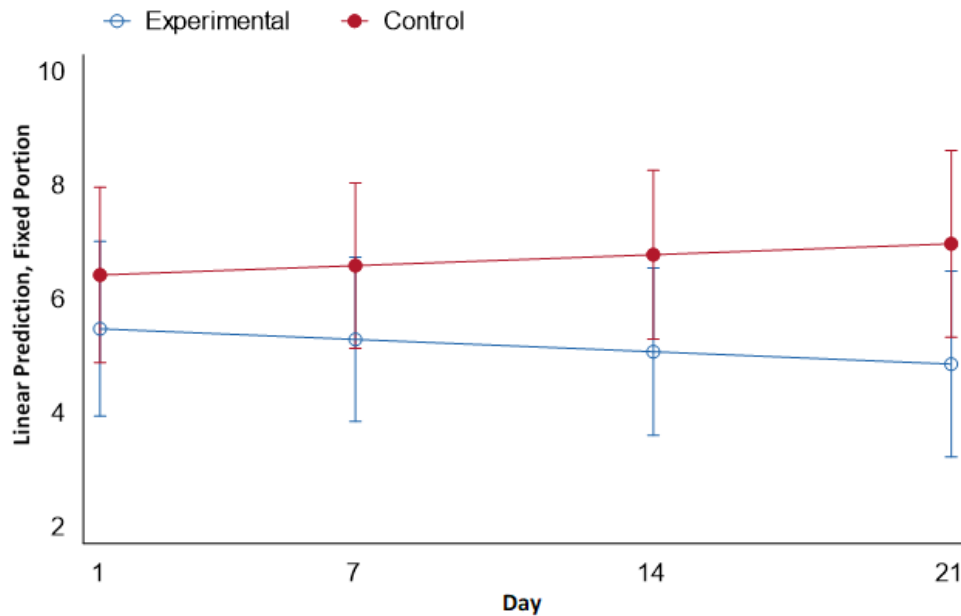
Table 5.5

DASS-21 Depression Descriptive Statistics

Day	DASS-21 Depression Subscale Score					
	Experimental Group			Active Control Group		
	N	M	SD	N	M	SD
1	25	5.8	(2.8)	26	6.3	(4.4)
7	21	5.0	(3.7)	18	6.2	(4.4)
14	21	4.8	(3.6)	17	6.5	(5.4)
21	19	5.2	(3.8)	20	6.6	(4.7)

Figure 5.6

Depression predictive margins of conditions with 95% Confidence Intervals.



The size of the difference in Depression scores between groups at any particular time point was also examined. Table 5.6 shows the estimated mean Depression scores by time point for each group and the difference between the groups by day. While the values do appear to be heading in the predicted direction, it can be noted that at no point are the differences in Depression scores statistically significant and the relatively wide confidence intervals indicates that there is little information that can be derived confidently from the results. This adds to the finding of no effect on Depression scores between groups. However, at Day 21 of the intervention depression scores were, on average, 2.11 units lower in the experimental group relative to the control group. An inspection of the 95% CI reveals clinically-relevant reductions in favor of the experimental group in the order of 3 to 4 units cannot be ruled out.

Table 5.6

Estimated Mean Depression Scores and Differences at each Day, adjusted for Age and Gender.

Day	Estimated Depression Scores by Group				Between groups difference		
	Experimental		Active Control		Difference	95% CI	p-value
	M	SE	M	SE			
1	5.48	0.78	6.42	0.79	-0.95	[-3.12, 1.23]	0.39
7	5.29	0.74	6.59	0.74	-1.29	[-3.34, 0.75]	0.22
14	5.08	0.75	6.78	0.76	-1.70	[-3.79, 0.38]	0.11
21	4.86	0.83	6.97	0.84	-2.11	[-4.43, 0.20]	0.07

A mixed model for effect of condition on Anxiety sub-scale score, controlling for age and gender was constructed. The interaction between condition and day (-0.05) was not significant, $p = 0.201$, 95% CI [-0.12, 0.02], meaning that the change in anxiety scores over time does not significantly differ between the experimental and active control groups.

The model was used to estimate rates of change slopes for each group and is shown in Figure 5.7. For the experimental group, anxiety scores decrease by 0.073 units (on average) per day, $p = 0.007$, 95% CI [-0.12, -0.2], a significant change. However, given a change in bands across the anxiety sub scale is 3 whole units, a change of 0.07 is not likely to be clinically significant. In the active control group, anxiety scores decrease by 0.024 units per day (on average), $p = 0.375$, 95% CI [-0.07, 0.03], which is not statistically significant. Overall, this offers mixed and limited support for hypothesis 4.

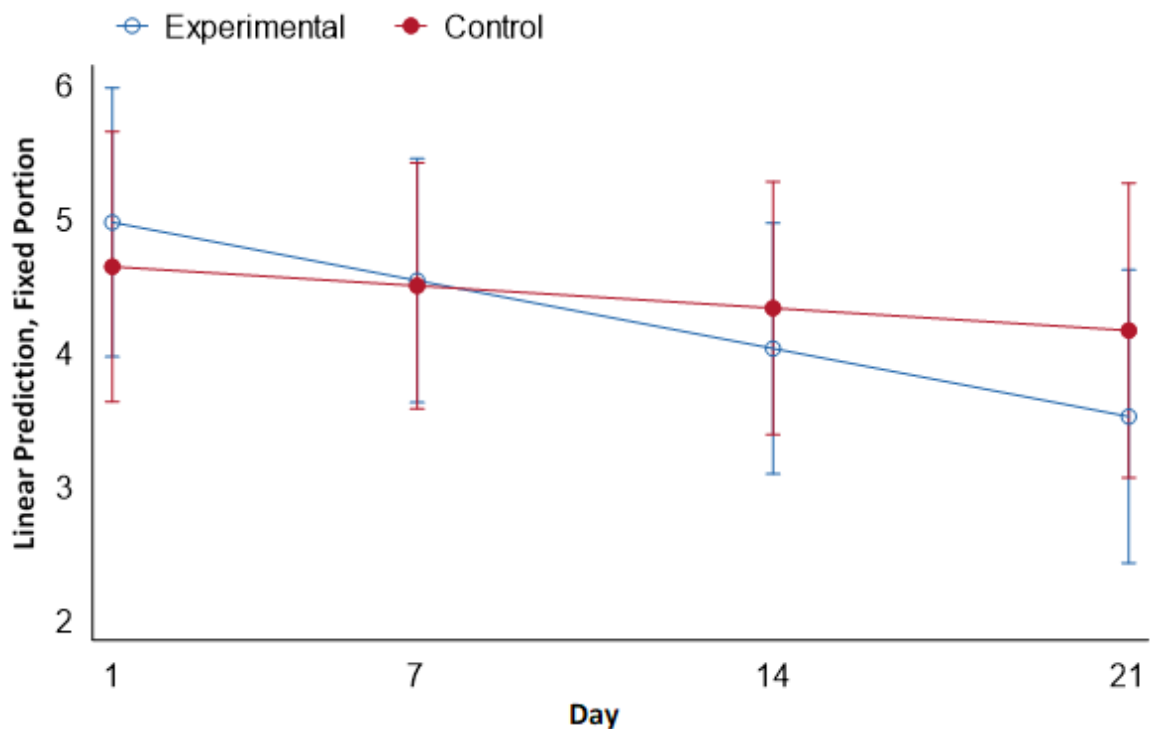
Table 5.7

DASS-21 Anxiety Descriptive Statistics

Day	DASS-21 Anxiety Subscale Score					
	Experimental Group			Active Control Group		
	N	M	SD	N	M	SD
1	25	5.2	(3.0)	26	4.4	(2.5)
7	21	4.4	(2.9)	18	4.7	(2.8)
14	21	3.9	(2.4)	17	4.4	(2.6)
21	19	3.8	(2.1)	20	4.0	(3.5)

Figure 5.7

Anxiety predictive margins of conditions with 95% Confidence Intervals.



The size of the difference in Anxiety scores between groups at any particular time point was also examined. Table 5.8 shows the estimated mean Anxiety scores by time point for each group and the difference between the groups by day.

Table 5.8

Estimated Mean Anxiety Scores and Differences at each Day, adjusted for Age and Gender.

Day	Estimated Anxiety Scores by Group				Between groups difference		
	Experimental		Active Control		Difference	95% CI	p-value
	M	SE	M	SE			
1	4.97	0.51	4.64	0.52	0.33	[-1.09, 1.75]	0.65
7	4.54	0.46	4.50	0.47	0.04	[-1.25, 1.33]	0.86
14	4.03	0.48	4.33	0.48	-0.30	[-1.63, 1.02]	0.66
21	3.52	0.56	4.17	0.56	-0.64	[-2.19, 0.91]	0.42

Even though anxiety scores are decreasing in the Experimental group, the difference between this rate of change and the rate of the change in the control group is not

significant. Even after 21 days of intervention, the difference in anxiety scores between the experimental group (adjusted mean = 3.52) and the active control group (adjusted mean = 4.17) is not statistically significant (difference = 0.643, $p = 0.417$).

A mixed model for effect of condition on Stress sub-scale score, controlling for age and gender was constructed. The interaction between condition and day (-0.16) was significant, $p < 0.0001$, 95% CI [-0.255, -0.08], meaning that the change in stress scores over time does significantly differ between the experimental and active control groups.

The model was used to estimate slopes for each group and is shown in Figure 5.8. It can be seen that the slope in the experimental group decreasing and the results indicate just that with the experimental group slope = -0.14, $p < 0.0001$, 95% CI [-0.20, -0.08]. The active control group scores appear relatively stable over time with slope = 0.022, $p = 0.45$, 95% CI [-0.04, 0.08]. This offers support for Hypothesis 5.

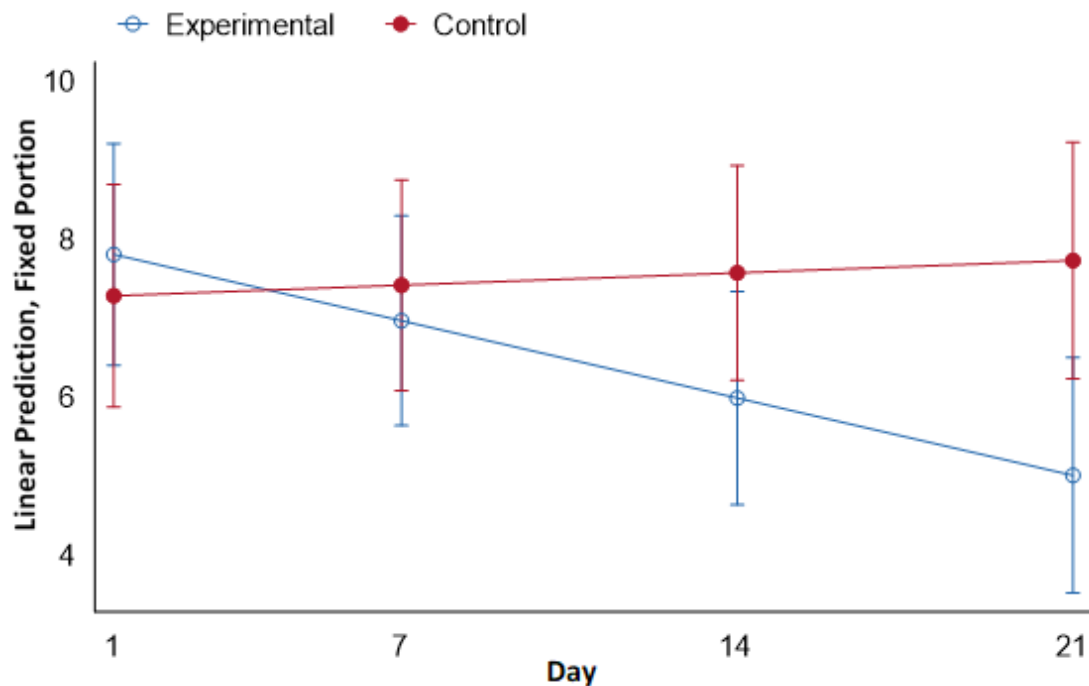
Table 5.9

DASS-21 Stress Descriptive Statistics

Day	DASS-21 Stress Subscale Score					
	Experimental Group			Active Control Group		
	N	M	SD	N	M	SD
1	25	8.3	(3.9)	26	7.1	(3.5)
7	21	6.6	(3.9)	18	7.7	(3.6)
14	21	5.9	(3.5)	17	7.1	(3.5)
21	19	5.7	(4.0)	20	7.2	(4.7)

Figure 5.8

Stress predictive margins of conditions with 95% Confidence Intervals.



The size of the difference in Stress scores between groups at any particular time point was also examined. Table 5.10 shows the estimated mean Stress scores by time point for each group and the difference between the groups by day. Figure 5.9 shows the marginal effect of the experimental condition at each time point. While the values appear to be heading in the predicted direction, it can be noted that at no point are the differences in Stress scores statistically significant and the relatively wide confidence intervals indicates that there is little information that can be derived confidently from the results.

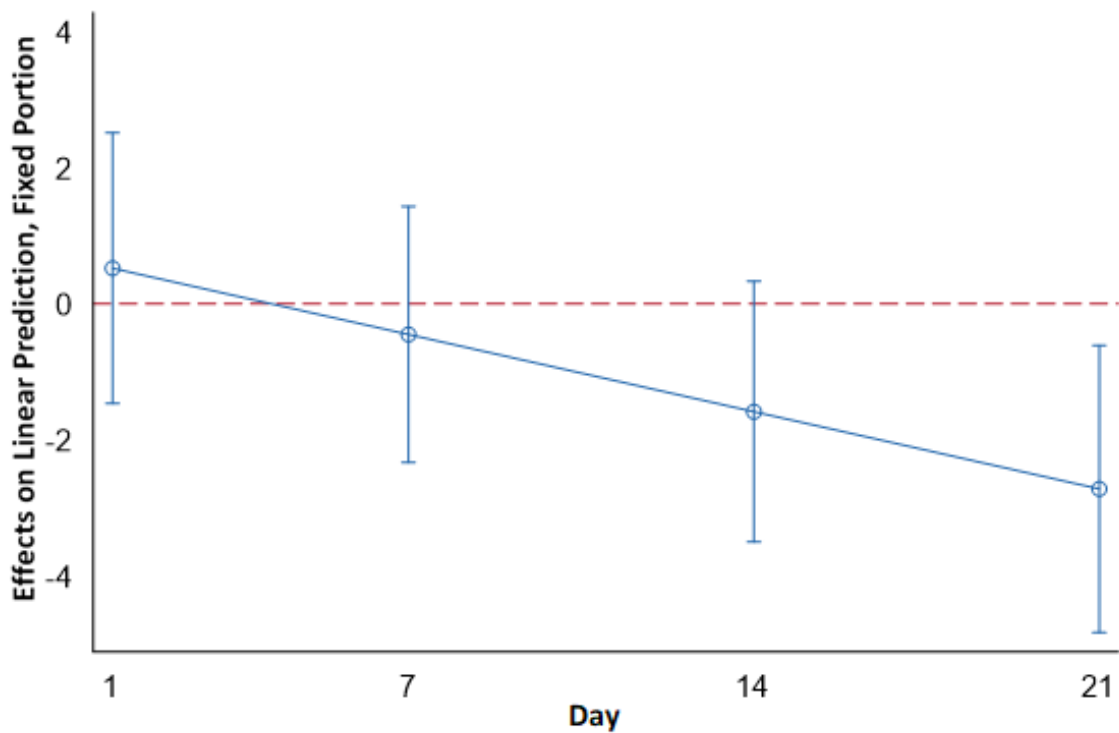
Table 5.10

Estimated Mean Group PIU hours and Differences at each Day, adjusted for Age and Gender.

Day	Estimated PIU Hours by Group				PIU between groups difference		
	Experimental <i>M</i>	<i>SE</i>	Active Control <i>M</i>	<i>SE</i>	<i>Difference</i>	<i>95% CI</i>	<i>p-value</i>
1	7.80	0.72	7.28	0.72	0.52	[-1.47, 2.52]	0.61
7	6.96	0.68	7.41	0.68	-0.45	[-2.33, 1.43]	0.64
14	5.98	0.69	7.57	0.69	-1.59	[-3.50, 0.33]	0.11
21	5.00	0.76	7.72	0.76	-2.72	[-7.83, -0.61]	0.01

Figure 5.9

Average Marginal Effects of Stress Scores of Experimental Condition Compared to Active Control Condition 95% Confidence Intervals



Results show that at Day 21, estimated mean stress scores (adjusted for age and gender) are 5.00 in the experimental group, 95% CI [3.51, 6.49], and 7.72 in the control group, 95% CI [6.23, 9.22]. The average difference in estimated stress scores between groups on this day is 2.72 units, $p = 0.017$, 95% CI [0.608, 4.833]. This result shows support for Hypothesis 5.

A mixed model for effect of condition on Social Anxiety scales score, controlling for age and gender was constructed. The interaction between condition and day (-0.18) was not significant, $p = 0.11$, 95% CI [-0.40, 0.04], meaning that the change in Social Anxiety scales scores over time does not significantly differ between the experimental and active control groups. This does not support Hypothesis 6.

The model was used to estimate slopes for each group and is shown in Figure 5.10. It can be seen that the slope in the experimental group decreasing and the results indicate just that with the experimental group slope = -0.14, $p < 0.0001$, 95% CI [-0.20, -0.08]. The active control group scores appear relatively steady with slope = -0.04, $p = 0.62$, 95% CI [-0.79, 0.11].

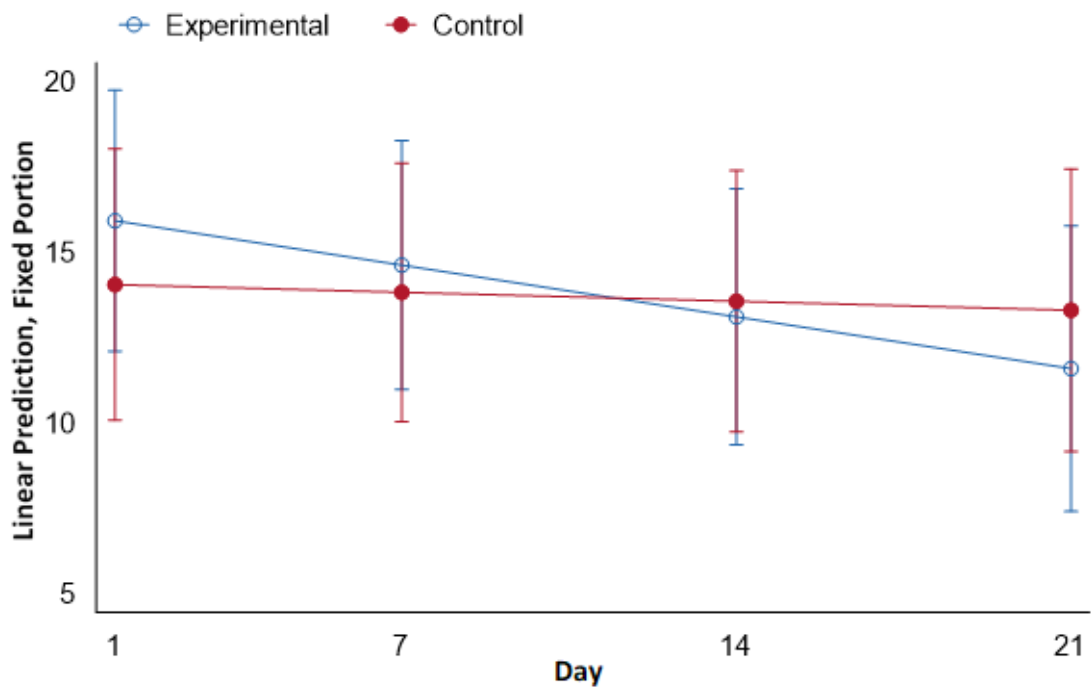
Table 5.11

Social Anxiety Descriptive Statistics

Day	Social Anxiety Score					
	Experimental Group			Active Control Group		
	N	<i>M</i>	<i>SD</i>	N	<i>M</i>	<i>SD</i>
1	25	16.0	(9.8)	24	13.8	(9.5)
7	21	14.8	(10.4)	18	15.1	(10.5)
14	21	13.8	(9.9)	17	12.5	(11.6)
21	13	12.7	(10.6)	19	14.1	(11.3)

Figure 5.10

Social Anxiety predictive margins of conditions with 95% Confidence Intervals.



The size of the difference in Social Anxiety scales scores between groups at any particular time point was also examined. Table 5.12 shows the estimated mean Social Anxiety scales scores by time point for each group and the difference between the groups by day.

Table 5.12

Estimated Mean Group Social Anxiety scores and Differences at each Day, adjusted for Age and Gender.

Day	Estimated DPI Hours by Group				PIU between groups difference		
	Experimental <i>M</i>	<i>SE</i>	Active Control <i>M</i>	<i>SE</i>	<i>Difference</i>	<i>95% CI</i>	<i>p-value</i>
1	15.92	1.95	14.04	2.03	1.87	[-3.64, 7.39]	0.51
7	14.62	1.86	13.82	1.93	0.80	[-4.46, 6.05]	0.77
14	13.10	1.92	13.56	1.95	-0.46	[-5.82, 4.81]	0.86
21	11.58	2.13	13.29	2.11	-1.72	[-7.59, 4.17]	0.57

While the values to appear to be heading in the predicted direction, it can be noted that at no point are the differences in Social Anxiety scales scores statistically significant between experimental and active control conditions. Further to this, the confidence intervals are very wide and this indicates that drawing any conclusions from the results must be done with caution. Overall, these results show limited support for Hypothesis 6.

5.3.3 Six-Week Follow-Up

After 6 weeks from the last day of the intervention, participants were sent a follow up assessment and were asked to report their daily personal hours from the day before, They were also administered the Internet Addiction Test (IAT), the Depression, Anxiety and Stress Scale (DASS-21), Social Interaction Anxiety Scale (SIAS-6) and Social Phobia Scale (SPS-6). The final sample completing the follow up measures comprised $n = 38$ participants. Participant characteristics by intervention group are summarized in Table 5.13.

Table 5.13

Follow up participant characteristics by intervention group

	Experimental Group			Self-Monitoring Group		
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>
Age in years	18	25.2	8.80	20	22.7	3.95
Gender (n, %)						
Male	10 (55.56)			11 (55.0)		
Female	8 (44.44)			9 (45.0)		
Follow up IAT score	17	42.82	9.98	20	51.70	13.04
Follow up DPI hours	18	5.61	2.31	20	7.13	2.32
Follow up DASS-21	16			20		
Depression		5.69	4.27		6.30	5.33
Anxiety		4.56	2.69		4.10	3.99
Stress		7.06	3.94		7.15	4.41
Follow up Social Anxiety	14	15.36	9.99	19	18.26	11.47

IAT: Internet Addiction Test, **DPI hours:** daily personal Internet hours

Differences were found between experimental and active control groups on follow up IAT scores $t(35) = -2.23, p = 0.03, 95\% \text{ CI } [-1.6, -0.80], \text{ Cohen's } d = 0.76$. A medium effect size that was not statistically significant was found between experimental and active control groups on follow up daily personal Internet (DPI) Hours, $t(36) = -1.96, p = 0.06, 95\% \text{ CI } [-3.08, 0.06], \text{ Cohen's } d = 0.66$. Non-statistically significant differences were found for follow up Depression $t(34) = -0.36, p = 0.72, 95\% \text{ CI } [-4.04, 2.82], \text{ Cohen's } d = 0.13$, follow up Anxiety $t(34) = 0.39, p = 0.70, 95\% \text{ CI } [-1.97, 2.90], \text{ Cohen's } d = 0.14$, follow up Stress $t(34) = -0.60, p = 0.95, 95\% \text{ CI } [-3.04, 2.86], \text{ Cohen's } d = 0.02$, or follow up Social Anxiety $t(31) = -0.74, p = 0.47, 95\% \text{ CI } [-10.81, 5.00], \text{ Cohen's } d = 0.27$. No significant effects were observed for depression, anxiety, stress and social anxiety scales and further analysis is not reported.

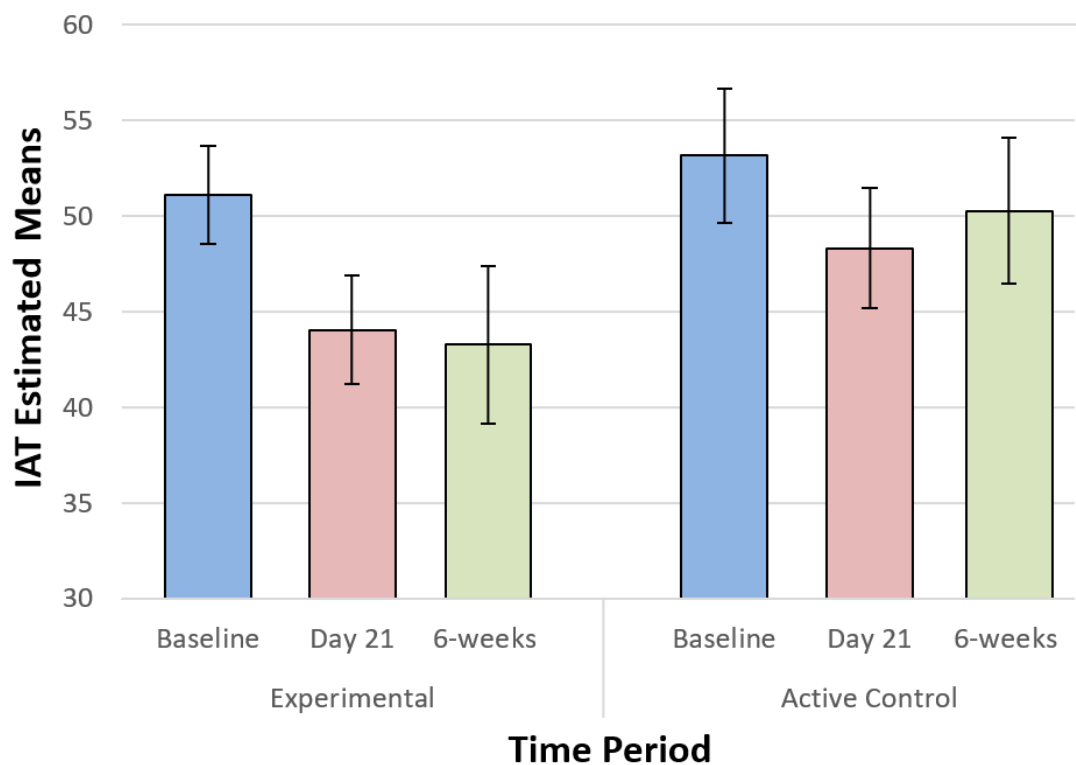
In order to investigate the long-term effects of the intervention we assessed if the effect of the intervention on IAT scores and DPI hours were carried through to post 6-week follow up. Given that there was significant attrition from both groups at follow-up, a linear mixed-effects model was used to assess the effect of the intervention on Internet Addiction Test (IAT) scores, controlling for baseline IAT or DPI, age and gender. Intervention condition (experimental or control), time (in days, analyzed as a continuous measure) and a condition-by-time interaction were entered as fixed effects, in addition to the adjustment variables. A random effect (random intercept) for participant was specified to account for repeated measurements from the same participant. Estimates of adjusted mean post-intervention IAT scores and DPI for each group were obtained from the model post-hoc, and differences in scores between groups were investigated at 6-week follow-up. All other factors were held fixed at their mean values. Even with the benefits of a mixed-effect model approach, given the small sample size, this analysis should be considered exploratory rather than evidentiary.

At the 6 week time point, the estimated mean IAT score in the model for the experimental group was 43.27, 95% CI [39.17, 47.37] and for the active control group was 50.27, 95% CI [46.46, 54.08], signifying a difference between the groups of 7.00, 95% CI [-12.6, -1.4], $p = 0.015$, Cohen's $d = 0.57$. This offers support for hypothesis 7.

The estimated mean DPI hours in the model for the experimental group was 3.60, 95% CI [2.94, 4.26] and for the active control group was 5.29, 95% CI [4.62, 5.96], signifying a difference between the groups of -1.69, 95% CI [-2.63, -0.75], $p < 0.001$, Cohen's $d = 0.56$, supporting hypothesis 8. The estimated mean IAT scores and DPI hours for the experimental and active control groups measured at baseline, Day 21, and 6-week follow-up are presented in Figure 5.11 and Figure 5.12.

Figure 5.11

Estimated Means for IAT scores by group across baseline, end of intervention period, and at 6-week follow up.

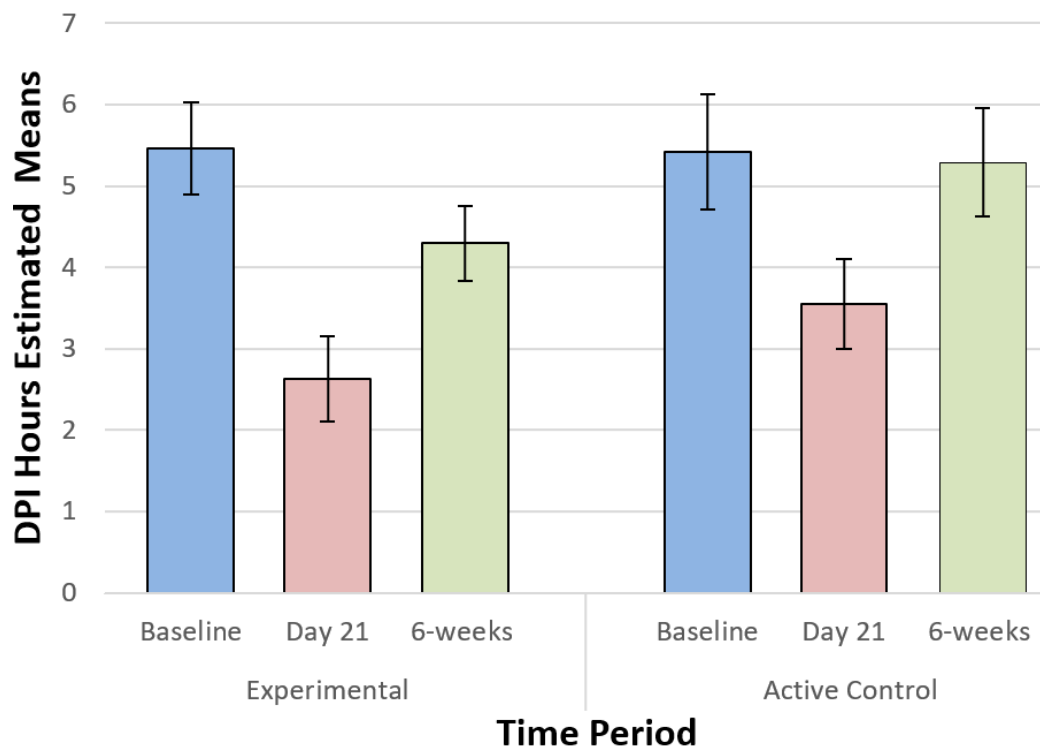


Note: Error bars show 95% confidence intervals.

It can be noted looking at Figure 5.11 that there appears to be a continuation of the intervention effect on IAT scores for the experimental group, while the active-control group appears heading back towards baseline scores. In order to examine this trend in the experimental group's IAT scores, individual question responses were inspected. Young (2015) provides a grouping of IAT questions into six categories: Neglect Social Life (engaging in online socializing and using the Internet to reduce psychosocial issues), Excessive Use (engaging in excessive and compulsive usage), Lack of Control (trouble managing online time and staying online longer than intended), Salience (preoccupation and hiding behaviors), Neglect Work (compromising work or academic performance), and Anticipation (excessive cognitions about using and compulsion to use the Internet).

Figure 5.12

Estimated Means for daily personal Internet (DPI) hours by group across baseline, end of intervention period, and at 6-week follow up.



Note: Error bars show 95% confidence intervals.

Individual question responses were grouped and averaged by category for each participant. Paired sample *t*-tests were carried out to compare baseline grouped question means to 6-week follow-up grouped question means for participants. The active control group showed no differences in their responses from baseline to 6-week follow-up and their data are not reported. The experimental group did show differences and their data are reported in Table 5.14 and displayed visually in Figure 5.13.

Table 5.14

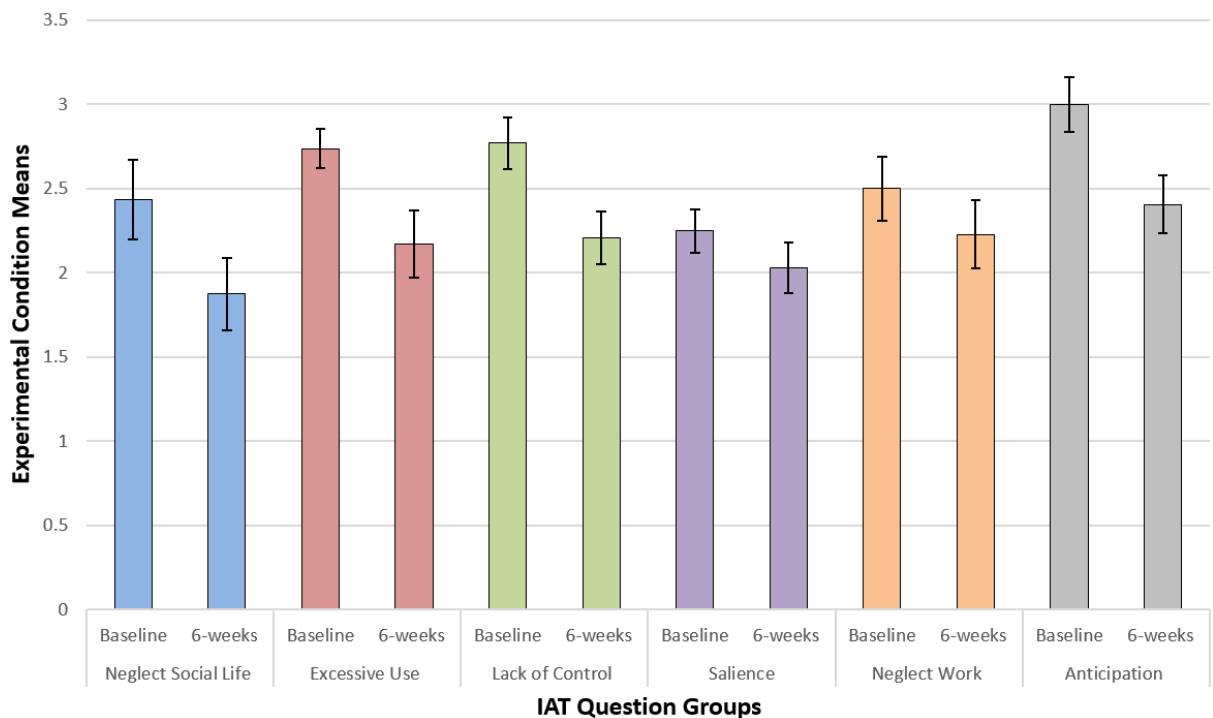
Experimental condition baseline and 6-week follow-up IAT Question Group means

	<i>N</i>	<i>Baseline</i>		<i>6-week follow-up</i>		<i>95% CI</i>	<i>Cohen's d</i>	<i>t-value</i>	<i>p-value</i>
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
Neglect Social Life	17	2.44	0.95	1.88	0.87	[-0.06, 1.18]	0.61	1.93	0.07
Excessive Use	17	2.74	0.47	2.17	0.80	[0.14, 1.00]	0.87	2.81	0.01
Lack of Control	17	2.88	0.62	2.21	0.62	[0.14, 0.99]	1.08	2.83	0.01
Salience	17	2.25	0.51	2.03	0.60	[-0.11, 0.55]	0.40	1.42	0.18
Neglect Work	17	2.50	0.75	2.23	0.80	[-0.33, 0.88]	0.35	0.96	0.35
Anticipation	17	3.00	0.66	2.41	0.69	[0.11, 1.08]	0.87	2.59	0.02

Significant differences were found for the experimental group in responses from baseline to 6-week follow-up in the Excessive Use, Lack of Control, and Anticipation question categories with large effect sizes for each.

Figure 5.13

Experimental condition IAT Question Groups compared from baseline to 6-week follow-up.



Note: Scores can range from 1 – Rarely to 5 – Always applies to me. Error bars show 95% confidence intervals.

5.4 Discussion

A recent model of goal-directed behavior and self-regulation deals with the self-control dilemma of battling multiple goals and temptations simultaneously and over the course of many decisions (Fishbach & Trope, 2005; Fishbach & Zhang, 2008, 2009; Fishbach et al., 2009; Koo & Fishbach, 2008; Zhang et al., 2007). The model has primarily been applied to a consumer and marketing context but seems suited to a clinical domain. Recent studies (Dunbar et al., 2017, 2018) began the investigation of applying the model in a clinical context and demonstrated that the model could be applied in a clinical domain of PIU showing that intended behaviors for individuals could be primed and influenced (Dunbar et al., 2017, 2018). The current study set out to extend that research by moving from intended future behaviors to actual current behavior outcomes and from a general

population to a population of individuals with PIU using a randomized control intervention delivered over the Internet.

Participants were screened so that only those who scored in the frequently problematic or significant ranges for personal Internet usage on the IAT were included. An intervention program was created based on the Dynamics of Self-Regulation theory (Fishbach et al., 2009) and previous research in the domain of problematic Internet usage (Dunbar et al., 2017, 2018). In line with previous research (Boot et al., 2013; Christensen et al., 2004; Simons et al., 2016), self-monitoring was established as an active control group to balance the environments and conditions for the experimental and control groups as much as possible. Participants interested in regulating their daily Internet usage were recruited and were informed that the study was about determining if people could reduce their personal Internet usage hours. Thus, a clinical population with a focal goal of reducing their personal Internet use was established for the study.

The primary purpose for the study was to investigate the effect of the experimental intervention on reducing participants' daily personal Internet hours and their subsequent score on the Internet Addiction Test (IAT). It was predicted that the theory driven experimental approach would outperform the active control group that employed a self-monitoring strategy. Results showed that both groups reduced their daily personal Internet hours. However, the experimental group achieved this at a greater rate than that of the self-monitoring group and this result was statistically significant with a medium effect size. Similarly, each group reduced their scores on the IAT. Both groups started with similar IAT scores at baseline but by Day-21 the experimental group had increased the gap to a statistically significant amount with a medium effect size. The hypotheses for both primary outcomes were supported suggesting that PIU is indeed a self-regulation issue (Billieux & Van der Linden, 2012; LaRose et al., 2003; Özdemir et al., 2014; Spada, 2014; Weinstein et al., 2014; Yau et al., 2013). Those results also support previous research in

the area using the Dynamics of Self-Regulation model showing that it can be used to influence behaviors after successful *and* failed goal behaviors (Dunbar et al., 2017, 2018; Fishbach et al., 2009). Results from the active control group support previous research showing that self-monitoring is an effectual behavior change method (Harkin et al., 2016; Rose et al., 2017). A third (33.3%) of participants in the experimental group had reduced their IAT scores below the threshold for problematic Internet use by Day-21 and half as many of the self-monitoring group (17.1%) achieved the same. Both these results offer clinical utility and are promising effects.

The data at 6-week follow-up yielded significant differences between experimental and active control group for IAT scores from baseline to 6-week follow-up with a medium effect size. It can be noted that the experimental group appeared to not only maintain the intervention effect on IAT scores but it was also extended at 6-week follow-up, while the active-control group scores trended towards baseline scores. Upon inspection of the IAT question categories (Young, 2015), significant differences were found for the experimental group in responses from baseline to 6-week follow-up in the Excessive Use, Lack of Control, and Anticipation question categories with large effect sizes found for each. The remaining categories that had no statistically significant changes but displayed small and medium effects were Neglect Social Life, Salience, and Neglect Work. While all categories potentially rely on self-regulation the categories with significant changes seem to directly relate to how individuals regulate and control their behaviors and thoughts when it comes to Internet use and behaviors. That is, these question categories seem directly related to self-regulation and self-control which was the specific target of the intervention. This potentially indicates that participants in the experimental group developed better self-regulation and self-control skills as a result of the intervention.

Intervention effects showed a pattern of reversal towards baseline for DPI hours in both groups, although a significant difference was found between DPI hours for

experimental and active control groups, indicating the experimental group was still receiving a benefit from the intervention. It is likely that participants who took the time to report at 6-week follow-up were also the most motivated and engaged participants and may not be a representative sample of the population.

The mixed-effect model allowed for differences in the groups to be detected at 6-week follow-up but the sample size was small and the data should be interpreted with caution. Regardless, the results are encouraging and deserve following up. It is possible that learning was occurring but needed more time to take hold. Therefore, a longer intervention or booster sessions after the intervention may enable the intervention effects to be better sustained.

A secondary purpose of the study was to investigate the effects of the interventions on important mental health issues, depression, anxiety, stress, and social anxiety, that are thought to be associated with PIU (Aboujaoude, 2010; Ho et al., 2014; Ko et al., 2012; Wang et al., 2015; Weinstein et al., 2015; Weinstein et al., 2014; Yau et al., 2013). Results generally showed a relative steadiness in the self-monitoring group across all four scales and a slight decrease in the experimental group over time. Only the Stress sub-scale was statistically significant in favor of the experimental intervention. Perhaps reducing Internet usage may help reduce stress, with a longer time needed to have an impact on anxiety or depression. Previous research (Özdemir et al., 2014) has shown a similar result, finding no interaction between self-control and depression. However, confidence intervals for most comparisons were large which limits the ability to draw conclusions from our data.

Previous research examined the opposite effects of Commitment and Progress framing. Specifically, how positive feedback can produce goal consistent behavior when a commitment framework is primed, but can produce the opposite effects of cruising or goal incongruent behavior when a progress framework is constructed. Similarly, negative feedback can produce goal rejection and goal incongruent behaviors under a commitment

frame, but produce a discrepancy in current and desired goal states leading to more goal congruent behavior choices under a progress framework (Dunbar et al., 2017, 2018; Fishbach & Dhar, 2005; Fishbach et al., 2006; Fishbach & Zhang, 2008; Koo & Fishbach, 2008; Zhang et al., 2007). The present study did not fully test the opposite effects of progress and commitment against positive and negative feedback. Instead, it used the fit for purpose aspects of the model and chose only the factors that would increase goal adherence. Goal adherence after initial goal success requires a commitment framework, a focus on the abstract goal, and presenting incongruent behaviors as being in competition with goal congruent behaviors. Recommitting to goal adherence after initial goal failure requires a progress framework, focusing on concrete steps to complete the goal, and presenting incongruent behaviors as being in competition with goal congruent behaviors.

Successful self-regulation is a fundamental component of mental well-being (Hoyle, 2010) and is the target of many clinical therapies (Beck, 2011; Harris, 2009; Hayes, 2004; Kuyken et al., 2010). The current study tested various cues and constructs that the dynamics of self-regulation model predicts will produce commitment or progress mental frameworks that then affect behavior choices. Overall, it appears that the commitment and progress frameworks were produced at the appropriate times and their opposite effects on behavior choices were observed as predicted by the model (Fishbach et al., 2009). Presentation format, framing cues, feedback cues and focusing on the abstract goal versus concrete plans were combined to form the feedback provided to participants in the experimental group and this research continues to demonstrate the effects of how successful and unsuccessful goal actions are interpreted under commitment or progress mental representations and can produce opposite outcomes in behaviors (Fishbach et al., 2009). A third of the participants in the experimental group reduced their IAT scores below the threshold for problematic Internet use by the end of the intervention. Given the apparent cost effectiveness of similar interventions (Murray et al., 2016) and the potential

for successful clinical outcomes it is of significant clinical importance that the understanding of the dynamics of self-regulation be continued and expanded in this and other clinical domains.

5.4.1 Implications for Clinical Practice

The dynamics of self-regulation model is one of cognitive interpretation (e.g. Fujita et al., 2006; Magen & Gross, 2007), with commitment and progress mental frameworks providing the mechanisms to support how individuals can re-construe or interpret the same events but then lead to opposite behavioral outcomes (Fishbach et al., 2009). This was a proof of concept study and results demonstrated that the dynamics of self-regulation model can be applied successfully in the domain of problematic Internet use with a population of individuals classified with PIU. Moving from a laboratory to a real world setting places greater significance on the results for clinical practice.

The Internet is pervasive in contemporary life (Internet World Stats, 2019). It appears not only unrealistic but also undesirable that complete abstinence could be the final goal for any treatment of problematic Internet usage. A moderated and balanced use of the Internet and other applications is supported by researchers, clinicians, and indeed those experiencing PIU (Cash et al., 2012; O'Brien et al., 2016; Young, 2007). The solution, therefore, is for individuals to utilize their self-regulation skills to manage, monitor and alter their cognitions, attention, and behaviors (Carver & Scheier, 2011; Cash et al., 2012; Fujita et al., 2016; Przepiorka et al., 2014).

Teaching clients to appropriately frame and construe the outcomes of their current goal results would be beneficial for advancement towards their stated goals. Individuals experiencing a goal failure could be taught to initially frame their thinking in terms of *progress* and focus on the discrepancy between their desired end goal state and current position. They can then be encouraged to break the goal down into small concrete steps towards the goal. When faced with a self-control dilemma individuals can also be taught

to frame the problem so that the different behaviors compete against, rather than complement each other. An example of self-talk to promote re-construal after goal failure might be: “I haven’t made progress towards my goal. My goal is important to me. Today I will achieve my concrete steps towards my goal. I still have more to do. If faced with a choice today I will recognize that I can either work towards my goal or move away from it. I cannot have both.” Individuals experiencing a goal success should be taught to initially frame their thinking in terms of *commitment* and highlight goal congruent behaviors. They can be encouraged to focus on their commitment to the focal goal. When faced with a self-control dilemma individuals can also be taught to frame the problem so that the different behaviors compete against, rather than complement each other. An example of self-talk to promote adherence after goal success might be: “I feel committed to my goal. It is important to me and today I will continue to focus on my goal. I am committed to success and I want to achieve my (high level) goal. If faced with a choice today I will continue to hold my (high level) goal in mind and choose goal congruent actions rather than goal incongruent behaviors.”

5.4.2 Limitations

A-priori power analysis determined that we would need 90 participants in order to find an effect. Despite 94 participants matching the inclusion criteria and being recruited, only 74 ultimately entered the study. Missing data was a factor throughout the study although the rates of completion are in line with similar Internet based interventions (Chebli et al., 2016). Our statistical approach employing a linear mixed effects model was utilized with this in mind as it gives more statistical power than other techniques, is better equipped to accommodate missing values, and results in minimal loss of information as every data point contributes to the analysis (Egbewale et al., 2014; Magezi, 2015; Meteyard & Davies, 2020; O'Connell et al., 2017). Nonetheless, it must be acknowledged that a small sample size limits the ability to draw conclusions. This lack of data may have

resulted in the inability to find significant effects in the DASS-21 or Social Anxiety measures.

While a longer term follow-up was desirable, resources did not allow for follow-up beyond 6 weeks. Only 50% of participants who started the study responded to this request which restricts our ability to make sound conclusions on the intervention in regards to its long term effects and benefits as these participants may not be representative of the population. Perhaps the more motivated participants in the experimental condition noticed how the commitment and progress frameworks were presented across the 21 day intervention and learned to apply to framework for themselves. That possibility does not seem to fit with higher DPI hours reported at 6-week follow-up, although the experimental group did outperform the active control group in this area as well. The mixed-effect model allowed for differences in the groups to be detected at 6-week follow-up but the sample size was small and the data should be interpreted with caution. This 6-week follow-up analysis should be considered exploratory rather than evidentiary.

This study used retrospective data and was fixed in its timing of feedback to participants. It compared self-reported daily personal Internet hours from yesterday and compared them against self-reported results from the day before. This was requested at 7am in the morning but participants were free to complete the questionnaire at any time of the day. Thus, participants may have received feedback well after a time when it could have influenced their behavior. Participants who did not complete their daily responses would have received no feedback at all. The study was therefore working on previous self-reported behavior with a sizeable lag for priming and feedback in order to influence current and future behaviors. This is in keeping with the dynamics of self-regulation model but it does offer opportunities to improve the timing of data collection and intervention delivery. Future research could look at some form of more real-time monitoring and instant feedback.

Participants were asked to report their aggregated daily personal internet hours. These data were not broken down into specific activities or areas on the Internet and thus makes it difficult to examine if changes in personal internet hours were in areas and activities that could be considered problematic to the individual or actually contributed to well-being, social relationships, and mental health; for example, spending time with online gaming to build teamwork skills and maintain social relationships (Billieux et al., 2013) versus using online gaming to reduce cravings, sooth social anxiety, and regulate mood (Müller et al., 2019). Future studies may examine personal internet activities in more detail.

Previous research showed that commitment or progress frameworks were not primed for participants for whom English was not their first language as the effect depends on common understandings and social constructs of the English words commitment and progress (Dunbar et al., 2018, Study 1). Therefore, only individuals with English as their first language were permitted in subsequent studies. However, a recent meta-analysis examined studies on PIU conducted across 26 countries (Tokunaga & Rains, 2016) and subsequent research showed that cultural orientation (individualistic or collectivistic) does not affect the associations between Internet use and psychosocial issues (Tokunaga, 2017). Given the extent of PIU across the globe, future research could examine if the current findings can be replicated in languages other than English.

There were several strengths to the study. Firstly, it was run in accordance with the CONSORT standards (Eysenbach & Group, 2011; Moher et al., 2012). Secondly, the interventions were carried out on a population of individuals experiencing problematic Internet usage. Research specifically on clinical populations has been lacking and considered a weakness in the PIU area (Tokunaga, 2017). Finally, an active control group condition was created to match the experimental group in order to balance attention, beliefs and expectations as much as possible between groups in or to prevent possible

confounding issues (Boot et al., 2013; Christensen et al., 2004; Simons et al., 2016). The positive results of the self-monitoring group indicate that improvement was made and that the self-monitoring control group was indeed an active control group.

5.4.3 Future Research

Our research (Dunbar et al., 2017, 2018) began by taking a novel model of self-regulation that had mainly been applied in the consumer and marketing domain research (Campbell & Warren, 2015; Fitzsimons et al., 2008; Wilcox et al., 2009) and situating it in a clinical domain of problematic Internet use. The first step took a single part of the model, presentation format (presenting choices as competing or complementary), and validated it in a general student population with participants indicating their intention to behave in online questionnaires (Dunbar et al., 2017). Further parts of the model, framing cues (questions on commitment or progress and pre-existing goal commitment), feedback cues (initial goal success or failure and unaccomplished or accomplished actions) and focusing on the abstract goal versus concrete plans were validated in successive studies (Dunbar et al., 2018).

The current study extended that research by moving from intended future behaviors to actual current behavior outcomes in a clinical domain using a randomized control intervention delivered over the Internet to a clinical student population. The results demonstrated that the dynamics of self-regulation model can be applied successfully in a clinical domain and with a population of individuals classified with PIU.

The dynamics of self-regulation model offers a unique perspective from other self-regulation models in that it can explain and predict an individual's opposite behaviors in seemingly the same conditions, something that is of great importance for clinical practice and individual wellbeing in general (Beck, 2011; Cipani & Schock, 2017; Miller & Rollnick, 2002; Reichenberg & Seligman, 2016; Young et al., 2003).

This study used retrospective data. That is, it was comparing yesterday's results against the results from two days prior. This was in line with the model, but did create a considerable lag in providing the intervention to participants with participants who skipped days not receiving any feedback at all. Perhaps reducing the delays between priming and feedback for success or failed goal behaviors would result in better performance and outcomes for individuals. Future research could look at real-time monitoring and instant feedback. This way, the moment the goal had been breached and a failure condition had been created, progress priming and appropriate feedback could be provided to prompt to the individual to notice the discrepancy in their desired goal state and pull them back to the focal goal as soon as possible. Individuals experiencing success could be *regularly* prompted with commitment priming and feedback to keep them highlighting goal congruent behaviors.

Almost two thirds of the world's population is now accessing the Internet and most developed countries push that percentage into the eighties and nineties with some almost reaching 100% of their population (Internet World Stats, 2019). The median ownership of smartphones in advanced countries is 76% and 45% in emerging countries. This number pushes into the 90% range for those aged 18-34 (Taylor & Silver, 2019). The technology is available and the delivery systems are already in place to deliver interventions similar to the current study. Technological interventions have great potential to improve health and well-being as they are scalable, easily accessed, and can be customized and personalized (Murray et al., 2016). A person-based approach should be employed with target users of the intervention engaged in development, testing and implementation in order to ensure usability, acceptability and satisfaction of the final system (Maguire, 2001; Yardley et al., 2015).

5.5 Acknowledgements

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5.6 Disclosure Statement

No competing financial interests exist.

Chapter 6: General Discussion

6.1 Overview

The main aims of this thesis were to examine whether the dynamics of self-regulation (DSR) model could be applied to a clinical domain, specifically that of problematic internet usage (PIU), and determine if it could be used to affect positive clinical outcomes. The research aims were accomplished through a series of five studies, presented in three papers.

The first study assessed the feasibility of the DSR model in the clinical domain of PIU examining the basic premise of highlighting (a commitment framework) or balancing (a progress framework) using a single component of the model, specifically presentation format. Follow up studies tested further components, namely framing cues (questions on commitment or progress and pre-existing goal commitment); feedback cues (initial goal success or failure and unaccomplished or accomplished actions) and focusing on the abstract goal versus concrete plans. The first four studies used a general student population and measured participants' behaviour intentions through online surveys.

The final study conducted a randomised controlled trial (delivered online) that specifically targeted a population of individuals identified as experiencing PIU using a theory driven intervention based on the DSR model. The intervention was designed to influence participants' actual Internet usage behaviours and produce positive outcomes such as a reduction in daily personal Internet use, PIU symptoms, and associated mental health issues of depression, anxiety, stress and social anxiety. The results of the studies suggest that the DSR model can be successfully applied to the clinical domain of PIU and that it not only affects individuals' intended behaviours but can also be used to affect the actual behaviours relating to Internet use. The changes in Internet behaviours do lead to positive outcomes with a reduction in daily personal Internet usage and PIU symptoms.

The current chapter summarises the key findings of each study, the theoretical and practical implications, strengths and limitations of the methodology, and future research direction that may follow from the findings.

6.2 Review of Thesis Findings

6.2.1 Paper One – Problematic Internet Usage Self-Regulation Dilemmas: Effects of Presentation Format on Perceived Value of Behaviour

The first study applied the DSR model in the clinical context of PIU by looking at the basic premise of highlighting (a commitment framework) or balancing (a progress framework). The study tested if the frameworks could be primed by presentation format and determined if those two representations produced opposite behavioural outcomes as predicted by the model.

A pilot study testing the operationalisation of variables and design used to test the model identified and established social and academic activities as especially important to the target population of University students and behaviours in these domains served as goal congruent items. Internet behaviours were established as goal-incongruent behaviours by presenting a vignette on PIU (Förster et al., 2007; Laham & Kashima, 2013).

An individual's motivational priority can be represented by the value placed on behaviour evaluation choices (Brendl & Higgins, 1996; Ferguson & Bargh, 2004; Fishbach & Zhang, 2008; Touré-Tillery & Fishbach, 2014) and, as such, behaviour outcomes were measured by the value participants assigned to various behaviours in Internet, academic and social domains. Filler behaviour items were included to conceal the purpose of the study. Behaviour items were presented so that they appeared to compete or complement each other. University students (N = 97) undertook an online survey rating the value of Internet, academic, and social-related behaviours across three conditions. The three conditions paired behaviours so that they appeared to complement each other, appeared to compete against each other, or were presented individually.

Results clearly showed lower value ratings were given on Internet behaviours for the competing condition compared to the complementary condition, confirming the model predictions for incongruent goal behaviours with moderate to large effect sizes, suggesting that the effect may have clinical utility. The adaptive outcomes predicted by the model for goal congruent behaviours received mixed results. The academic domain showed non-significant values in the predicted direction with effect sizes approaching moderate magnitude but the social domain showed no difference between the complementary and competing formats.

The first study provided the opportunity to assess the feasibility of using the DSR model in the clinical domain of PIU. It examined the basic premise of highlighting or balancing in commitment and progress frameworks that were primed using presentation format. Results established that the frameworks were primed and they did impact on individuals' assessment of behavioural evaluations. Incongruent goal behaviours, operationalised as Internet behaviours appeared to be the most influenced by the theory. Goal-congruent behaviours in the academic domain showed positive support for the theory without being statistically significant and behaviours in the social domain showed limited support.

Predicted results were found in the Internet and academic domains that indicated that study design or power issues were not responsible for the lack of support in the social domain. It was hypothesised that social behaviours may hold both high immediate and high long-term value to individuals, enabling them to serve as enjoyable short-term temptations in the present as well as fulfilling long-term goals. This would nullify their being able to form or identify a self-control dilemma, thus making them immune to the effects of balancing and highlighting. Reflecting on that supposition, perhaps a reason the best outcomes were seen in the Internet domain behaviours was because that domain was the easiest for participants to identify a self-control conflict. This would identify the failures in

the social and to a lesser extent in the academic domains to be a breakdown in self-regulation rather than self-control (Baumeister & Heatherton, 1996; Carver & Scheier, 1998; Fishbach & Converse, 2011).

Despite the lack of outright success in congruent goal domains, the first study achieved the desired outcomes and laid the foundations for future studies to further explore the DSR model. This paper also gave the first insight and indication of how clinical interventions might benefit from using the DSR model by suggesting that individuals experiencing issues with problematic Internet usage would benefit from framing self-regulatory dilemmas in a competing format.

6.2.2 Paper Two – Problematic Internet Usage Self-Control Dilemmas: the Opposite Effects of Commitment and Progress Framing Cues on Perceived Value of Internet, Academic and Social Behaviors

While the first paper was focused on a single factor that had no interactions within the model and tested the basic premises of highlighting in a commitment framework and balancing in a progress framework, the next series of three studies study set out to test elements of the model that did interact. These studies also began to test the opposite effects of commitment and progress frameworks. The opposite effects in the model are seen both between and within the commitment and progress frameworks.

When individuals with a commitment framework receive or attribute positive feedback they highlight subsequent goal-congruent behaviours, but when they receive negative feedback they can question their commitment to the goal and will perceive goal-incongruent behaviours more favourably. With a progress framework, when an individual attributes or receives positive feedback it can signal that enough progress has been made on a goal leading them to balance between goal-congruent and incongruent behaviours. However, if they receive or attribute negative feedback it signals a discrepancy between current and end goal states promoting action towards their goal and favouring subsequent goal-congruent over goal-incongruent actions.

Despite the issue for social domain behaviours in the previous paper, both academic and social behaviours were used in order to offer more weight to the ability to generalise from the results.

The first study tested whether framing questions could prime the mental representation frameworks of commitment and progress and what effect positive and negative feedback had on subsequent behaviour ratings. Manipulation checks validated that participants were engaged with the goal to reduce their level of personal Internet usage and they placed a high level of importance on academic and social success.

Manipulation checks on participants with English as a second language compared their level of commitment ratings in the commitment success and commitment failure conditions, and their sense of progress towards their goal in the progress success and progress failure conditions. Results showed that the manipulation was not effective for those participants and they were excluded from the final dataset. This was the first indication that priming mental representation frameworks required the common understandings and social constructs of the English words *commitment* and *progress*. Future studies in the research thesis would exclude any participants for whom English was not their first language to eliminate this confound.

A group of University students ($N = 173$) undertook the online survey and were randomly assigned to one of four conditions. Results supported that the frameworks were primed by questions on commitment or progress and that these frameworks along with positive or negative feedback did influence individuals' subsequent assessment of behavioural ratings.

Incongruent goal (Internet) behaviour ratings were clearly affected by the experimental manipulations as were academic behaviour ratings, whereas the social behaviour ratings seemed immune to any effect, indicating that something different was occurring for individuals within this domain. Methodological issues were again ruled out

as a cause as the social behaviour stimuli were constructed to be divorced from any use of technology and specifically mentioned in-person meetings, so there appeared to be no potential overlap in the domains. Further, the predicted effects were found in the Internet and academic domains. Nonetheless, the first study achieved the desired outcomes and showed that framing questions could prime the mental representation frameworks of commitment and progress and that positive and negative feedback affected subsequent behaviour ratings as predicted in the Internet and academic domains.

This investigation laid the foundations for the next two studies to further explore the DSR model and gathered the first evidence of the opposite behaviour effects between and within commitment and progress frameworks within the clinical domain of PIU.

The second study investigated the effect of high or low goal engagement on inducing progress or commitment frameworks respectively and whether focusing on accomplished or unaccomplished actions can implicitly provoke positive or negative feedback.

The model (Koo & Fishbach, 2008) proposes that high levels of engagement towards a goal promote internal questions inducing a progress framework, while low levels of engagement trigger internal questions that induce a commitment framework. Focusing on accomplished actions can signal partial goal completion to progress-framed individuals and high engagement to the commitment-framed individuals. Conversely, focusing on unaccomplished actions can signal a discrepancy in the progress-framed groups and a lack of engagement in the commitment-framed groups. Hence, accomplished actions (focusing on goal achievement) acts like positive feedback whereas unaccomplished actions (focusing on incomplete goal actions) acts like negative feedback (Koo & Fishbach, 2008).

Goal-congruent behaviours and goal-incongruent behaviours were again operationalised in the academic, social and Internet domains. University students ($N = 180$) participated in the study and were randomly assigned to one of four conditions.

Manipulation checks validated that participants in the high engagement groups had a greater engagement to the goal than those in the low engagement group. The results were as expected according to the model, so positive and negative feedback seems to have been achieved by the manipulation of focusing on accomplished versus unaccomplished actions. The predicted opposite effects of behaviour ratings in the Internet and academic domains were observed with moderate and large effect sizes respectively. The effects were again not observed in the social domain.

This study showed how individuals form different frameworks and ask themselves different questions depending on their level of engagement to a goal. It also demonstrated the difference in how individuals' construe accomplished or unaccomplished actions as goal performance feedback.

The third study addressed the influence of focusing on a high-level or abstract goal versus the concrete steps needed to implement the goal. The DSR model (Fishbach et al., 2006; Zhang et al., 2007) proposes that focusing on a high-level or abstract goal forms a commitment framework, leading to the pattern of highlighting, whereas focusing on the concrete goal actions forms a progress framework, leading to a pattern of balancing.

This study assessed additional factors that induce commitment and progress framework according to the model, and again explored the opposite effects both between and within the commitment and progress frameworks.

Goal-congruent behaviours and goal-incongruent behaviours were again operationalised in the academic, social and Internet domains. A similar procedure as used in study two primed the initial goal to reduce personal Internet hours. Further vignettes were used to prime thinking in terms of the abstract high-level goal or the concrete steps needed to achieve the goal.

A final group of University students ($N = 172$) participated in the study and were randomly assigned to one of four conditions. Results demonstrated that a commitment

framework is formed when individuals focus on the abstract or higher-level goal while a progress framework is formed when the focus is on concrete behaviour steps. The opposite effects between and within framework outcomes were observed in the Internet domain with moderate effect sizes. Significant and non-significant effects were observed in the two academic domain conditions with small effect sizes. The social domain again showed no effects.

This study showed how individuals form different frameworks depending on their level of abstraction when thinking about their goal. When using high-level abstraction individuals will form a commitment framework, whereas when using low-level abstraction, focusing on concrete steps, individuals will form a progress framework.

The second paper assessed additional factors specified in the DSR model. Aspects that prime commitment of progress frameworks tested were questions on commitment and progress, high or low goal engagement levels, and focusing on abstract or high-level goal versus concrete steps of goal implementation. All factors were found to prime commitment and progress frameworks. Positive and negative feedback was also shown to be construed if focusing on accomplished versus unaccomplished goal actions respectively. Importantly, the opposite effects between and within the commitment and progress frameworks were observed across all three studies.

Six out of six hypotheses were supported in the Internet behaviours domain with mainly moderate effect sizes. Five out of six hypotheses were supported in the academic behaviours domain with small, moderate and large effects sizes. This sixth hypothesis was non-significant but in the predicted direction and had a small effect size. None of the six hypotheses were supported in the social behaviours domain with small and negligible effects sizes and some results in the opposite direction of prediction. Taken together with the first paper, there appears to be strong and consistent evidence that the social behaviour domain, as operationalised in these designs, was immune to the effects of commitment and

progress framings. Social behaviours might serve as enjoyable short-term temptations in the present as well as achieving long-term goals for the future, thus making it difficult for individuals to identify a self-control dilemma.

Regardless of the social domain findings, the results of the first two papers provided enough evidence to suggest that the DSR model could be applied in the clinical domain of PIU and that an intervention specifically targeting Internet behaviours could be constructed in order to reduce Internet usage and behaviours.

6.2.3 Paper Three – Problematic Internet Usage: Can Commitment and Progress Frameworks Help Regulate Personal Internet use?

The first four studies demonstrated that the DSR model could be applied to the clinical domain of PIU. Commitment and progress frames could be produced via a variety of mechanisms and the opposite between and within behaviour effects were subsequently observed from positive and negative feedback. These studies targeted a general student population and measured goal adherence by capturing value ratings of intended behaviours. Motivation to reduce Internet usage was generated by study design manipulation (e.g. reading vignettes and watching a video on PIU).

Determining the clinical utility of the model is best served by evaluating the model in a clinical population. While measuring intended behaviour evaluations is a good predictor of actual behaviours (Sheeran, 2002; Webb & Sheeran, 2006) it is not the same as measuring actual behaviour change. Finally, rather than generating goal motivation through manipulation it was decided to recruit participants who were actively motivated to reduce their personal Internet usage.

As such, an online randomised controlled trial (RCT) was designed to apply the DSR model to a population of individuals identified as experiencing PIU. The experimental group would be offered an intervention informed by the DSR Model to influence their Internet usage and produce positive outcomes including reduction in daily personal Internet use, PIU symptoms, and associated mental health issues of depression,

anxiety, stress and social anxiety. Comparison to an active-control group would ensure the best chance of discovering if any positive effects were truly produced by the DSR model based intervention (Boot et al., 2013; Christensen et al., 2004; Simons et al., 2016). Self-monitoring is an effective behaviour change technique across a variety of domains (Harkin et al., 2016; Rose et al., 2017), and it was employed for the active control group in order to balance the environments and expectations for both conditions.

The intervention used the germane aspects of the model and chose only the factors previously tested that would increase goal adherence. Presentation format (presenting choices as competing or complementary), framing cues (questions on commitment or progress and pre-existing goal commitment), and feedback cues (initial goal success or failure s) were combined to form the feedback provided to participants in the experimental group (Dunbar et al., 2017, 2018; Fishbach & Dhar, 2005; Fishbach et al., 2006; Fishbach & Zhang, 2008; Koo & Fishbach, 2008; Zhang et al., 2007). It did not fully test the opposite effects of progress and commitment against positive and negative feedback as there was no desire to produce goal-incongruent behaviours. After an initial goal success, goal adherence requires a commitment framework, a focus on the abstract goal, and presenting incongruent behaviours as being in competition with goal congruent behaviours. After an initial goal failure, recommitting to the goal requires identification of the discrepancy in current and end goal states. Thus, it requires a progress framework, focusing on concrete steps to complete the goal, and presenting incongruent behaviours as being in competition with goal congruent behaviours. Focusing on accomplished or unaccomplished acts like positive or negative feedback and the study design used participants' actual positive or negative performance to generate this feedback.

Participants interested in regulating their daily Internet usage were recruited and informed that the study was about determining if people could reduce their personal Internet usage hours. Participants were screened so that only those who scored in the

frequent or significant problematic ranges for personal Internet usage on the Internet Addiction Test (IAT) were included. Thus, a population with a focal goal of reducing their personal Internet use was established for the study.

Problematic Internet usage symptoms were operationalised as a score of 40 or more on the IAT, as scores higher than this indicate frequent or significant problematic usage issues, and daily personal Internet (DPI) hours spent on the Internet. Secondary outcomes measured were psychosocial issues associated with PIU, namely: depression, anxiety, stress and social anxiety.

The RCT was conducted online with University students ($N=94$) over a period of 21 days. A total of 74 participants completed the intervention and 38 completed the follow up assessments. Due to the attrition rate and missing data in both groups, linear mixed-effects models were used to assess the effect of the intervention on IAT scores, DPI hours, depression, anxiety, stress and social anxiety, controlling for baseline scores, age and gender.

Results indicated that by the end of the intervention the experimental group had reduced their DPI hours significantly more than the active control group. Findings also showed a larger reduction in IAT scores for the experimental group compared to the active control. Limited effects were found for depression, anxiety, stress and social anxiety scores. Clinically significant change in symptoms of PIU were found with a third (33.3%) of participants in the experimental condition and 17.1% of the active control group reducing their IAT scores to below the threshold of 40 points by day 21. While being limited due to a small sample size, follow-up analysis indicated persistence and possible extension of the treatment effect for IAT scores for participants in the experimental group 6 weeks after the intervention had concluded.

The RCT study showed that the DSR framework provides a promising approach to controlling problematic Internet use, resulting in a decrease of PIU behaviours that leads to a reduction in subsequent negative symptoms and adverse life outcomes for individuals.

6.3 Implications

There are several theoretical and practical implications of this research, which are likely to be of interest to researchers and practitioners. The aim of this research thesis was to apply the novel and promising model on the DSR, that up to now had mainly be applied in consumer and marketing domains (e.g. Baek & Yoon, 2020; Camacho et al., 2019; Campbell & Warren, 2015; Chanm et al., 2020; Fitzsimons et al., 2008; Schwabe et al., 2018; Wilcox et al., 2009; Yang et al., 2019), to a clinical domain and affect positive clinical outcomes. The five presented studies show that this can be done and their results provide abundant implications for the research field.

The model has been shown to positively impact on values, intentions, and behaviours for individuals suffering from the growing and global issue of PIU. There are differences of opinion about definitions and models of PIU (see Chapter 1) but one thing researchers do agree upon is that, regardless of the model (addiction, cognitive, or socio-cognitive), a key feature of PIU is maladaptive self-regulation processes leading to the loss of self-control over Internet use (Billieux & Van der Linden, 2012; Caplan, 2010; Davis, 2001; LaRose et al., 2003; Tokunaga, 2015, 2017; Young, 2004). The DSR model can be further applied to this issue and perhaps form part of new therapeutic approaches.

The DSR model is a general model of self-regulation that has been shown to work in a clinical domain. Therefore, other clinical domains in which self-regulation is important may potentially benefit from the model. Other online domains such as cybersex, online gambling, and online gaming seem to be obvious examples, as they are specific instances of general PIU. In addition, public health issues such as healthy eating, dieting, exercising, oral health and sleep hygiene adherence may also benefit from instituting methods based

on the model. Finally, substance use disorders such as methamphetamine, alcohol, prescription medication, nicotine, cannabis misuse and others may also benefit from the model.

The current thesis tested the major components of the model. The opposite effects of commitment and progress frameworks both between and within the frameworks, along with framing and feedback cues, were all validated in a clinical domain. There are still some remaining factors in the model that could be evaluated, such as group identification, mood, and future plans and expectations. With regard to group identification, highly devoted individuals will focus on group progress while uncertain individuals focus on questions of commitment to the group (Fishbach et al., 2009). For mood, when mood is attributed to goal success or failure a positive mood increases motivation when it signals commitment and a negative mood increases goal adherence motivation when it signals insufficient progress towards a goal (Eyal et al., 2009; Fishbach & Labroo, 2007; Fishbach et al., 2009); With regard to future plans and optimistic expectations, plans for the future can signal commitment to or progress on the current goal, and optimism about those plans predicts the magnitude of the effect (Zhang et al., 2007). These additional factors could be tested for PIU, and for other clinical and public health domains as indicated above.

Numerous practical implications flow from this research demonstrating that the DSR model can be applied to a clinical domain and can perhaps inform new therapeutic approaches. The DSR model offers many factors and variables that can be used by clinicians in conjunction with clients in order to build self-regulation and self-control skills. Successful self-regulation is a foundation of healthy psychological function (de Ridder et al., 2012; Hoyle, 2010) and has been shown to be associated with many positive life outcomes. (Baumeister & Vohs, 2016; Busch & Hofer, 2012; Elliot et al., 2011; Gagnon et al., 2016; Hofer et al., 2011; Tangney et al., 2004; Vohs et al., 2008). Therefore,

the practical implications of the model have the capacity to enable better outcomes across a variety of clinical domains, not just PIU.

The first step in resolving a self-control dilemma is identifying it in the first instance (Fishbach & Converse, 2011; Myrseth & Fishbach, 2009). The first paper on presentation format showed that presenting behaviour choices as competing versus complementing each other enables the self-regulation monitoring processes to more easily identify a self-control conflict and therefore give the opportunity for self-control resources to be deployed.

The second paper assessed further components in the DSR model. The first study gave the insight that simple questions on commitment or progress can form frameworks in an individual's mind that will effect future behaviour choices. Asking questions is a natural part of the therapeutic relationship (Sommers-Flanagan & Sommers-Flanagan, 2015) and clinicians should be aware that simple questions on commitment or progress will invoke commitment and progress frameworks and these internal frameworks will have consequences for the client's behaviours.

This was also the first study to show the opposite effects of positive and negative feedback within and between commitment and progress frameworks in the clinical domain of PIU, specifying how positive feedback is not always good for goal compliance and how negative feedback can be used to induce positive goal compliance. The opposite effects provides clinicians with a useful tool in delivering therapy for behavioural change, as whether the reported client outcomes are positive or negative, the clinician can frame the situation in order to maximise the likelihood of avoiding future temptations and adhering to client goals.

The second study in this paper showed that different levels of engagement with a goal will lead individuals to favour commitment (low engagement) or progress (high engagement) frameworks that then leads them to ask themselves different questions

internally. When engagement levels are uncertain and low, individuals question if the goal is essential or even achievable and focus on their commitment, whereas when engagement is certain and high, individuals need not worry about commitment but rather are inclined to focus on their progress (Koo & Fishbach, 2008).

This component is of importance to clinicians as clients seek treatment with varying degrees of engagement and enthusiasm and are often ambivalent about change (Miller & Rollnick, 2012). That is, clients have low or high levels of engagement. As well as this, clinicians can spend a great deal of time attempting to move a person from low to high engagement. Results from this study suggest that clinicians can utilise the DSR model and recognise that individuals with low engagement are likely to have a commitment framework and will be best served by positive feedback. Perhaps counterintuitively, the theory informs that positive feedback is the incorrect feedback to give someone with a high level of engagement as they are more likely to internally be asking themselves progress questions and hence will form a progress framework that promotes balancing between goal congruent behaviours and temptations for positive feedback.

This study also verified that focusing on accomplished versus unaccomplished actions could be construed as positive or negative feedback respectively. Clinicians also engage in encouraging clients to begin, continue and complete their therapeutic goals. In doing that, they help clients to focus on accomplished or unaccomplished actions. Knowing how these different foci could be interpreted and what the consequences are for an individual with a commitment or progress framework seems relevant and highly important.

The third study in the second paper showed how individuals form different frameworks depending on their level of abstraction when thinking about their goal. When using a high-level abstraction, individuals will form a commitment framework, whereas when using a low-level abstraction, focusing on concrete steps, individuals will form a

progress framework. Clients and clinicians set goals during therapy, treatment plans are created, steps identified, and activities are undertaken to achieve the goals (Beck, 2011; Greenberger & Padesky, 2015; Harris, 2009; Miller & Rollnick, 2012; Young et al., 2003). If clients switch between commitment and progress frameworks depending on their level of abstraction when thinking about their goals it could lead to significant and divergent effects on treatment outcomes. Positive or negative performance and feedback could unwittingly induce the opposite effects in seemingly identical cases simply because of differences in levels of abstraction. It seems very appropriate that clinicians are informed about how and when commitment or progress frameworks are formed, so that they can, provide the appropriate feedback, teach their clients about what level of abstraction they are using, and teach the appropriate commitment or progress focus given positive or negative performances.

The third paper proposed that the DSR model could be adapted from a general population, evaluating behaviour intentions and validating its components, to measuring actual behaviour changes in a clinical population. A randomised control trial was implemented via the Internet to deliver the intervention online. Successful delivery of the intervention online holds several practical implications.

Almost two thirds of the world's population have access to the Internet (Internet World Stats, 2019). Smartphone ownership with Internet access is almost an equivalent proportion and actually higher for those aged 18-34 years of age (Taylor & Silver, 2019). Hence, the technology is available and delivery systems already exist to provide online interventions. Technological interventions are scalable, customisable, personalisable, and simply accessed, which offers great potential to improve health and well-being (Murray et al., 2016). Employing a person-based approach with target users of the intervention to involve them in development, testing and implementation can ensure usability, satisfaction and uptake of any final system (Maguire, 2001; Yardley et al., 2015). The DSR model can

be applied to numerous clinical domains where monitoring and directing behaviours is required.

It was noted throughout the first four studies that the social behaviours domain seemed resistant to the effects of the different components in the DSR model. It was proposed that the failure in this domain was brought about because the initial self-control dilemma was not identified in the first instance and thus no self-control resources were marshalled to affect behaviour evaluations (Fishbach & Converse, 2011; Myrseth & Fishbach, 2009). A self-control dilemma is defined as an internal conflict where a shorter-term goal or temptation endangers the attainment of a higher order and usually longer-term goal (Fishbach et al., 2003; Fishbach & Labroo, 2007; Fishbach & Shah, 2006; Fujita et al., 2016; Hofmann et al., 2009). It is a dual motive conflict where only one of the motives can be satisfied (Fujita, 2011). It was proposed that there was no self-control dilemma, because participants seemed unaware that Internet behaviours could interfere and be detrimental to social relationships. If this assumption is correct, then clinicians need pay special attention and establish if a motivational conflict exists between the behaviours in question in order to allow the theory to be applied successfully. Clinicians could help clients realise the self-control conflict using techniques such as motivational interviewing. For example, the motivational interviewing technique of developing discrepancy involves increasing a client's awareness of the consequences and negative aspects of current behaviours, and developing the discrepancy between current behaviours and their important goals (Miller & Rollnick, 2012).

6.4 Strengths and Limitations

There were several strengths to this series of studies. The methodological approaches and designs of the studies addressed several shortcomings in the PIU landscape and for research in general.

All three studies in Paper Two and the RCT study in Paper Three operationalized participants' focal behavioural goal as a reduction in personal Internet hours. Using the same construct reduces possible confounds and allows for easier comparison of effects between the four studies. Having a reduction of personal Internet hours as the focal goal in the three Paper Two studies made the decision and process to implement an online RCT with an intervention to reduce daily personal Internet hours relatively straightforward.

The methodological approach and design of the RCT study was undertaken in accordance with the CONSORT standards (Eysenbach & Group, 2011; Moher et al., 2012) and this rigour has been deficient in the field of PIU (King et al., 2011). The RCT study also targeted a population of individuals experiencing PIU symptoms, an approach that has been found wanting in the PIU area (Tokunaga, 2017). Furthermore, the RCT study employed an active control group to match and balance attention, beliefs and expectations between conditions, an approach that is sometimes lacking for research in general (Boot et al., 2013; Christensen et al., 2004; Simons et al., 2016).

The RCT study employed a linear mixed effects model in an attempt to overcome attrition and adherence issues. Linear mixed effect models give more statistical power than other techniques, can handle unbalanced longitudinal data, and are equipped to accommodate missing values at the various time-points, allowing for every participant data point to contribute to the analysis (Egbewale et al., 2014; Magezi, 2015; Meteyard & Davies, 2020; O'Connell et al., 2017). Employing this statistical approach was a strength as it enabled the opportunity for all data to be counted and maximised the chance of finding any effects from the intervention.

The research thesis was able to achieve its aims of situating the DSR theory in a clinical domain and affecting positive clinical outcomes, and this is a significant strength.

The sequence of studies was not without their limitations. The DSR model components tested in the studies failed to affect the social behaviours domain. It was

hypothesised that no self-control dilemma existed for individuals in this domain and therefore a conflict between behaviours was not identified that would affect appraisals and provoke changes to behaviour choices (Fishbach & Converse, 2011; Myrseth & Fishbach, 2009). That is, a self-control dilemma was not identified as the proximal and distal motivations for the behaviours were equal and did not signal a divergence (Fujita, 2011). The scope of the current thesis meant that this hypothesis was not able to be tested and leaves questions outstanding. This hypothesis could be tested by teasing apart the importance of social behaviours in regards to their temporal distance and measuring their importance to individuals at proximal and distal points.

The Internet behaviour stimuli used in papers one and two intended to insulate themselves from those that served social functions and, as such, actions such as use Facebooks or similar social networking sites were specifically excluded. However, the Internet, its functions and activities are ever growing and evolving (Australian Communications and Media Authority, 2014; comScore, 2017; Internet World Stats, 2019) and online gaming is now considered more mainstream, with a large component of its function for individuals in providing social affiliation and teamwork (Billieux et al., 2013; Ryan et al., 2006; Yee, 2006). As such, the premise that online gaming has no overlap with social functions as considered in the first and second papers may no longer be accurate. Any replication of these studies should consider removing “play your favourite online game” from the internet actions set of items.

The Internet behaviour items may have also been unbalanced in terms of their gender preferences and time spent in pursuing them. For example, online shopping is a behaviour more preferred by females and whereas males more prefer online gaming (Kim & Davis, 2009). Additionally, gamers spend more time online than shoppers with ecommerce sales exceeding three trillion US dollars in 2019 indicating differences in negative life outcomes for different Internet activities (Kemp, 2020).

Mobile phone usage has dramatically increased in recent years and social networking applications hold four of the top five most popular applications of people aged 18-24 (comScore, 2017). It seems apparent that separating social activities from Internet behaviours may be problematic. Future studies should consider the new ways individuals are accessing the internet and the new and different ways individuals are now spending their time.

Construal level theory states that information is construed at a high level when it is represented in terms that are abstract, simple, decontextualized, primary, superordinate, and goal relevant, whereas low-level construals are represented as concrete, complex, contextualised, secondary, subordinate and goal irrelevant (Trope & Liberman, 2003). Examples of this in a social domain are statements such as “maintaining friendships” versus “talking to a friend today” or “feeling connected to someone” versus “listening to a friend discuss what happened to them today”. A study could collect rating values of those statements. High-level statement ratings would give a distal value and low-level statement ratings would give a proximal value. If the values are approximately equal then this may explain how self-control dilemmas were not activated for individuals as they would be less likely identify a self-control conflict (Fishbach & Converse, 2011; Fujita, 2011).

The online RCT study suffered from adherence (participants not engaging in the complete intervention) and attrition (participants failing to complete the intervention) issues. Study attrition and adherence pose threats to internal validity as they potentially affect the random configuration and balance of the study groups, external validity as the study population becomes skewed towards those who report the most data, and statistical validity as they can substantially reduce the sample size resulting in loss of statistical power (Donkin et al., 2011; Li et al., 2015; Linardon & Fuller-Tyszkiewicz, 2020). Attrition and adherence problems can also impact the ability to assess the efficacy of the intervention and properly measure the dose-response rate or how many sessions are

required to induce a lasting effect (Donkin et al., 2011; Linardon & Fuller-Tyszkiewicz, 2020). For example, results from the RCT study showed that at day 18 the experimental group started to diverge with statistical significance from the active control group in its effectiveness. This suggests that a 21-day (or 3 week) intervention would be sufficient to realise change but perhaps this is an unreliable conclusion due to attrition and adherence issues skewing the data. Involving intended users in a person-based approach in development, testing and implementation could ensure usability, satisfaction and observance of future studies that may limit attrition and adherence issues (Maguire, 2001; Yardley et al., 2015). Future studies that employ different intervention lengths could help determine the optimum amount of sessions required to produce a persistent effect.

Empirical research on the DSR theory normally tests one or two components of the model at a time. Typically, it is a framing factor combined with a feedback factor. These designs have obvious advantages in eliminating confounding variables. However, they are limited in that cannot necessarily assess or measure any interactions of components in the model. It is possible that once combined, different components could begin to act as mediators or moderators for others. Indeed, once combined, some components may even become redundant features offering no further effects than a single component. For example, does using multiple framing components increase the strength of the frame and which components apply the greatest influence on framing strength? Similar questions can be raised for feedback cues such as: are more feedback cues better, do feedback cues begin to fight with each other, or do feedback cues become redundant after a certain number? These are important questions as the answers can directly inform and influence therapeutic approaches. The RCT study employed four components of the model. Framing cues were questions on commitment or progress, presentation format (presenting choices as competing or complementary), and focusing on the abstract goal versus concrete plans. The single feedback cue was daily personal Internet hours compared to the previous day's

value calculated to provide success or failure feedback. Without undertaking moderator and mediator analysis there is no easy way to tell which factors provide the most effect and what strengths they each provide (Baron & Kenny, 1986) and this is a limitation of the presented studies.

PIU is recognised as a worldwide phenomenon (Tokunaga, 2017; Tokunaga & Rains, 2016; World Health Organization, 2015). Only individuals with English as their first language were permitted as research by Dunbar et al. (2018, Study 1) showed that commitment or progress frameworks were not primed for participants for whom English was not their first language. This was a limitation of these studies and given the extent of PIU across the globe, future research should examine if the current findings can be replicated in languages other than English. This could be addressed in the first instance by direct translation into other languages. Another option could be to enlist bilingual participants and run them through a series of studies in English and other languages separately. Comparable results across languages would indicate that the commitment and progress frameworks of the DSR model work equally in other languages.

6.5 Future Research Directions

There are several possible directions for future research. At a practical level, it would be reasonably straightforward to restructure and repeat the online RCT intervention with a larger sample size. This could yield a number of immediate positive outcomes. Firstly, research could replicate the results of the current thesis and provide substance to support using the DSR model in a clinical domain. Secondly, it could be structured with moderator and mediator analysis in mind so that this analysis could be undertaken to provide information about the strengths and effects of different factors in the model. Thirdly, different intervention lengths could be employed to determine the dose-response rate or how many sessions are required to produce a persistent effect. Finally, more

comprehensive follow ups than six weeks (e.g. six or twelve months) could be employed to give a better measure of the long-term effectiveness of the intervention.

It would be of definite interest to complete the evaluation of the DSR model in a clinical domain and test the remaining factors of group identification, mood, and future plans and optimistic expectations. The domain of PIU seems an obvious choice to begin with. Secondly, undertaking moderator and mediator analysis to assess how factors from the model interact and what strengths they respectively offer also seems necessary and appropriate as those answers can directly inform therapeutic approaches. Third, it is important to apply the theory to other clinical areas such as those noted earlier in this chapter.

The results from the current series of studies could inform other therapeutic approaches and could immediately be implemented in their existing frameworks. The opposite effects between and within commitment and progress frameworks offer flexibility for clinicians to motivate client behaviours.

For example, setting, implementing, monitoring and adhering to homework underpins cognitive behavioural therapy and clients come to homework assignments with varying degrees of enthusiasm and willingness (Beck, 2011). The DSR model suggests individuals with low engagement are likely to have a commitment framework and will be best served by positive feedback whereas a highly engaged client will not worry about their commitment but instead focus on their progress. In that case, positive feedback will engage balancing and is the incorrect feedback to provide. As client engagement levels change, so can the clinician's approach to providing and framing feedback.

The DSR theory may not only be applied to the process of homework but also to assignments within the homework. For example, behavioural activation is an essential activity that is often set in a variety of therapies and is frequently a struggle for clients to engage with and carry out (Beck, 2011; Greenberger & Padesky, 2015; Harris, 2009;

Reichenberg & Seligman, 2016; Resick et al., 2016). Tailoring a program given a client's engagement, level of goal adherence, focusing on accomplished versus unaccomplished actions, initial goal success or failure, and focusing on the abstract goal versus concrete plans would provide enormous flexibility and opportunity for clinicians to motivate and engage clients. The DSR model seems ideally suited to a variety of therapeutic needs.

6.6 Final Comments

This research took a novel and promising model of the DSR that, up until now, had been mainly verified in the consumer and marketing domains, and tested it in the important clinical domain of problematic Internet usage. Through a series of studies, individual components were verified as effective in shifting behavioural evaluations in student populations. Further validation of the model was produced by the implementation of an online DSR theory driven RCT intervention delivered to a population of individuals classified with PIU that affected real-world behaviours.

It is hoped that the research presented herein will promote greater methodological rigour in studies on PIU, stimulate further research using the DSR model in other clinical domains, and perhaps enable the immediate adoption of various components of the DSR model into existing therapeutic approaches.

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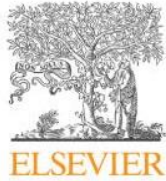
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Problematic internet usage self-regulation dilemmas: Effects of presentation format on perceived value of behavior



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ABSTRACT

A model of the dynamics of self-regulation describes two patterns of commitment or progress that individuals may follow when selecting goal directed behaviors. In the commitment pattern, individuals are more likely to highlight congruent goal behavior choices while in the progress pattern individuals are more likely to balance between incongruent and congruent goal behavior choices. This study set out to test the model in the context of problematic Internet usage. After being primed about problematic Internet usage, a sample of 97 undergraduate university students completed an online survey rating the value of Internet, academic and social-related behaviors across three conditions. The three conditions paired behaviors so that they appeared to complement each other, appeared to compete against each other, and presented them individually. Results showed that Internet behaviors were rated more highly when presented as complementary than when presented as competing, supporting the prediction that presentation format primes progress and commitment frameworks and leads to higher ratings of incongruent goal behavior in the progress condition. While results did not fully support the model's predictions regarding congruent goal behavior, they were in the predicted direction with small to moderate effect sizes. This study may inform clinical interventions by suggesting that individuals experiencing issues with problematic Internet usage would benefit from framing self-regulatory dilemmas in a competing format.

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1. Introduction

A research program conducted by Ayelet Fishbach and colleagues over the last decade has investigated a dual representation model of goal directed behavior (Fishbach & Shen, 2014; Fishbach, Zhang, & Koo, 2009). This novel research investigating the simultaneous pursuit of multiple goals and temptations and the effects on subsequent behavioral outcomes has uncovered many processes and variables contributing to the dynamics of self-regulation. At the heart of their research is the fundamental proposition that goals can be represented as commitment to, or progress towards, a desired end state, and that these two representation frameworks

drive different behavioral choices (Fishbach & Dhar, 2005). For a brief overview see Table 1 and for a more comprehensive discussion see Fishbach and Zhang (2009).¹

A commitment framework promotes highlighting of the focal goal instead of temptations (or incongruent goal behaviors) and leads to more goal congruent behavioral choices, whereas a progress framework promotes balancing choices between the focal goal and other goals or temptations, leading to the likelihood of fewer goal-congruent choices and more goal-incongruent outcomes (Fishbach & Dhar, 2005). These two representational frameworks can be primed by a variety of processes and factors (Fishbach et al., 2009). To date, the frameworks have been utilized in marketing and consumer studies (Campbell & Warren, 2015; Fitzsimons, Chartrand, & Fitzsimons, 2008; Wilcox, Vallen, Block, & Fitzsimons, 2009) but have yet to be applied in a clinical setting. The present study seeks to apply the theory in a clinical context: specifically, the domain of problematic Internet usage (PIU).

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¹ The term model is used throughout the paper in reference to the overall concepts, hypotheses, and principles described by the self-regulation theories developed by Fishbach and colleagues. The term framework is used in reference to the two mental representation frames that an individual can adopt of commitment or progress; as predicted by the model.

Table 1

Dynamics of self-regulation model: Commitment and progress representations overview.

Representation	Commitment to the focal goal	Progress towards goal end state
Promotes	Highlighting of the focal goal	Balancing between all goals
Leads To	Emphasizing the focal goal at the cost of alternate goals (temptations).	Valuing alternate goals (temptations) as well as the focal goal.
Causing	Focal goal behaviors increase in perceived value. Alternate goal behaviors (temptations) consequently decrease in perceived value.	Alternate goal behaviors (temptations) increase in perceived value. Focal goal behaviors consequently decrease in perceived value.

1.1. Problematic internet use

Problematic Internet usage is a growing and global public health concern (Jelenchick et al., 2014; Spada, 2014) and despite the first published case being recorded in 1996 (Young, 1996), psychological research has not kept up with the technological advances (Aboujaoude, 2010) and growing popularity of Internet usage (World Internet Users and 2014 Population Stats, 2014). Mobile platform penetration has reached more than 90% worldwide with almost 7 billion mobile subscriptions (International Telecommunication Union, 2014). Mobile Internet usage recently surpassed desktop usage illustrating that individuals have more and more constant internet access (Australian Communications and Media Authority, 2014; comScore, 2014).

Psychological research on PIU has blossomed in recent years, but there is still not enough known about PIU to draw anything other than preliminary conclusions (Winkler, Dorsing, Rief, Shen, & Glombiewski, 2013). New terms are being proposed for the Diagnostic and Statistical Manual of Mental Disorders (DSM), such as *nomophobia* (fear of being without a mobile device) to describe issues individuals are experiencing (Bragazzi & Del Puente, 2014) with smartphone addiction a rising concern (Pavia, Cavani, Di Blasi, & Giordano, 2016; Samaha & Hawi, 2016; Sapacz, Rockman, & Clark, 2016; Wang, Wang, Gaskin, & Wang, 2015). Even with the rise in research there is still yet to be consensus in the literature, with problematic Internet usage also known as Internet addiction, pathological Internet use and Internet dependence (Spada, 2014). Despite a lack of consensus overall, numerous studies have shown excessive use of the Internet is associated with poorer academic achievement and personal relationship quality for adolescents and young adults (Aboujaoude, 2010; Jelenchick et al., 2014; Lopez-Fernandez, Honrubia-Serrano, Freixa-Blanxart, & Gibson, 2014; Muusses, Finkenauer, Kerkhof, & Billedo, 2014; Wang, Jackson, Gaskin, & Wang, 2014; Yau, Potenza, & White, 2013).

1.2. Fishbach research program and model

The research program conducted by Fishbach and colleagues identified many processes and variables that influence the dynamics of self-regulation. These include the following:

- the type of feedback that is sought and offered when under commitment or progress framings (Fishbach & Dhar, 2005; Fishbach, Eyal, & Finkelstein, 2010);
- high versus uncertain commitment to a goal, and focusing on accomplished goal progress or unaccomplished goal progress (Koo & Fishbach, 2008, 2012);
- focusing on an abstract or high level goal versus an individual sub-goal or concrete action when receiving positive or negative feedback (Fishbach, Dhar, & Zhang, 2006);
- future expectations of goal progress (Zhang, Fishbach, & Dhar, 2007);
- the influence of mood attribution towards success or failure of goal attainment (Fishbach & Labroo, 2007); and
- how presentation format can affect how two behaviors can be perceived (Fishbach & Zhang, 2008).

It is the last factor, presentation format, which will serve as the starting point for testing the theories in a clinical context. Presentation format can be established with no interaction with other processes or variables in the model, which allows us to test the fundamental principle of highlighting and balancing and the effect those dynamics have on subsequent behavioral choices in the new clinical context.

1.3. Current study context from model

Previous research (Fishbach & Zhang, 2008) has found that presentation format can prime the two representational formats such that when different behavioral choices were presented and arranged so that they appeared to complement each other a pattern of balancing was promoted (a progress framework), but when the choices were arranged so that they appeared to compete against each other a pattern of highlighting (a commitment framework) was promoted. The respective primed progress and commitment representations then resulted in higher evaluations of goal-incongruent behavior compared to goal-congruent behavior in the progress group and lower goal-incongruent evaluations of behaviors compared to goal-congruent behaviors for the commitment group (Fishbach & Zhang, 2008).

1.4. Why self-regulation is important

Self-regulation dilemmas are a common daily occurrence (Baumeister, Vohs, & Tice, 2007), for example: “Should I have the chocolate cake or do I go for the salad?” or “Should I surf the Internet right now and then study for my exam?” Given the ubiquity of the Internet in modern living (World Internet Users and 2014 Population Stats, 2014) it seems unrealistic that the final goal for any treatment of problematic Internet usage would be complete abstinence. Therefore, a more likely intervention approach would be directed at some form of moderation training and this treatment would involve developing and implementing behavioral strategies for coping with self-regulation dilemmas (Rotgers, 2004). Factors that decrease the likelihood of incongruent goal actions and increase the likelihood of congruent goal actions would be promoted in such an intervention.

Throughout any intervention, clinicians ask questions and provide feedback to clients (Beck, 2011; Miller & Rollnick, 2012). If the presentation format of the question and feedback can sway later behavioral choices of the client then it is important for a clinician to know how to present the questions and feedback in order to ensure the best possible results.

1.5. The present research

The present study sought to apply the dynamics of this self-regulation model in a clinical context by looking at the basic premise of highlighting (a commitment framework) or balancing (a progress framework), asking if they can be primed by presentation format, and determining if those two representations produce opposite behavioral outcomes as predicted by the model. A goal to reduce personal Internet usage was primed by way of reading a

vignette on PIU (Förster, Liberman, & Friedman, 2007; Laham & Kashima, 2013). Maladaptive outcomes for academic/work and social functions both result from PIU (Aboujaoude, 2010) and these two activities are likely to be important to individuals in general. Indeed, a pilot study testing the operationalization of variables and design used to test the model in a clinical context established these two activities as especially important to the target population of undergraduate university students. Therefore, the incongruent goal behavior for the study is personal Internet usage and two congruent goal behaviors are academic and social behaviors. Using the two domains of academic and social behaviors to test the model's predictions adds weight to the ability to generalize from the results and so both are included.

Adopting the approach of Fishbach and Zhang (2008) that an individual's motivational priority is reflected by the value placed on items (Brendl & Higgins, 1996; Ferguson & Bargh, 2004; Touré-Tillery & Fishbach, 2014), the present study tested the hypothesis that when behavior actions are presented in a complementary format this will prime a progress representational framework and individuals will rate incongruent goal behaviors more highly than when presented in a competing format. We also tested the hypothesis that when behavior actions are presented in a competing format this will prime a commitment framework and individuals will rate congruent goal behaviors more highly than when presented in a complementary format.

2. Method

2.1. Participants

One hundred and five undergraduate psychology students (73 female, 32 male) participated in the study in exchange for course credit. Eight participants failed to complete the survey and were excluded from the final dataset leaving a final $N = 97$. The gender of participants did not yield any effects and is therefore omitted from further consideration. Participants ages ranged from 17 to 57 ($M = 20.97$, $SD = 7.42$). Ethical approval was granted by the University's Human Research Ethics Committee. No personal identifying information was collected.

2.2. Design

The current study's procedure and design was adapted from a study by Fishbach and Zhang (2008) that tested how the presentation format of goal congruent and goal incongruent items affected subsequent behavior evaluation and choice. Stimuli from Fishbach and Dhar (2005) that utilized academic and social behavior items were adapted and extended to form a set of behavior items mapping to Internet, academic and social domains.

The independent variable was presentation format and the dependent variables were the motivation to perform congruent goal actions or incongruent goal actions. In line with the problematic Internet usage context, incongruent goal behavior was operationalized as Internet behavior, and keeping in line with the target population and verified by a pilot study, congruent goal actions were operationalized as academic and social behaviors.

Presentation format was represented as *complementary*, with actions presented such that they appeared to complement each other, *competing*, with actions presented such that they appeared to compete against each other, and *single*, with actions presented individually. Dependent variables of interest were the motivation to perform congruent goal actions or incongruent goal actions.

Motivation to perform congruent goal actions or incongruent goal actions was captured using perceived value of a behavior item using a 7-point Likert scale (1 – Very Negative to 7 – Very Positive)

as used by Fishbach and Dhar (2005) and Fishbach and Zhang (2008).

2.3. Stimuli

Behavior items from Fishbach and Dhar (2005) that utilized academic and social behavior items were adapted and extended, thus creating a set of behavior items mapping to Internet, academic and social domains. Each statement was simple in nature and designed such that it clearly represented a behavior in the intended domain. In order to minimize the risk of some Internet actions being perceived by participants as social in nature, social networking sites, such as Facebook, were not used. The list of behavior action items is displayed in Table 2.

To conceal the purpose of the study nine filler behavior items such as “go to the supermarket to buy some groceries” and “do your weekly laundry” were created. This was done so that the final presented list of behavior action items would look like a normal set of actions that any student would encounter on a typical day. That is, study, socialize, use the Internet, do some chores, and other daily life activities.

In the Complementary condition the action statements were combined using the conjunction “and then”, were presented in a single sentence, but were combined in such a way as each behavior was always on its own line (see Fig. 1). In the Competing condition the action statements were combined using the conjunction “or”, were presented in distinct statements, and notably separated from each other (see Fig. 2).

Each of the four Internet behavior action items were paired with the four academic items giving 16 pairs and each social behavior action item giving another 16 pairs. Another 28 pairs of filler behavior action item statements were created so that each participant received 60 pairs of action statements (16 Internet and Academic pairs, 16 Internet and Social Pairs, 28 Filler pairs). The order of action items was randomized such that half of the time the Internet action item was presented first in the pairing and half of the time the Academic or Social action was presented first. The first two behavior pairs were always randomized filler pairs. The remaining behavior pairs were presented in random order. After reading each action statement pairing, participants were asked the question: “Please indicate how you would rate the value (from 1–Very Negative to 7 – Very Positive) of the following actions”. Participants then rated the value of each of the two actions on separate 7 point scales.

It can be noted that the only differences in stimuli between Complementary and Competing conditions was the conjunction used to combine the individual action statements and the space dividing them.

In the single condition each action statement was presented on its own page. The first two action items were always randomized filler behavior action items. The remaining order of the behavior action items was randomized. After reading each action statement participants were asked: “Please indicate how you would rate the value (from 1–Very Negative to 7 – Very Positive) of the following action”. Participants then rated the value of each action on a 7 point scales. The single condition presented the four Internet, Academic and Social action statements as well as eight filler action statements individually for a total of 20 actions statements.

2.4. Procedure

A between-participants design used three presentation formats (complementary, competing and single), the main dependent variables were incongruent goal behavior operationalized as Internet behavior ratings, and congruent goal behaviors were captured by

Table 2
Behavioral action item stimuli sets in social, academic and internet domains.

Domain	Behavior action Item
Social	<ul style="list-style-type: none"> • Hanging out with friends at a café, bar or restaurant. • Attending an event (e.g. movie, play, or concert) with friends. • Sitting with friends at lunch or during a break.
Academic	<ul style="list-style-type: none"> • Helping a friend (or friends) celebrate a special achievement. • Studying for a quiz for a key course you are taking. • Preparing for an upcoming tutorial for a key course you are taking. • Working on a paper for a key course you are taking.
Internet	<ul style="list-style-type: none"> • Reading an important chapter or paper for a key course you are taking. • Play your favorite online game. • Watching videos from your favorite channels, feeds or suggestions on YouTube or other similar sites. • Browsing through shopping websites that you like. • Surfing the net or using your favorite sites, or reading blogs, etc.

You spend some time hanging out with friends at a café, bar or restaurant and then browse through shopping websites that you like.

Fig. 1. Presentation format: Complementary condition.

You spend some time hanging out with friends at a café, bar or restaurant
OR
Browse through shopping websites that you like.

Fig. 2. Presentation format: Competing condition.

ratings of academic and social behaviors.

Participants took the survey using SurveyMonkey at their convenience. The first part of the study gained consent and gathered basic demographic information. In order to prime participants' goals they were asked to read a short (280 word) literature review on problematic Internet usage. The literature review was presented as part of a pilot for an unrelated study and some simple questions were asked after reading to further enhance its image of being part of a separate research project. Participants were then instructed that the real experiment was about to begin and clicked a link which took them to a new window.

Two randomized filler stimuli were always presented first in each condition in order to help obscure the purpose of the study and all subsequent stimuli were presented randomly. After completing the rating portion, participants were asked to describe what they thought the study was investigating, were thanked for their participation and dismissed. Analysis of the provided descriptions revealed that none of the participants were able to determine the true intent of the study.

3. Results

The value ratings for responses to the 16 academic and Internet paired items as well as for the responses to the 16 social and Internet paired items were averaged to give a single mean rating or value for each participant on Internet actions (when paired with academic actions), academic actions, Internet actions (when paired with social action), and social actions. This was done in both the complementary and competing conditions. In the single condition, the four value ratings for Internet, social and academic items were averaged for each participant to give a single mean value for each

participant across each domain. Descriptive statistics are presented in Table 3. Analysis is reported separately for Academic and Social domains for clarity.

3.1. Academic versus internet behavior

A one-way between subjects ANOVA was conducted to compare the effect of presentation format on Internet behavior value ratings in complementary, competing and single presentation format conditions. There was a significant effect of presentation format on Internet behavior value ratings at the $p < 0.05$ level for the three conditions, $F(2, 94) = 3.17, p = 0.047$. A contrast analysis revealed that in the complementary condition participants rated the value of Internet behaviors higher than in the competing condition, $t(64) = 2.50, p = 0.016$. Further, Cohen's effect size ($d = 0.62$) was moderate in size. There was no significant difference in the value of Internet behaviors between the single condition and either complementary or competing conditions, with Cohen's d values of 0.29

Table 3
Descriptive statistics for internet, academic and social behavior value ratings.

Condition	N	Internet (Academic)		Internet (Social)		Academic		Social	
		M	SD	M	SD	M	SD	M	SD
Complementary	34	5.05	1.07	5.04	1.11	4.09	1.56	6.11	0.84
Competing	32	4.29	1.39	4.18	1.28	4.80	1.49	5.95	0.76
Single	31	4.74	1.21	4.74	1.21	4.75	1.36	5.56	1.02

Note: In the Single condition there were no pairings of Internet behaviors. Therefore there is only a single data group for Internet ratings. This single value has been repeated in the table as Internet (Academic) and Internet (Social) values for completeness.

and -0.34 respectively, indicating small effects. Taken together, these results support the hypothesis that incongruent goal actions will be more highly valued when presented together than when presented apart (see Fig. 3).

A one-way between subjects ANOVA revealed no significant effect of presentation format on academic behavior value ratings, $F(2, 94) = 2.37, p = 0.10$. The values for each condition showed some support for the hypothesis (see Fig. 3), with academic behaviors being valued less in the complementary condition than in the competing condition and the single condition. Cohen's effect size calculations showed these differences were both approaching a moderate size (complementary versus competing, $d = -0.47$ and complementary versus single, $d = -0.45$) and were in the predicted direction.

3.2. Social versus internet behavior

A one-way between subjects ANOVA was conducted to compare the effect of presentation format on Internet behavior value ratings in complementary, competing and single presentation format conditions. There was a significant effect of presentation format on Internet behavior value ratings at the $p < 0.05$ level for the three conditions, $F(2, 94) = 4.26, p = 0.017$. A contrast analysis revealed that in the complementary condition participants rated the value of Internet behaviors more highly than in the competing condition, $t(64) = 2.50, p = 0.005$. Further, Cohen's effect size value ($d = 0.74$) suggested this difference was moderate to large in size. There was no significant difference in the value of Internet behaviors between the single condition and either complementary or competing conditions, with Cohen's d values of 0.27 and -0.45 respectively indicating small effects. Taken together, these results support the hypothesis that incongruent goal actions will be more appealing when presented together than when presented apart (see Fig. 4).

A one-way between-subjects ANOVA revealed a significant effect of presentation format on social behavior value ratings, $F(2,$

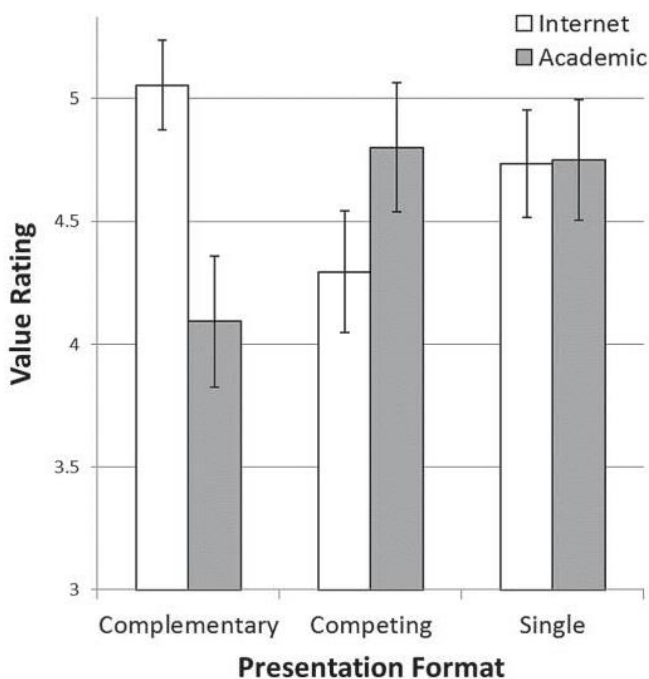


Fig. 3. Internet and Academic Mean Value Ratings Across Conditions. Error bars represent standard errors.

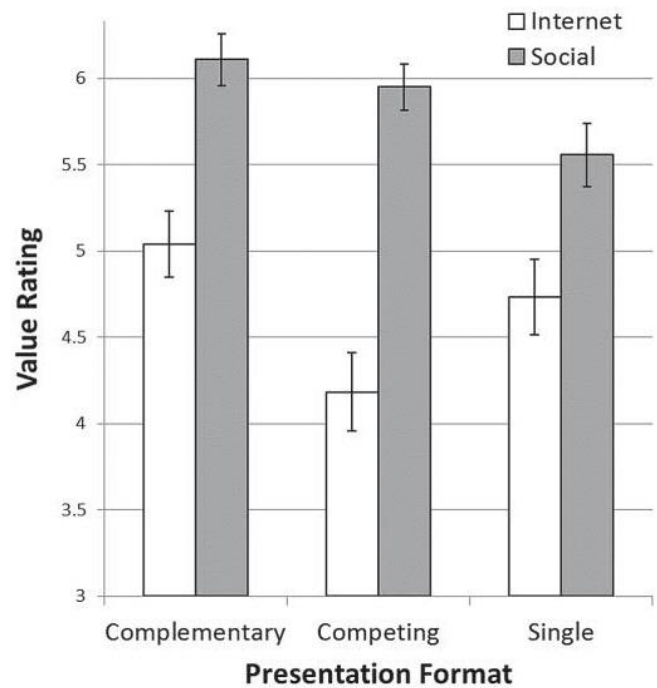


Fig. 4. Internet and Social Mean Value Ratings Across Conditions. Error bars represent standard errors.

$94) = 3.31, p = 0.041$. A contrast analysis revealed that in the complementary condition participants rated the value of social behaviors higher than in the single condition, $t(63) = 2.36, p = 0.02$. Further, Cohen's effect size value ($d = 0.60$) suggested this difference was moderate in size.

There was no significant difference in the value of social behaviors between the competing condition and either complementary or single conditions, with Cohen's d values of 0.20 and 0.45 respectively indicating small effects. These results do not support the hypothesis that congruent goal actions will be more appealing when presented apart than when presented together (see Fig. 4).

4. Discussion

Considerable research has been conducted into goal directed behavior and self-regulation but a recent model has been developed that deals with the more real world self-regulation dilemma of battling multiple goals and temptations simultaneously and over the course of many decisions (Fishbach et al., 2009). The model has primarily been applied to a consumer and marketing context and the present study set out to translate the model into a clinical context. Specifically, we set out to determine if the presentation format component of the model on the dynamics of self-regulation would translate into a context of problematic Internet usage.

The model predicted that when goal incongruent and congruent actions are presented together and appear to complement each other, goal incongruent actions will be valued more highly than when the same actions are presented apart and appear to compete against each other. On the other hand, when goal incongruent and congruent actions are presented apart and appear to compete against each other, goal congruent actions will be valued more highly than when the same actions are presented together and appear to complement each other.

We tested these predictions across academic and social domains using Internet usage as the incongruent behavior. Results showed

that the representational frameworks of commitment induced highlighting and progress induced balancing can be primed by presentation format. Further to this, these representational frameworks lead to different evaluations of behavior. Higher value ratings were given on Internet behaviors for the complementary condition compared to the competing condition, confirming the model predictions against both academic and social domains. The effect sizes were moderate to large, suggesting that the effect may have clinical utility.

The adaptive outcomes the model predicted for goal congruent behaviors were not supported, but neither were they rejected. The academic domain showed values in the predicted direction and effect sizes approaching moderate magnitude, but the differences were not statistically significant.

The social domain showed a positive effect in congruent goal behavior ratings for competing and complementary conditions compared against the single condition, but there was no difference between the complementary and competing formats. This does not appear to be due to a failure in the design or lack of priming as the predicted effects were found in the Internet and academic domains. It is therefore more likely that presentation format did not impact individual's appraisal of their social actions value. This perhaps implies that the participants were not actually in a self-control dilemma when considering the social behavior items (Fujita, 2011). Another possible explanation for this is that individuals awarded social behaviors both high immediate and high long term value. Social behaviors would then be able to serve both as enjoyable short term temptations in the present as well as fulfilling long term goals and would therefore be immune to the effects of balancing and highlighting. Future research could consider how to investigate this discrepancy with the model.

From a clinical standpoint, resolving self-regulatory dilemmas in a constructive manner would include behavioral strategies for decreasing incongruent goal actions and increasing congruent goal actions (Beck, 2011; Harris, 2009). Results of this study suggest that individuals experiencing issues with problematic Internet usage may benefit from framing self-regulatory dilemmas in a competing format. These effects may generalize to other clinical domains such as problematic drinking or gambling.

4.1. Limitations of the study

The effect predicted by the model was found for the incongruent Internet behavior. However, there was partial support for the congruent academic behavior and contradicting results in the social actions. The goal to reduce personal Internet usage was primed using a literature review on PIU which, while accurate, deliberately placed emphasis on the problems surrounding spending too much time and the detrimental effects that had on work, academic, social and other life outcomes. There may have been insufficient emphasis placed on positive academic and social outcomes in order to adequately prime them as goals for participants. Future work could ensure that equal weight was given to priming not only the incongruent goal behaviors but also the congruent goal behaviors.

The study was conducted via an online survey given to a general population of University undergraduates which limits the ability to generalize the results as being applicable to reducing actual problematic internet usage behavior in a clinical population. Added to this, the presentation of the behaviors were distinguished by either an "or" or "and then" conjunction. It is unclear if these kinds of simple constructions and distinctions can be delivered in a clinical practice or if they can be made within an individual dealing with problematic internet usage. Future studies may address these concerns.

4.2. Future research

The current study has shown that fundamental components of the dynamics of self-regulation model proposed by Fishbach and colleagues can be applied in a clinical domain. The commitment and progress representation formats can be primed and this does lead to opposite effects in behavioral ratings. Future research could test this effect in a clinical population of individuals with problematic Internet usage. Future studies are also required to test other components of the model which could better inform clinical interventions. These might be additional progress or commitment framing cues, such as whether asking questions about goals can prime either a commitment or progress representations, whether focusing on accomplished or unaccomplished tasks affect the representation frameworks for a client, and how providing feedback on goal accomplishments may affect future behavior choices, depending on what representation framework the client holds. During the course of treatment clinicians provide much feedback to clients and this can take many forms (Beck, 2011; Miller & Rollnick, 2012; Page & Stritzke, 2006). If the words chosen when simply asking clients about their current state, summarizing progress towards a goal, emphasizing current accomplishments or future work influences subsequent behavioral choices a client makes then it is important for a clinician to know how to frame the questions and feedback in order to ensure the best possible outcome for the client that is in line with the client's stated goals.

5. Conclusion

This study has begun the investigation of the opposite effects of goal commitment and progress representational frameworks and their effects on behavioral choices in the context of the self-regulation dilemma of problematic Internet usage. Results showed that the representational frameworks of commitment induced highlighting of goal congruent behaviors and progress induced balancing between goal congruent and incongruent behaviors can be primed by presentation format. These representational frameworks cause different evaluations for incongruent goal behaviors with undesirable outcomes for the complementary presentation format condition. The predicted effect for goal congruent behaviors was not supported but there was encouraging evidence in the academic domain. The model developed by Fishbach and colleagues explaining the dynamics of self-regulation shows potential to have positive influences on the processes for implementing psychological interventions. When faced with a self-regulation dilemma of goals versus temptations, framing behavior choices in a competing format will produce more goal behaviors and less succumbing to temptation.

Disclosure statement

No competing financial interests exist.

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Problematic Internet Usage self-control dilemmas: The opposite effects of commitment and progress framing cues on perceived value of internet, academic and social behaviors.



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ABSTRACT

Problem Internet Usage (PIU) is a growing public health concern and despite an upsurge in research, there is limited information regarding effective psychological interventions. A model of the dynamics of self-regulation may provide a useful framework for psychological intervention with PIU. The model describes two patterns that individuals may follow when choosing goal directed behaviors, according to whether they hold commitment or progress frameworks. The model explains and predicts how opposite behavior outcomes can be achieved by holding commitment or progress frameworks.

Three online studies tested the model in the context of PIU using a student population. Incongruent goal behavior was operationalised as internet activity and congruent goal behaviors as academic and social activities. Study 1 (N = 173) tested priming of commitment or progress frameworks and examined what effects positive and negative feedback had on subsequent behavior intentions. Study 2 (N = 167) examined high versus uncertain goal engagement priming effects and whether focusing on accomplished or unaccomplished actions produced the opposite behavior intentions. Study 3 (N = 172) tested if focusing on an abstract goal versus concrete steps would prime commitment or progress frameworks.

Results supported the model's predictions for the framing cues and subsequent opposite behaviors for internet and academic activities with moderate and large effects. No support was found for predictions of social activities. Results of the study provide support for the self-regulation model in a clinical domain. Results may inform clinical interventions for PIU, demonstrating how opposite behavior outcomes may be achieved for the same scenarios given different underlying mental frameworks, and indicating how those frameworks may be cued in the first place.

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1. Introduction

The ubiquity of Internet usage in our societies has given rise to a modern self-control dilemma of problematic Internet usage (PIU) and this is receiving much recent attention in the scientific community. Numerous studies have shown that excessive use of the Internet is associated with unfavourable consequences such as poorer academic achievement and personal relationship quality (Aboujaoude, 2010; Spada, 2014; Škařupová, Ólafsson, & Blinka, 2015). A model of the dynamics of self-regulation developed by

Ayelet Fishbach and colleagues over the last decade (Fishbach & Dhar, 2005; Fishbach & Zhang, 2008, 2009; Fishbach, Dhar, & Zhang, 2006; Fishbach, Zhang, & Koo, 2009; Koo & Fishbach, 2008; Zhang, Fishbach, & Dhar, 2007) may be usefully applied to Problematic Internet Usage. This model describes contrasting patterns of commitment or progress frameworks that individuals may follow when selecting goal directed behaviors. To date, the model has mainly been applied in marketing and consumer research (Campbell & Warren, 2015; Fitzsimons, Chartrand, & Fitzsimons, 2008; Wilcox, Vallen, Block, & Fitzsimons, 2009). However, recent research by Dunbar, Proeve, and Roberts (2017) showed that fundamental components of the model can be applied in the clinical domain of PIU. The present study seeks to develop application of the model further by conducting an investigation of additional aspects of the theory in the clinical context of PIU, in a series of

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three studies. The dynamics of self-regulation model has the potential to offer novel approaches for clinicians when dealing with individuals facing the self-control dilemma of PIU.

1.1. Problematic Internet Usage

Problematic Internet Use (PIU) is a growing and global public health concern (Jelenchick et al., 2014; Spada, 2014). Despite the first published case being recorded in 1996 (Young, 1996), psychological research has not kept up with technological advances (Aboujaoude, 2010) and the growing popularity of Internet usage (World Internet Users and 2014 Population Stats, 2014). Mobile platform penetration has reached more than 90% worldwide with almost 7 billion mobile subscriptions (International Telecommunication Union, 2014). Mobile Internet usage recently surpassed desktop usage, illustrating that individuals have increased ability to access the Internet from anywhere and at any time (Australian Communications and Media Authority, 2014; comScore, 2014).

Psychological research on PIU has increased in recent years, but there is still not enough known about PIU to draw anything other than preliminary conclusions in regards to its underlying mechanisms and treatment approaches (Winkler, Dorsing, Rief, Shen, & Glombiewski, 2013). New terms are being proposed for the Diagnostic and Statistical Manual of Mental Disorders (DSM), such as nomophobia (fear of being without a mobile device) (Bragazzi & Del Puente, 2014) and smartphone addiction (Pavia, Cavani, Di Blasi, & Giordano, 2016; Samaha & Hawi, 2016; Sapacz, Rockman, & Clark, 2016; Wang, Wang, Gaskin, & Wang, 2015), but there is yet to be consensus in the literature regarding PIU, also known as Internet addiction, pathological Internet use and Internet dependence (Spada, 2014). Despite a lack of consensus overall, numerous studies have shown that excessive use of the Internet is associated with poorer academic achievement and personal relationship quality for adolescents and adults (Aboujaoude, 2010; Jelenchick et al., 2014; Lopez-Fernandez, Honrubia-Serrano, Freixa-Blanxart, & Gibson, 2014; Muusses, Finkenauer, Kerkhof, & Billedo, 2014; Wang, Jackson, Gaskin, & Wang, 2014; Yau, Potenza, & White, 2013).

There is difficulty in attributing causality to the development of PIU given the large amount of comorbid conditions that exist with PIU (Beard, 2005; Jorgenson, Hsiao, & Yen, 2016; Weinstein, Feder, Rosenberg, & Dannon, 2014), such as depression, generalised anxiety disorder, social anxiety, obsessive compulsive disorder (OCD), and attention-deficit hyperactivity disorder (ADHD) (Ha et al., 2006; Ko, Yen, Yen, Chen, & Chen, 2012; Spada, 2014; Weinstein et al., 2015). However, the foremost theory of problematic and addictive Internet use is that Internet use acts on an operant conditioning variable ratio reward schedule, similar to problematic gambling (Beard, 2005; Cash, Rae, Steel, & Winkler, 2012; Davis, 2001; Kuss & Lopez-Fernandez, 2016; LaRose, Lin, & Eastin, 2003; Yau et al., 2013). Unpredictable reward schedules and variable reward structures can be established with many different Internet activities. For example, continually checking for message or email replies can result in an arbitrary schedule with unpredictable results. When the reply finally comes, the behavior is reinforced with their reward. If this behaviour is coupled with mood enhancement, such as on a dating site, the return on their efforts can be strengthened even further (Beard, 2005; Cash et al., 2012).

From another perspective, many researchers have described problematic Internet usage as an impulse control disorder, implicating self-regulation processes as key factors in its progression and maintenance (Bernardi & Pallanti, 2009; Billieux & Van der Linden, 2012; Davis, 2001; Jorgenson et al., 2016; Pies, 2009; Pontes, Kuss, & Griffiths, 2015; Yau et al., 2013).

1.2. Defining self-regulation and self-control

It has been said that our most crucial characteristic as human beings is our capacity to self-regulate (Baumeister, 2003; Boekaerts, Pintrich, & Zeidner, 2005). Indeed, healthy psychological function is built on successful self-regulation (Hoyle, 2010). Consequently, self-regulation failures have been regularly shown as responsible for a wide range of adverse outcomes across the lifespan such as emotional dysregulation, poor attentional control and lack of behavioural inhibition (Busch & Hofer, 2012; Eiesenberg et al., 1997; Spinrad et al., 2006). An important requirement for adaptive self-regulation and an appropriate response to avoiding temptations is the implementation of self-control (Baumeister & Heatherton, 1996; Carver & Scheier, 1998; Fishbach, Friedman, & Kruglanski, 2003; Metcalfe & Mischel, 1999; de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012).

Several theories of human motivation emphasize goals and individual use of self-regulation processes to model one's behavior in pursuit of those goals (Bandura, 1991; Carver & Scheier, 1998; Deci & Ryan, 2000; Gollwitzer, 1999; James, 1890; Kuglanski et al., 2002; Locke & Latham, 2015). Self-regulation refers to the processes that allow individuals to manage, monitor, assess and alter their cognitions, affect, feelings, attention, and behaviors (Fujita, 2011; Hofmann, Friese, & Strack, 2009). In relation to goal directed behavior, self-regulation processes are the dynamic psychological mechanisms that allow individuals to direct their behavior, successfully or unsuccessfully, towards goals (Gendolla, Tops, & Koole, 2015; Mann, de Ridder, & Fujita, 2013).

Self-control is defined as the capability to override, change or restrain urges, cravings, desires, impulses, or habitual responses (Bandura, 1991; Baumeister, 2003; Carver & Scheier, 1998; Metcalfe & Mischel, 1999). Self-control can be thought of as a specific self-regulatory challenge where an individual needs to protect a goal, which has long term benefits, against a temptation, which offers short term gains but that is in conflict with the goal (Baumeister, Vohs, & Tice, 2007; Fishbach & Shah, 2006; Hagger, Wood, Stiff, & Chatzisarantis, 2010; de Ridder et al., 2012).

A self-control dilemma is defined as an internal conflict where the attainment of a higher order and typically longer-term goal is jeopardised by a shorter term goal or temptation (Fishbach & Labroo, 2007; Fishbach & Shah, 2006; Fujita, Carnevale, & Trope, 2016; Hofmann et al., 2009). A self-control dilemma involves a dual motive conflict where only one of the motives can be fulfilled (Fujita, 2011). Self-control dilemmas are a common daily occurrence (Baumeister et al., 2007; Hofmann et al., 2009). For example: "Should I have the chocolate cake or do I go for the salad?" or "Should I surf the Internet right now or study for my exam?" are self-control dilemmas. Given the ubiquity of the Internet in modern day living (World Internet Users and 2014 Population Stats, 2014) it seems unrealistic that the final goal for any treatment of problematic Internet usage could be complete abstinence. Indeed, a non-abstinence approach is receiving support from researchers and clinicians alike who argue that a controlled and balanced use of the Internet and applications should be the goal of any therapy (Cash et al., 2012; Young, 2007). This approach is not only supported by researchers and clinicians but also from individuals experiencing PIU (O'Brien, Li, Snyder, & Howard, 2016). In order to achieve this therapeutic goal, individuals need to utilize their self-regulation skills to manage, monitor and alter their cognitions, attention, and behaviors (Carver & Scheier, 2011; Cash et al., 2012; Fujita et al., 2016; Przepiorka, Blachnio, Miziak, & Czuczwar, 2014).

Despite the recent upsurge in studies, there has been limited success for psychological interventions dealing with PIU and there is not enough known about the efficacy and effectiveness of current treatments (Winkler et al., 2013). There is a pressing need for new

effective approaches to deal with the issue of PIU (Przepiorka et al., 2014; Winkler et al., 2013). The dynamics of self-regulation model offers the possibility for new insights in how to effect these changes in a clinical population.

1.3. Dynamics of self-regulation model

The model of the dynamics of self-regulation by Ayelet Fishbach and colleagues investigated a dual representation framework of goal-directed behavior (Fishbach & Shen, 2014; Fishbach et al., 2009). This research examined the simultaneous pursuit of multiple goals and temptations and their effects on subsequent behavioral outcomes, and uncovered many processes and variables contributing to the dynamics of self-regulation. For an overview see Table 1 and for a more comprehensive discussion see Fishbach and Zhang (2009). At the heart of the research is the fundamental proposition that when regulating multiple goals, individuals can evaluate their level of commitment to, or their progress in moving toward, a focal goal (Fishbach & Dhar, 2005).

Under a *progress* goal representational framework, individuals are motivated to monitor and regulate the discrepancy between the current and desired end state, a behavioral model that is equivalent to the cybernetic models of self-regulation (Carver & Scheier, 1998; Powers, 2005). Under this model, a successful goal behavior would indicate partial completion of the goal and signal to an individual that enough effort towards completion of the goal has been exerted for now. Consequently, other goals in the environment become more salient as the individual disengages from the focal goal for the moment. The resulting dynamic of self-regulation is that of *balancing*.

Using a *commitment* goal representational framework, individuals are motivated to monitor and regulate their level of commitment to the goal end state. A successful goal behavior suggests a strong commitment to the focal goal and increases motivation to ensure completion of this highly committed goal by undertaking related and complementary behaviors at the expense of opposing behaviors. This is in line with work by Dreze and Nunes (2006), who found that individuals work harder towards a goal after experiencing initial goal success and Shah, Friedman, and Kruglanski (2002) who found that commitment to a focal goal impedes the availability of alternate goals. The resulting dynamic of self-regulation is *highlighting* congruent goal behaviors.

In sum, this dual representational framework model of self-regulation states that individuals utilise either a commitment or progress mode when regulating their behavior, which produces opposite effects. After successful initial goal pursuit, commitment-focused individuals adopt a highlighting pattern and are more likely to choose goal congruent behaviors, while progress-focused individuals adopt a balancing pattern and are more likely to choose temptations over focal goal actions.

Interestingly, the opposite effects occur when an individual fails at a goal behavior or fails to act upon a goal. Under a mental representation of *progress*, a goal failure signals a discrepancy between the current and desired end states and motivates action on the goal

in order to remove the discrepancy (Carver & Scheier, 1998). With a *commitment* frame, however, goal failure indicates a low level of commitment to the goal and individuals are likely to disengage from the goal altogether, leading them to choose other behaviors (Soman & Cheema, 2004). A visual representation of how the model might work in the context of PIU is shown in Fig. 1.

The research program conducted by Fishbach and colleagues identified many processes and variables that influence the dynamics of self-regulation. These include the following: the impact of initial goal success or failure on subsequent behavior choices (Fishbach et al., 2006; Koo & Fishbach, 2008); the type of feedback that is sought and offered when under commitment or progress framings (Fishbach & Dhar, 2005; Fishbach, Eyal, & Finkelstein, 2010); pre-existing commitment to a goal (Koo & Fishbach, 2008); focusing on accomplished goal progress or unaccomplished goal progress (Koo & Fishbach, 2008, 2012); focusing on an abstract or high level goal versus an individual sub-goal or concrete actions (Fishbach et al., 2006); future expectations of goal progress (Zhang et al., 2007); group identification (Koo, Fishbach, & Henderson, 2009); the influence of mood attribution towards success or failure of goal attainment (Fishbach & Labroo, 2007); and how presentation format can affect how two behaviors can be perceived (Fishbach & Zhang, 2008).

1.4. The current study

Dunbar et al. (2017) tested presentation format and showed that the principal commitment and progress framing components of the dynamics of self-regulation model proposed by Fishbach and colleagues can be applied in a clinical domain of PIU. Presentation format was chosen as the first factor to test as it could be established with no interaction with other processes or variables in the model (Dunbar et al., 2017).

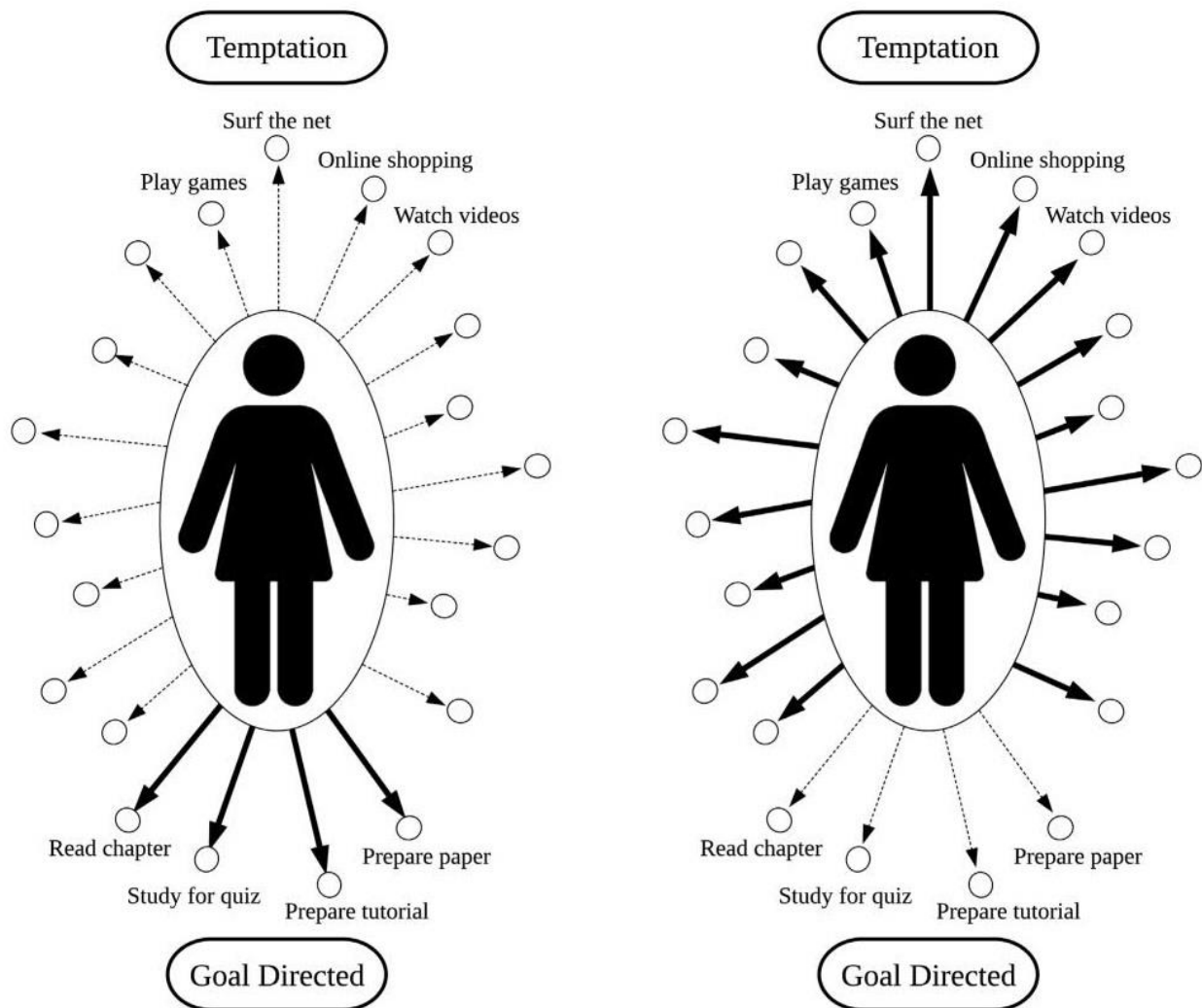
The current study set out to test elements of the model that do interact: framing cues (questions on commitment or progress and pre-existing goal commitment); feedback cues (initial goal success or failure and unaccomplished or accomplished actions) and focusing on the abstract goal versus concrete plans. These three factors were chosen as they are fundamental elements to the theory (Fishbach et al., 2009) which can be established with the least interaction from other components and confounding variables while still exercising the model, and have the potential to offer important insights for clinicians when attempting to influence goal directed client behaviour.

Maladaptive outcomes for academic/work and social functions both result from PIU (Aboujaoude, 2010) and these two activities are likely to be important to individuals in general. Indeed, the study by Dunbar et al. (2017) established these two activities as especially important to the target population of undergraduate university students. Therefore, the incongruent goal behavior for the studies is personal Internet usage and two congruent goal behaviors are academic and social behaviors. Including the two domains of academic and social behavior to test the model's predictions adds weight to the ability to generalize from the results.

Table 1

Dynamics of self-regulation model: Commitment and progress representations overview.

	Representation <i>Commitment</i> to the focal goal	<i>Progress</i> towards goal end state
Promotes	Highlighting of the focal goal	Balancing between all goals
Leads To	Emphasizing the focal goal at the cost of alternate goals (temptations).	Valuing alternate goals (temptations) as well as the focal goal.
Causing	Focal goal behaviors increase in perceived value. Alternate goal behaviors (temptations) consequently decrease in perceived value. The selection of focal goal actions is more probable. Decision is likely to be focal goal behavior over temptation behavior.	Alternate goal behaviors (temptations) increase in perceived value. Focal goal behaviors consequently decrease in perceived value. Temptations more inclined to be acted on. Decision is likely to be Temptation behavior and then focal goal behavior.



Factors that promote congruent goal behavior

Progress frame with **negative** feedback:

- A discrepancy is observed between actual and desired goal attainment
- Congruent goal behaviors are more attractive

Commitment frame with **positive** feedback:

- Highlighting occurs
- Congruent goal behaviors are more attractive

Factors that promote incongruent goal behavior

Progress frame with **positive** feedback:

- Balancing occurs
- Enough has been done pursuing the goal for now, others behaviors seen as more attractive

Commitment frame with **negative** feedback:

- Commitment to goal is questioned, the goal is seen as less important
- Other behaviors are now more attractive

Fig. 1. Visual overview of dynamics of self-regulation model in action. Circles represent the multiple behavior choices that are available at any time. Goal directed actions in the figure are operationalized as academic behaviors while incongruent goal actions (temptations) are operationalized as Internet behaviors.

We tested the predictions from the model in three experimental studies. In the first study we tested whether framing questions can prime the mental representation frameworks of commitment and progress and what effect positive and negative feedback has on subsequent behavior ratings. In study two, we examined the dynamics of high commitment versus low commitment and if they do indeed induce the progress and commitment frameworks as suggested by the theory. Finally, in study three, we examined the effects of focusing on a higher level or abstract goal compared to

focusing on concrete goal actions.

1.5. Statistical analyses, power, and data

All three studies employed 2×2 between-participants designs. As each study was testing direct evaluations of theoretically-driven predictions, individual 1-tailed *t*-tests were conducted with effect sizes on planned contrasts, an approach defined by Furr and Rosenthal (2003). A priori power analysis was carried out before

data collection to determine required sample sizes and based on previous research (e.g. Fishbach & Dhar, 2005) a moderate effect size was used. The required sample sizes were computed using the GPower computer program (Faul, Erdfelder, Lang, & Buchner, 2007) with α of 0.05, moderate effect size, and power of 0.80 resulting in an estimated 42 participants per group. Given the repeated use of t -tests, the Bonferroni-Holm method for correction of multiple comparisons (Holm, 1979) was applied to the p -value in each respective study before considering significance. All reported p -values for hypotheses testing are adjusted Bonferroni-Holm values. Normality of the data was assessed using Kolmogorov–Smirnov tests and examining Q-Q plots and histograms. All skewness and kurtosis scores were within ± 1 and the results demonstrated that data were within acceptable limits for a normal distribution (Pallant, 2013) indicating that the planned statistical analyses could be undertaken.

2. Study 1 – commitment and progress questions and feedback

2.1. Introduction

Fishbach and Dhar (2005) and Zhang et al. (2007) found that simply by asking gym members about whether they were expressing their commitment to healthy living by working out induced a commitment framework, so that they increased their interest in future goal congruent behaviors. However, asking gym members if their workout was helping them make progress towards their goal of staying fit produced a progress framework. These individuals decreased their interest in subsequent goal congruent behaviors. Questions about goal commitment or goal progress provide cues to individuals and can induce a pattern of highlighting or balancing.

Initial goal achievement is a fundamental dynamic of the self-regulation model. Numerous studies (e.g., Fishbach et al., 2006) found that positive feedback was inferred from a successful initial goal pursuit and this causes individuals with commitment framings to highlight subsequent congruent goal behaviors, while individuals with progress framings balance across congruent and incongruent goal behaviors. On the other hand, negative feedback is inferred from unsuccessful initial goal pursuits and this causes individuals with commitment framings to reject the goal and rate incongruent goal behaviors higher, while individuals with progress framings infer a discrepancy and rate congruent goal behaviors higher. This study set out to determine if commitment and progress mental representations could be framed by asking questions about commitment or progress. We further tested whether a feedback cue of positive initial goal action engenders opposite behavior effects in the commitment and progress groups. The transposed opposite effects after a feedback cue of negative initial goal action were also investigated. The following hypotheses were generated from the dynamics of self-regulation model:

H1. Participants with a Commitment framework will rate their interest in incongruent (Internet) behaviors **lower** than participants with a Progress framework when given positive feedback (success condition).

H2. Participants with a Commitment framework will rate their interest in congruent (academic and social) behaviors **higher** than participants with a Progress framework when given positive feedback (success condition).

H3. Participants with a Commitment framework will rate their interest in incongruent (Internet) behaviors **higher** than participants with a Progress framework when given negative feedback

(failure condition).

H4. Participants with a Commitment framework will rate their interest in congruent (academic and social) behaviors **lower** than participants with a Progress framework when given negative feedback (failure condition).

2.2. Method

2.2.1. Participants

Eighty five undergraduate University Psychology students (51 female, 34 male) participated in the study in exchange for course credit. Because the psychology student participation pool was closed before the required numbers of participants for each condition were collected, the survey was opened to all undergraduate students. A further 126 students then participated in exchange for the chance to win one of two \$50 gift vouchers. For recruitment of the second participant group, we collected demographic data such as type of degree, faculty of the university, and whether English was a second language. English speaking status was seen as an important factor as the study relies on priming mental representation frameworks via the common understandings and social constructs of the English words commitment and progress. It was not considered an issue for students recruited from the Psychology group, as the entry requirements for Psychology at the University demand a high level of English ability.

Manipulation checks on participants with English as a second language compared their level of commitment ratings in the commitment success ($M = 4.80$, $SD = 1.32$) and commitment failure ($M = 4.18$, $SD = 1.60$) conditions, $t(19) = 0.96$, $p = .35$, and their sense of progress towards their goal in the progress success ($M = 4.25$, $SD = 1.83$) and progress failure ($M = 4.33$, $SD = 1.50$) conditions, $t(15) = 0.10$, $p = .92$. These results determined that the manipulation was not effective for those participants. Therefore, they ($N = 38$) were excluded from the final dataset.

A final group of 173 participants (101 Female, 73 Male) was analyzed. The gender of participants did not yield any effects and is therefore omitted from further consideration. Participants ages ranged from 17 to 63 ($M = 23.34$, $SD = 9.08$).

2.2.2. Stimuli

Behavior items in Internet, social and academic domains developed by Dunbar et al. (2017) were used and there were four actions in each of the three domains (see Table 2). Each statement was simple in nature and designed such that it clearly represented a behavior in the intended domain. In order to minimize the risk of some Internet actions being perceived by participants as social in

Table 2
Behavioral Action item stimuli sets in social, Academic and internet domains.

Domain	Behavior Action Item
Social	Hanging out with friends at a café, bar or restaurant.
	Attending an event (e.g. movie, play, or concert) with friends.
	Sitting with friends at lunch or during a break.
	Helping a friend (or friends) celebrate a special achievement.
Academic	Studying for a quiz for a key course you are taking.
	Preparing for an upcoming tutorial for a key course you are taking.
	Working on a paper for a key course you are taking.
Internet	Reading an important chapter or paper for a key course you are taking.
	Play your favourite online game.
	Watching videos from your favourite channels, feeds or suggestions on YouTube or other similar sites.
	Browsing through shopping websites that you like.
	Surfing the net or using your favourite sites, or reading blogs, etc.

nature, social networking sites, such as Facebook, were deliberately not used.

To conceal the purpose of the study eight filler behavior items such as “go to the supermarket to buy some groceries” and “do your weekly laundry” were created. This was done so that the final presented list of behavior action items would look like a normal set of actions that any student would encounter on a typical day; that is, studying, socializing, using the Internet, performing chores, and other daily life activities.

2.2.3. Design

The current study was adapted from the general theories described in Fishbach et al. (2009). The initial design was based on the work of Fishbach and Dhar (2005) that tested the priming of commitment and progress mental framings by asking respondents to infer either the level of commitment or the level of progress based on questions on initial goal pursuit. The design was further extended using work produced by Fishbach et al. (2006) that combined failure of initial goal pursuit to the already tested success condition, and by the work of Dunbar et al. (2017) that took the theories of Fishbach and colleagues from the marketing and consumer research field into the clinical domain of PIU.

A between-groups design was used. The independent variables were mental representation (commitment or progress) and the result of initial goal pursuit (success or failure). The main dependent variables were incongruent goal behavior operationalized as rating of Internet behaviors, and congruent goal behavior operationalized as ratings of academic and social behaviors. Motivation to perform the actions was captured by asking participants to rate their interest in pursuing each action on a seven-point scale ranging from (1 – Not at all to 7 – A lot). As predicted by the theory, planned contrasts were made between participants in the commitment success and progress success conditions and between participants in the commitment failure and progress failure conditions.

2.2.4. Procedure

Ethical approval was granted by The University's Human Research Ethics Sub-Committee for the School of Psychology. Participants provided consent and were informed that they were free to withdraw at any time.

Participants took the survey using SurveyMonkey at their convenience. The first part of the survey collected basic demographic information. In order to prime participants' goals they were asked to read a short (280 word) literature review about Problematic Internet Usage. To further strengthen the priming, a short 3-min video on Problematic Internet Usage was also presented straight after.

Participants were then presented with a vignette describing a person who has just learned about PIU and has concerns that it may apply to them. They were worried that they were spending too much personal time (not counting time spent for study or work) on the Internet to the detriment of their academic work and social relationships. The goal for the person in the vignette was to reduce their Internet usage to a certain amount. The amount was deliberately vague so as not to bring in value judgments by participants about what might be a small or large amount of personal time that would be acceptable to spend using the Internet.

Participants were then randomly assigned to one of the four conditions. In the *success* conditions, participants were asked to put themselves in the place of the person in the vignette and imagine that they had a very productive day and accrued near enough to zero hours of personal Internet usage. In the *failure* conditions, participants were asked to imagine that they had not had a very productive day and had already accrued near enough to their

maximum allowable hours of personal Internet usage.

Commitment or Progress representation formats were then primed, for both success and failure scenarios, by asking participants if they felt they were committed to their goal (commitment) or had made progress towards their goal (progress) when they had a very productive day and accrued zero hours (or had not had a very productive day and had already accrued near enough to their maximum allowable hours). This technique of priming commitment and progress representational formats is in line with a previous method utilized by Fishbach and Dhar (2005). The 20 behavior actions were then presented in random order and participants were asked to rate their level of interest in pursuing them on a seven-point scale (1 – not at all interested to 7 – very much interested). After completing the rating portion, participants were asked further questions: how interested and motivated they were in regards to the goal to reduce personal Internet hours in the vignette scenario; how important academic success and maintaining long lasting relationships was to them in general. Finally, participants were asked to describe what they thought the study was investigating, were thanked for their participation and dismissed. Analysis of the provided descriptions revealed that none of the participants were able to determine the true intent of the study.

2.2.5. Manipulation checks

The success of the participants adopting the goal to reduce personal Internet usage hours was assessed by asking how important they viewed the goal and how motivated they were to achieve it in the vignette scenario. Participants gave ratings on a seven-point scales for the level of importance (1 – no at all important to 7 – very much important) and for their level of motivation to engage in it (1 – no at all motivated to 7 – very much motivated). The importance of achieving academic and social success was assessed by asking participants to rate how important it was for them to achieve academic and social success on a seven-point scale (1 – not at all important to 7 – extremely important). To check the effectiveness of the success and failure manipulations we compared participants' scores when rating their level of commitment to the goal of reducing personal Internet hours on a seven-point scale (1 – no commitment to 7 – a lot of commitment).

2.3. Results

2.3.1. Manipulation checks

The level of importance of adopting the goal ($M = 5.14$, $SD = 1.28$) was compared to the mid-point of the seven point scale (value of 4), $t(172) = 11.73$, $p < .001$. Motivation ($M = 4.79$, $SD = 1.36$) was also compared to the mid-point of the seven point scale (value of 4), $t(172) = 7.59$, $p < .001$. These results support the assumption that participants were engaged with the goal to reduce their level of personal Internet usage and therefore perceived Internet actions as incongruent to their focal goal. The level of importance of academic success ($M = 6.40$, $SD = 0.85$) and social success ($M = 6.29$, $SD = 1.01$) indicated that participants placed high importance on these goals. Results showed a significant difference in the level of commitment ratings between the commitment success ($M = 5.23$, $SD = 1.36$) and commitment failure ($M = 4.09$, $SD = 1.51$) conditions, $t(84) = 3.68$, $p < .001$, as well as a significant difference in the progress success ($M = 5.13$, $SD = 1.36$) and progress failure ($M = 3.45$, $SD = 1.76$) conditions, $t(83) = 4.97$, $p < .001$, with respective large effect sizes (Cohen's $d = 0.80$ and 1.09). Taken together these results indicate that the manipulation between success and failure conditions was effective.

2.3.2. Opposite effects of commitment and progress after successful goal accomplishment

To investigate the opposite effects of commitment and progress representational frameworks in the success groups, participants' value ratings were averaged for the four Internet, academic and social behavior action items and the resultant mean scores were compared. Descriptive statistics can be found in Table 3.

Participants in the commitment condition rated the value of Internet behaviors lower than in the progress condition, $t(86) = -2.31, p = .045$. A Cohen's d of -0.49 indicated an effect size approaching moderate magnitude. This supports H1, that after a successful goal action progress-focused individuals will rate their interest in pursuing goal incongruent actions higher than commitment-focused individuals (see Fig. 2). For academic actions, the commitment condition participants rated their interest higher than the progress condition participants, $t(86) = 2.11, p = .048$. The magnitude of this effect was small (Cohen's $d = 0.46$). This result supports H2, that after a successful goal action commitment-focused individuals will rate their interest in pursuing goal congruent actions higher than progress-focused individuals (see Fig. 3). Participants rated the value of social actions lower in the commitment condition compared to those in the progress condition, $t(86) = -0.26, p = .40$, with a negligible effect size (Cohen's $d = -0.06$), offering no support for H2 in a social domain (see Fig. 4).

Table 3
Study 1 Descriptive statistics for Internet, academic and social behavior value ratings.

	Goal Success			Goal Failure		
	N	M	SD	N	M	SD
Internet Domain						
Commitment	43	3.38	1.39	43	4.59	1.47
Progress	45	4.06	1.36	42	3.61	1.39
Academic Domain						
Commitment	43	5.02	1.13	43	4.13	1.34
Progress	45	4.46	1.40	42	4.89	1.56
Social Domain						
Commitment	43	5.28	1.03	43	4.69	1.62
Progress	45	5.34	1.16	42	5.02	1.34

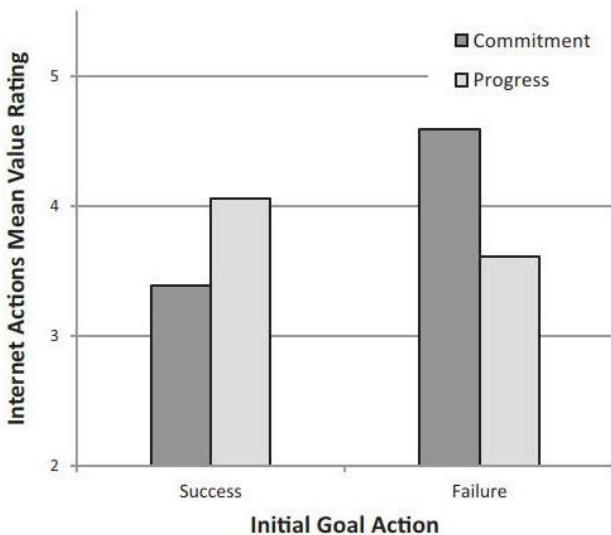


Fig. 2. Internet behavior value ratings for competing and progress representation formats after successful and unsuccessful initial goal actions.



Fig. 3. Academic behavior value ratings for competing and progress representation formats after successful and unsuccessful initial goal actions.

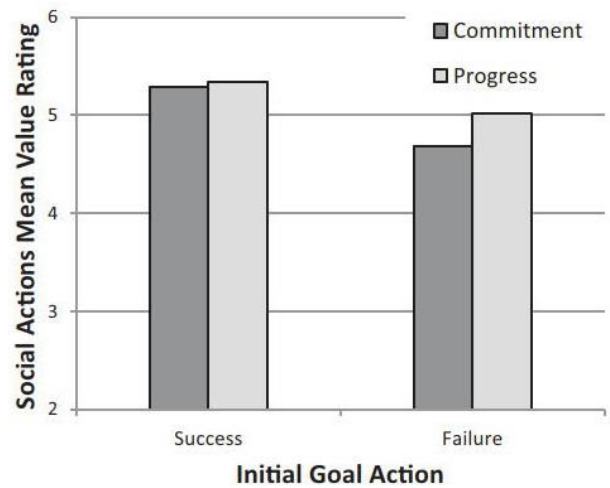


Fig. 4. Social behavior value ratings for competing and progress representation formats after successful and unsuccessful initial goal actions.

2.3.3. Opposite effects of commitment and progress after unsuccessful goal action

To investigate the opposite effects of commitment and progress representational frameworks in the failure groups, participants' value ratings were averaged for the four Internet, academic and social behavior action items and the resultant mean scores were compared.

Participants in the commitment failure condition rated their interest in pursuing Internet behaviors higher than participants in the progress failure condition, $t(83) = 3.16, p = .006$, a moderate effect, $d = 0.69$. This result supports H3, that after an unsuccessful goal action, Commitment-focused individuals will rate their interest in pursuing goal incongruent actions higher than Progress focused individuals (see Fig. 2). For academic actions, the commitment condition participants rated their interest lower than the progress condition participants, $t(83) = -2.40, p = .048$. The magnitude of this effect was moderate (Cohen's $d = 0.53$). This

result supports H4, that after a successful goal action Commitment focused individuals will rate their interest in pursuing goal congruent actions higher than Progress focused individuals (see Fig. 3). Participants rated the value of social actions lower in commitment condition compared to those in the progress condition. The difference was non-significant, $t(83) = -1.05, p = .30$, with a small effect (Cohen's $d = -0.23$) which offers little support for H4 in a social domain (see Fig. 4).

2.4. Discussion

Results supported the predictions of the dynamics of self-regulation model in the Internet domain, as participants in the commitment group rated their interest in incongruent goal (Internet) behaviors lower than those in the progress group after a successful goal action. As well, when the initial goal action was unsuccessful the progress group rated their level of interest in incongruent goal (Internet) behaviors lower than those in the commitment group. The academic domain results also supported the model but this time individuals rated their level of interest in congruent (academic) behaviors. Both Internet and academic domains showed results similar to those found by Fishbach and Dhar (2005). The social domain offered some support, with a small effect in the failure condition although the success condition produced results in the opposite direction to the model's prediction. Overall, the results of the study add further evidence to support the model's application in a clinical domain.

Study 1 continued the work begun by Dunbar et al. (2017) in applying the dynamics of self-regulation model set out by Fishbach and colleagues in a clinical domain. Results showed that the mental representations of commitment and progress focus can be primed with a simple question and that these mental frameworks produce opposite effects for the value individuals assign to future behaviors combined with positive feedback. Individuals with a commitment framework rate congruent goal behaviors higher than those with a progress framework, and rate incongruent goal behaviors lower than those with a progress framework, emphasising patterns of highlighting and balancing. These opposite effects are transposed for the mental frameworks when combined with negative feedback. When given negative feedback on goal success, individuals with a progress framework appear to perceive the discrepancy in their goal progress and consequently rate congruent goal behaviors higher than those with a commitment framework, and rate incongruent goal behaviors lower than those with a commitment framework.

During the course of treatment, clinicians provide considerable feedback to clients and this can take many forms, including summarising a client's improvement or non-improvement towards a certain behavioral goal (Beck, 2011; Harris, 2009; Sommers-Flanagan & Sommers-Flanagan, 2015; Wright, Basco, & Thase, 2006). If the words chosen when summarising progress towards a goal influences subsequent behavioral choices a client makes – and indeed, can have opposite effects given a self-regulation framing – then it is important for a clinician to know how to frame the feedback in order to ensure the best possible outcome for the client that is in line with the client's stated goals. For example, consider a clinician who starts the session asking the client how they have progressed since they last met and after receiving information from the client about their achievement follows that up with a statement praising the client's achievement. Will the original question from the clinician induce a progress frame in the client and will the positive feedback then signal partial goal attainment leading the client to adopt a balancing pattern? Should the clinician rather phrase the feedback to focus on the outstanding and unaccomplished work in order to emphasise a discrepancy? In Study 2, we

investigated these questions by testing additional feedback and framing cues from the dynamics of self-regulation model.

3. Study 2 – high versus low engagement

3.1. Introduction

Koo and Fishbach (2008) asked questions about individuals' levels of engagement to their goals. They reasoned that when engagement is high and assured, individuals tend not to worry about their commitment but tend to focus on their progress, however when engagement levels are low or unsure, individuals question if the goal is essential or even achievable. They proposed that high levels of engagement towards a goal promote internal questions that induce a progress framework, while low levels of engagement trigger internal questions that induce a commitment framework. Koo and Fishbach (2008) also found that focusing on accomplished actions signalled partial goal completion to the progress-framed individuals and high engagement to the commitment framed individuals. Conversely, focusing on unaccomplished actions signalled a discrepancy in the progress-framed groups and a lack of engagement in the commitment framed groups. Accomplished actions acted like goal achievement or positive feedback whereas unaccomplished actions act like incomplete goal action or negative feedback.

This study set out to determine if the framing cues of high and low goal engagement activate progress and commitment mental representations respectively. After the framings had been activated, we tested whether focusing on accomplished or unaccomplished actions produces the opposite behavior effects in the commitment and progress groups. The following hypotheses were generated from the dynamics of self-regulation model.

H5. For participants with high goal engagement (who will seek Progress feedback on a goal) those who focus on accomplished (To-Date condition) actions will rate their interest in incongruent (Internet) goal behaviors **higher** than participants who focus on unaccomplished (To-Go condition) actions.

H6. For participants with high goal engagement (who will seek Progress feedback on a goal) those who focus on accomplished (To-Date condition) actions will rate their interest in congruent (Academic and Social) goal behaviors **lower** than participants who focus on unaccomplished (To-Go condition) actions.

H7. For participants with low goal engagement (who will seek Commitment feedback on a goal) those who focus on accomplished (To-Date condition) actions will rate their interest in incongruent (Internet) goal behaviors **lower** than participants who focus on unaccomplished (To-Go condition) actions.

H8. For participants with low goal engagement (who will seek Commitment feedback on a goal) those who focus on accomplished (To-Date condition) actions will rate their interest in congruent (Academic and Social) goal behaviors **higher** than participants who focus on unaccomplished (To-Go condition) actions.

3.2. Method

3.2.1. Participants

One hundred and eighty one undergraduate University students (118 female, 63 male) participated in the study in exchange for a chance to win one of two \$50 gift vouchers. Fourteen participants failed to complete the survey and were excluded from the final dataset leaving $N = 167$. The gender of participants did not yield any effects and is therefore omitted from further consideration. In line

with results from Study 1, only participants with English as their first language were included in the study. Participants ages ranged from 18 to 59 ($M = 23.75$, $SD = 6.76$).

3.2.2. Stimuli

The behavior items from study 1 and developed by Dunbar et al. (2017) were used (see Table 2). In order to manipulate participants' focus towards completed or remaining actions, two figures were created based on the work by Koo and Fishbach (2008). These can be seen in Figs. 5 and 6. The bar represented the total amount of work required to complete the goal and the arrow reflected either the work completed or the work remaining. In line with the argument by Koo and Fishbach (2008) the current level of performance was represented at 48% so that participants would not easily flip the manipulation in their mind; for example, changing a 50% to-date condition into a 50% to go condition.

3.2.3. Design

The current study was adapted from the general theories described in Fishbach et al. (2009). The initial design was based on the work of Koo and Fishbach (2008) that examined how focusing on already accomplished (to-date) goal actions versus unaccomplished and remaining (to-go) goal actions are affected by commitment and progress representation frameworks.

A between-participants design was used. The independent variables were mental representation (commitment or progress) and focus of goal progress (to-date or to-go). The main dependent variables were incongruent goal behavior operationalized as rating of Internet behaviors, and congruent goal behavior operationalized as ratings of academic and social behaviors. Motivation to perform the actions was captured by asking participants to rate their interest in pursuing each action on a 7-point scale ranging from (1 – Not at all to 7 – A lot). As predicted by the theory, comparisons were made between participants in the commitment to-date and to-go conditions and between participants in the progress to-date and to-go conditions.

3.2.4. Procedure

Ethical approval was granted by The University's Human Research Ethics Sub-Committee for the School of Psychology. Participants provided consent and were informed that they were free to withdraw at any time.

Participants took the survey using SurveyMonkey at their convenience. The first part of the study gained consent and gathered basic demographic information. Participants were randomly assigned into either high engagement or low engagement groups. The high engagement group was given a short (280 word) literature review on Problematic Internet Usage (PIU) to read in order to prime a goal of reducing Internet usage. To further strengthen the priming, a short 3-min video on Problematic Internet Usage was also presented straight after. Participants in the low commitment condition received no information on PIU.



Fig. 5. To-Date condition stimulus.

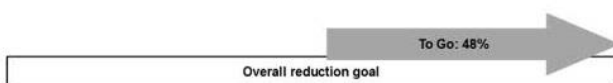


Fig. 6. To-Go condition stimulus.

A vignette describing a person who has concerns that they may be spending too much personal time (not counting time spent for study or work) on the Internet to the detriment of their academic work and social relationships was presented. The goal for the person in the vignette was to reduce their Internet usage to a certain amount. The amount was deliberately vague so as not to bring in any value judgments by participants about what might be a small or large amount of time that would be acceptable to spend using the Internet.

Participants in each group were split again and randomly assigned to either to-date or to-go action conditions. After being asked to keep in mind the person in the vignette participants in the to-date condition read: "To date, you have reduced your level of personal Internet usage by about 48%." and were presented with Fig. 5, while the to-go condition read: "You have about 48% more reduction in your personal Internet usage to go." and were presented with Fig. 6.

The 20 behavior actions were then presented in random order and participants were asked to rate their level of interest in pursuing them on a seven point scale (1 – not at all interested to 7 – very much interested). After completing the rating portion, participants were asked further questions such as how important academic success and maintaining long lasting relationships was to them. Finally, participants were asked to describe what they thought the study was investigating, were thanked for their participation and dismissed. Analysis of the provided descriptions revealed that none of the participants were able to determine the true intent of the study.

3.2.5. Manipulation check

The level of engagement to the focal goal of reducing personal Internet usage was measured by asking participants to rate how important they viewed the goal and how motivated they were to achieve it in the vignette scenario. Participants gave ratings on a seven point scales for the level of importance (1 – no at all important to 7 – very much important) and for their level of motivation to engage in it (1 – no at all motivated to 7 – very much motivated).

3.3. Results

3.3.1. Manipulation check

Values for participants in both high engagement groups were averaged and compared to values for participants in both low engagement groups. Participants in the high engagement conditions ($M = 5.48$, $SD = 1.18$) rated the level of importance for the goal higher than in the low conditions ($M = 5.11$, $SD = 1.52$), although the difference was non-significant, $t(165) = 1.78$, $p = .08$. Cohen's d of 0.27 indicated a small effect. However, participants in the high conditions ($M = 4.52$, $SD = 1.24$) rated their level of motivation significantly higher than participants in the low conditions ($M = 3.80$, $SD = 1.44$), $t(165) = 3.46$, $p = .001$. The magnitude of this effect was moderate (Cohen's $d = 0.54$). Taken together, these results suggest that the participants in the high engagement groups had a greater engagement to the goal than those in the low groups.

3.3.2. Factors that increase or reduce goal adherence hypotheses

To investigate the factors that increase or reduce goal adherence, participants' value ratings were averaged for the four Internet, academic and social behavior action items in the four conditions: high commitment and to-date focus, high commitment and to-go focus, low commitment and to-date focus, and low commitment and to-go focus groups. The resultant mean scores were compared. Descriptive statistics can be found in Table 4.

Table 4
Study 2 descriptive statistics for Internet, academic and social behavior value ratings.

	High Engagement			Low Engagement		
	N	M	SD	N	M	SD
Internet Domain						
To Date	43	4.34	1.23	41	3.06	1.26
To Go	41	3.63	1.21	42	3.98	1.27
Academic Domain						
To Date	43	3.96	1.16	41	5.08	1.31
To Go	41	5.19	.99	42	4.44	1.26
Social Domain						
To Date	43	5.37	1.04	41	5.13	1.19
To Go	41	5.22	1.25	42	5.37	1.00

3.3.3. High goal engagement groups

Participants in the high goal engagement to-date condition rated the value of Internet behaviors higher than those in the high goal commitment to-go condition, $t(81) = -2.65, p = .02$. A Cohen's *d* of 0.59 indicated an effect size of moderate magnitude. This result supports H5 (see Fig. 7).

Participants in the high goal engagement to-date condition rated the value of Academic behaviors lower than those in the high goal engagement to-go condition, $t(81) = -5.21, p < .001$. A Cohen's *d* of 1.16 indicated a large effect size. This result supports H6 for the academic domain (see Fig. 8). Participants in the high goal engagement to-date condition rated the value of Social behaviors higher, against the predicted direction, than those in the high goal engagement to-go condition, although the difference was non-significant, $t(81) = 0.60, p = .68$. A Cohen's *d* of 0.16 indicated a negligible effect size. This result does not support H6 in the social domain (see Fig. 9).

3.3.4. Low (uncertain) goal engagement groups

Participants in the low goal engagement to-date condition rated the value of Internet behaviors lower than those in the low goal engagement to-go condition, $t(82) = -3.32, p = .001$. A Cohen's *d* of -0.73 indicated an effect size of moderate magnitude. This result supports H7 (see Fig. 7).

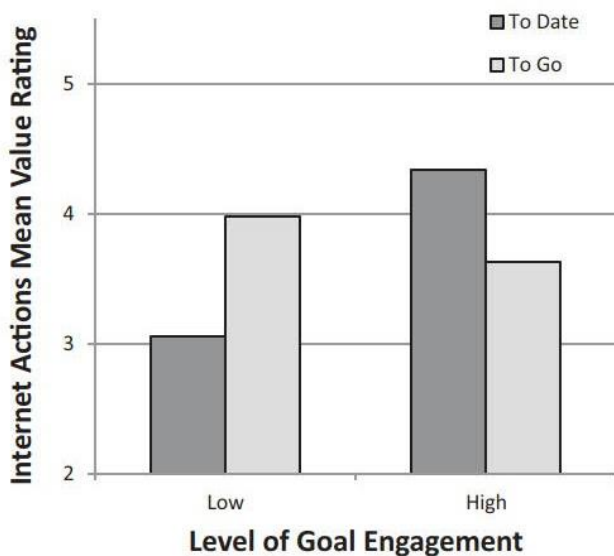


Fig. 7. Internet behavior value ratings for low and high engagement participants comparing to-date and to-go groups.

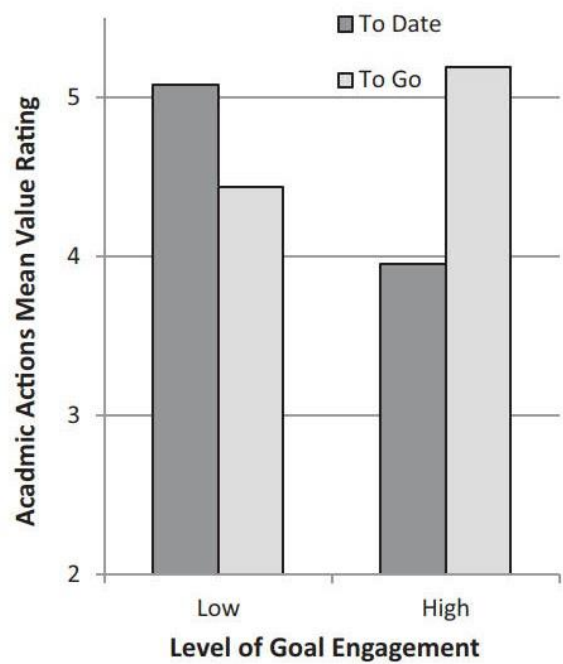


Fig. 8. Academic behavior value ratings for low and high engagement participants comparing to-date and to-go groups.

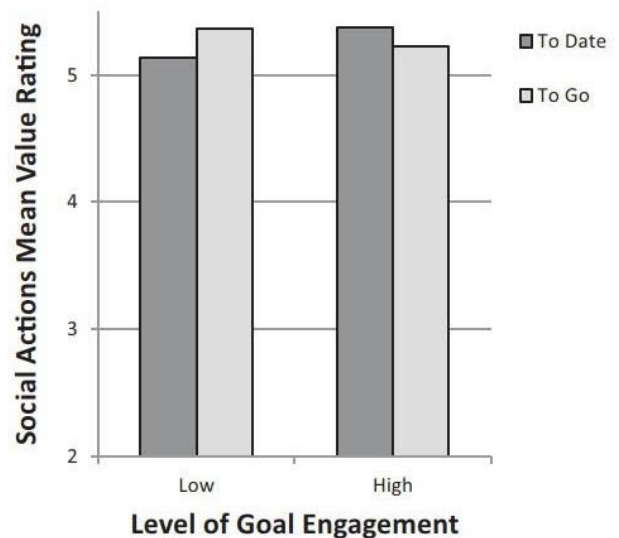


Fig. 9. Social behavior value ratings for low and high engagement participants comparing to-date and to-go groups.

Participants in the low goal engagement to-date condition rated the value of academic behaviors higher than those in the low goal engagement to-go condition, $t(82) = 3.02, p = .02$. A Cohen's *d* of .51 indicated a moderate effect size. This result supports H8 for the academic domain (see Fig. 8). Participants in the high goal engagement to-date condition rated the value of social behaviors lower, against the predicted direction, than those in the low goal engagement to-go condition, although the difference was non-significant, $t(82) = -0.97, p = .68$. A Cohen's *d* of 0.21 indicated a small effect size. This result does not support H8 in the social domain (see Fig. 9).

3.4. Discussion

Results supported the predictions of the dynamics of self-regulation model in the Internet domain with participants in the high engagement group appearing to attend to the progress of their goal pursuit and those in the low engagement group appearing to attend to their commitment to their focal goal to reduce personal Internet usage. Further, focusing on accomplished (the 'To Date' condition) versus unaccomplished actions (the 'To Go' condition) induced a sense of goal accomplishment as opposed to goal failure. The resulting behavioral ratings were as predicted by the model in the Internet and academic domains with moderate to large effect sizes, supporting the work done by Koo and Fishbach (2008).

The results for the social domain offered no support for the hypotheses, with both results opposite to the predicted directions, although the results were not significant with negligible or small effect sizes. The study design meant that each participant rated Internet, academic and social behaviors; and the effects of engagement and progress framings were evident in the Internet and academic behavior item ratings. It is therefore unlikely that failure to prime the commitment and progress frameworks is a plausible explanation for the results. The to-go and to-date manipulations also produced the results predicted by the model in the Internet and academic domains. However, while the manipulation of high and low engagement was effective, we did not really manipulate participants to be *uncertain* about their goal. We only made the uncertain groups less motivated than the high engagement groups. Perhaps, the level of manipulation was not strong enough to produce the predicted effect in the social domain. Study 1 showed clear support of the model in the Internet and academic domains but almost no support in the social domain. Taken with the results from Study 2, this does indicate that there is potentially something different between the social and academic domains and how they are interpreted by participants. While they are clearly important to individuals in the target population, actions in each domain do not appear to be interpreted in the same manner.

Results showed that focusing on goal actions completed to-date does engender a sense of accomplishment equivalent to positive feedback. However, focusing on outstanding goal actions still to-go engenders a sense of discrepancy and disappointment in goal achievement, comparable to receiving negative feedback. Study 2 then, did shed some light on questions raised in Study 1. Directing someone's attention to accomplished or unaccomplished actions can be equivalent to providing positive or negative feedback and the behavior evaluations will be dependent on the mental framework held by the individual.

Clients seek treatment with varying degrees of willingness and engagement, and many are often ambivalent about change (Miller & Rollnick, 2012). Results from this study show that engaged individuals favour a progress focus and will have more motivation to complete a goal if they focus on the unaccomplished actions to go ("I still have work to do", "I need to action this", etc.) versus focusing on accomplished actions ("I have already completed a lot", "I can balance my actions for the moment", etc.). Disengaged individuals, on the other hand, favour a commitment focus and will have more motivation to complete a goal if they focus on completed actions ("having already done so much, it must be important") versus focusing on actions yet to be completed ("there is still lots to do, it can't be that important to me"). Clinicians should ascertain their client's level of engagement to their goal before presenting feedback.

Studies 1 and 2 have shown how framing and feedback cues can prime commitment and progress frameworks and interact to cause opposite behaviors. The third study investigated the effects of holding to a high-level goal with focusing on step by step actions on

values of future behaviors.

4. Study 3 – abstract goal versus concrete goal actions

4.1. Introduction

Additional studies by Fishbach et al. (2006) and Zhang et al. (2007) investigated outcomes when individuals break a high level goal into concrete behavior steps. They explored differences in self-regulation after an initial goal behavior has been performed, if they focus on the high level or abstract goal that initiated the behavior or on the specific behavior step itself. The results demonstrated that when individuals focus on the abstract or higher-level goal, a commitment framework is formed and when initial goal achievement is positive it induces a highlighting pattern resulting in an increase in interest in goal congruent behavior. However when initial goal achievement is negative, there is disengagement from the goal, resulting in a decrease in interest in goal congruent behavior. Conversely, when the focus is on concrete behavior steps, a progress framework is formed and when initial goal achievement is positive it induces a balancing pattern resulting in a decrease in interest in goal congruent behavior. When initial goal achievement is negative, this signifies a discrepancy and in an increase in interest in goal congruent behavior (Fishbach et al., 2006; Zhang et al., 2007).

This study set out to test the framing cues of focusing on a high-level goal versus the concrete steps required to achieve the goal. The theory predicts that focusing on a high level or abstract goal forms a commitment framework, leading to the pattern of highlighting, whereas focusing on the concrete goal actions forms a progress framework, leading to a pattern of balancing. After the framings had been activated, positive and negative feedback on goal success was given to test if this produced opposite behavior effects in the commitment and progress groups, as predicted by the model. The following hypotheses were constructed from the dynamics of self-regulation model.

H9. Participants who consider abstract goals and receive positive feedback about goal achievement will rate their interest in incongruent (Internet) goal behaviors **lower** than participants who consider concrete goal actions and receive positive feedback.

H10. Participants who consider abstract goals and receive positive feedback about goal achievement will rate their interest in congruent (Academic and Social) goal behaviors **higher** than participants who consider concrete goal actions and receive positive feedback.

H11. Participants who consider abstract goals and receive negative feedback about goal achievement will rate their interest in incongruent (Internet) goal behaviors **higher** than participants who consider concrete goal actions and receive negative feedback.

H12. Participants who consider abstract goals and receive negative feedback about goal achievement will rate their interest in congruent (Academic and Social) goal behaviors **lower** than participants who consider concrete goal actions and receive negative feedback.

4.2. Method

4.2.1. Participants

One hundred and ninety four undergraduate University students (122 female, 72 male) participated in the study in exchange for a chance to win one of two \$50 gift vouchers. Twenty two participants failed to complete the survey and were excluded from

the final dataset leaving a final $N = 172$. The gender of participants did not yield any effects and is therefore omitted from further consideration. In line with results from Study 1, only participants with English as their first language were included in the study. Participants ages ranged from 17 to 75 ($M = 24.96$, $SD = 8.61$).

4.2.2. Stimuli

The behavior items from study 1 and developed by Dunbar et al. (2017) were used (see Table 2).

4.2.3. Design

The current study was adapted from the general theories described in Fishbach et al. (2009). The initial design was based on the work of Fishbach et al. (2006) that examined how focusing on abstract or higher level goals versus concrete goal actions and positive or negative feedback on goal performance affected subsequent goal choices.

A between-participants design was used. The independent variables were goal saliency (focusing on an abstract goal or concrete goal actions) and initial goal outcome (success or failure). The main dependent variables were incongruent goal behavior operationalized as rating of Internet behaviors, and congruent goal behavior operationalized as ratings of academic and social behaviors. Motivation to perform the actions was captured by asking participants to rate their interest in pursuing each action on a seven point scale ranging from (1 – Not at all to 7 – A lot). As predicted by the theory, comparisons were made between participants in the success outcome groups comparing abstract versus concrete conditions and between participants in the failure outcome groups comparing abstract versus concrete conditions.

4.2.4. Procedure

Ethical approval was granted by The University's Human Research Ethics Sub-Committee for the School of Psychology. Participants provided consent and were informed that they were free to withdraw at any time.

Participants took the survey using SurveyMonkey at their convenience. The first part of the study gained consent and gathered basic demographic information. In order to prime participants' goals they were asked to read a short (280 word) literature review on Problematic Internet Usage. To further strengthen the priming, a short 3-min video on Problematic Internet Usage was also presented straight after.

Participants were randomly assigned to one of four conditions: Abstract Goal and Positive Feedback, Abstract Goal and Negative Feedback, Concrete Goal Actions and Positive Feedback, and Concrete Goal Actions and Negative Feedback.

A vignette was presented describing a person who has just learned about PIU and has concerns that it may apply to them. The person was worried that they are spending too much personal time (not counting time spent for study or work) on the Internet to the detriment of their academic work and social relationships.

Participants were randomly assigned into abstract goal or concrete steps groups. The abstract goal group then read that the person in the vignette was setting a higher-level goal to reduce their personal Internet usage to a certain amount. The amount was deliberately vague so as not to bring in any value judgments by participants about what might be a small or large amount of time that would be acceptable to spend using the Internet. The abstract goal group was split again and randomly assigned into positive or negative feedback groups. Positive and negative feedback was then provided by describing some time later when a reduction in hours was achieved and that was either well below the norm (negative feedback) or well above the norm (positive feedback) of what was to be expected at that time.

The concrete steps groups read that the person was setting a goal to reduce their personal Internet usage to a certain amount. Again, the amount was deliberately vague so as not to bring in any value judgments by participants about what might be a small or large amount of time that would be acceptable to spend using the Internet. They then read the person had come across a program designed to reduce their personal Internet usage that was composed of a number of discrete steps and they were going to follow the program step by step. The concrete steps group was split again and randomly assigned into positive or negative feedback groups. Positive and negative feedback was provided by describing some time later when a reduction in hours was achieved and that achievement was either well below the norm (negative feedback) or well above the norm (positive feedback) of what was to be expected at that time.

The 20 behavior actions were then presented in random order and participants were asked to rate their level of interest in pursuing them on a seven-point scale (1 – not at all interested to 7 – very much interested). After completing the rating portion, participants were asked further questions such as how interested and motivated they were in regards to the goal to reduce personal Internet hours in the vignette scenario, how important academic success and maintaining long lasting relationships was to them in general. Finally, participants were asked to describe what they thought the study was investigating, were thanked for their participation and dismissed. Analysis of the provided descriptions revealed that none of the participants were able to determine the true intent of the study.

4.3. Results

4.3.1. Effects of highlighting abstract goal or concrete actions and initial goal achievement

To investigate the opposite effects of abstract goal or concrete actions in the success groups, participants' value ratings were averaged for the four Internet, academic and social behavior action items and the resultant mean scores were compared. Descriptive statistics can be found in Table 5.

4.3.2. Successful initial goal pursuit group

Participants in the abstract goal commitment and positive feedback condition rated the value of Internet behaviors lower than those in the concrete goal actions and positive feedback condition, $t(83) = -2.76$, $p = .02$. A Cohen's d of -0.61 indicated an effect size of moderate magnitude. This result supports H9 (see Fig. 10).

Participants in the abstract goal commitment and positive feedback condition rated the value of Academic behaviors higher than those in the concrete goal actions and positive feedback condition, although the result was non-significant, $t(83) = 1.58$,

Table 5
Study 3 descriptive statistics for Internet, academic and social behavior value ratings.

	Positive Feedback			Negative Feedback		
	N	M	SD	N	M	SD
Internet Domain						
Abstract Goal	42	3.69	1.35	45	4.65	1.19
Concrete Actions	43	4.46	1.21	42	3.77	1.34
Academic Domain						
Abstract Goal	42	5.10	1.24	45	4.49	1.40
Concrete Actions	43	4.62	1.53	42	5.13	1.34
Social Domain						
Abstract Goal	42	5.30	1.33	45	5.27	1.06
Concrete Actions	43	5.45	1.04	42	5.49	.99

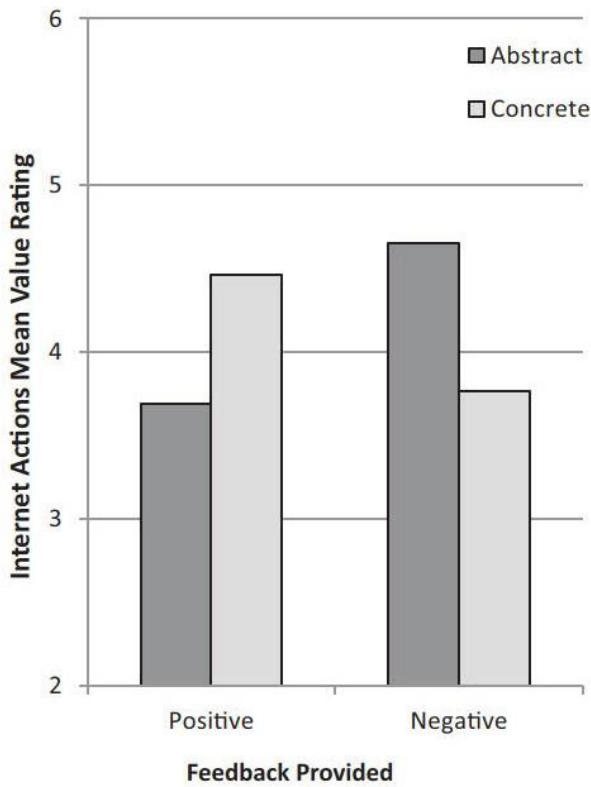


Fig. 10. Internet behavior value ratings for abstract goal and concrete action conditions with positive and negative feedback on initial goal actions.

$p = .18$. A Cohen's d of 0.35 indicated a small effect size. This result is in the predicted direction but not statistically significant, offering some support for H10 (see Fig. 11).

Participants in the abstract goal commitment and positive feedback condition rated the value of Social behaviors lower than those in the concrete goal actions and positive feedback condition, which is in the opposite direction and does not support H10 in the social domain (see Fig. 12). The result is non-significant, $t(83) = -0.56, p = .33$ and a Cohen's d of -0.12 indicates a negligible effect size.

4.3.3. Unsuccessful initial goal pursuit group

Participants in the abstract goal commitment and negative feedback condition rated the value of Internet behaviors higher than those in the concrete goal actions and negative feedback condition, $t(85) = 3.25, p = .003$. A Cohen's d of 0.71 indicated an effect size of moderate magnitude. This result supports H11 (see Fig. 10).

Participants in the abstract goal commitment and negative feedback condition rated the value of Academic behaviors lower than those in the concrete goal actions and negative feedback condition, $t(85) = -2.16, p = .03$. A Cohen's d of 0.47 indicated a small effect size. This result supports H12 in the academic domain (see Fig. 11).

Participants in the abstract goal commitment and negative feedback condition rated the value of Social behaviors lower than those in the concrete goal actions and negative feedback condition, although the result is non-significant, $t(85) = -0.98, p = .33$. A Cohen's d of -0.21 indicated a small effect size. This result is in the predicted direction but not statistically significant, again offering some support for H12 in the social domain (see Fig. 12).

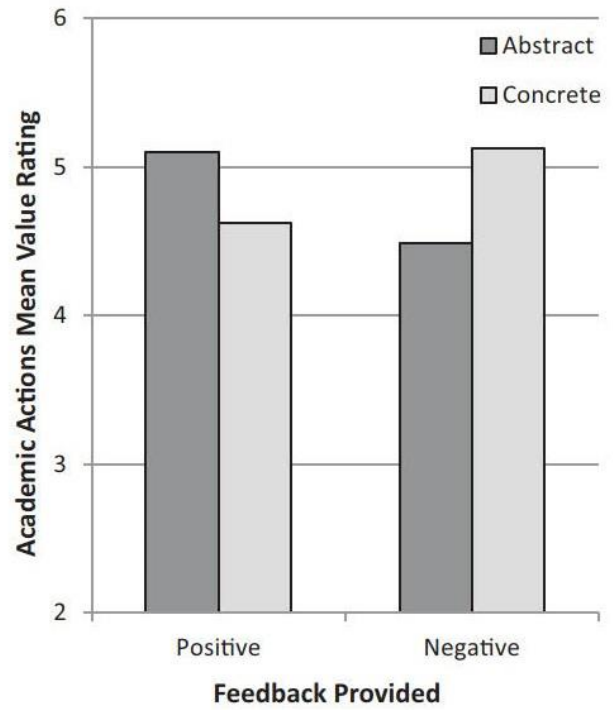


Fig. 11. Academic behavior value ratings for abstract goal and concrete action conditions with positive and negative feedback on initial goal actions.

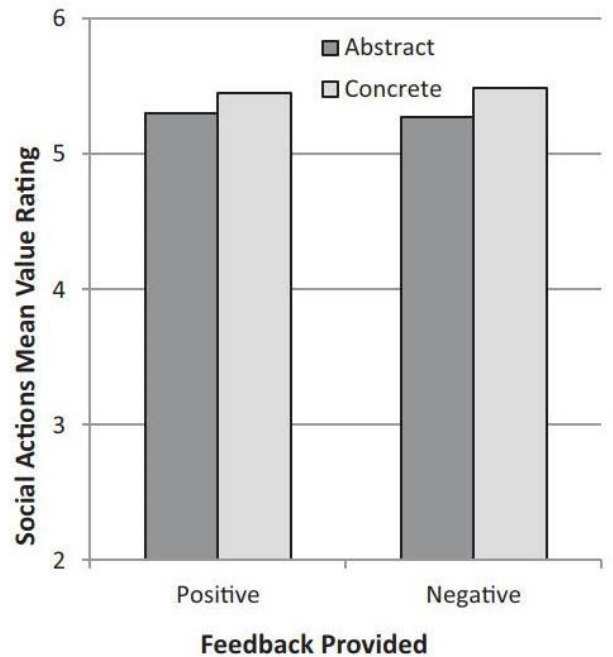


Fig. 12. Social behavior value ratings for abstract goal and concrete action conditions with positive and negative feedback on initial goal actions.

4.4. Discussion

Results supported the predictions of the dynamics of self-regulation model in the Internet domain with participants in the abstract goal group appearing to form a commitment framework and participants who focused on concrete steps appearing to form a

progress framework. Positive and negative feedback on initial goal pursuit produced the opposite effects on behavior ratings for future goal actions, as predicted by the model. The Internet domain again showed the strongest support with moderate effect sizes for both conditions. The academic domain showed some support with both differences in the predicted direction and one condition showing a significant difference. The effect sizes were small in both cases. This data supports the work done by Fishbach et al. (2006) and adds to the results in Studies 1 and 2 of the current paper. The results for the social domain were again non-significant and not in the predicted direction for one condition.

As for studies 1 and 2, the study manipulations cannot account for the failure to support the hypotheses in the social domain as the results for the Internet and Academic domains were as predicted by the model, albeit the academic domain this time offered less support than in the first two studies. The repeated failure to produce results predicted by the model in the social domain indicates that there may be something fundamentally different from the Internet and Academic domains. A broader exploration is offered in the General Discussion section.

During the course of treatment, clinicians and clients develop a treatment plan and goals; assignments, tasks, and homework are also set as steps for clients to undertake as part of therapy (Beck, 2011; Harris, 2009; Wright et al., 2006). Clients, then, can concentrate on concrete tasks for treatment as well as have a high level and abstract goal or plan in place for the whole process. If focusing on concrete actions has a different effect than focusing on a high-level goal then clinicians need to be aware of how best to provide feedback in relation to specific tasks as well as the ongoing treatment plan in order to best serve the client's needs for the topic under discussion and develop the best outcome for treatment.

Results from this study show that individuals who focus on concrete actions will form a progress framework. When presented with feedback on performance, individuals who get high performance feedback will focus on balancing their goals and will be more likely to choose more goal incongruent actions whereas individuals who get low performance feedback will focus on the discrepancy between the feedback and their goal and will more likely choose more goal congruent actions than individuals with a commitment framework. Results also indicate that individuals who focus on abstract goals will form a commitment framework. When presented with feedback on performance, individuals who get high performance feedback will highlight focal goal behaviors at the expense of temptations and will be more likely to choose more goal congruent actions whereas individuals who get low performance feedback will focus on the low importance of the goal, likely reducing the goal's weight in the process and subsequently choose more goal incongruent actions than individuals with a progress framework.

5. General Discussion

A recent model of goal-directed behavior and self-regulation deals with the self-regulation dilemma of battling multiple goals and temptations simultaneously and over the course of many decisions (Fishbach et al., 2009). The model has primarily been applied to a consumer and marketing context but seems suited to a clinical domain. A recent study by Dunbar et al. (2017) began the investigation of applying the model in a clinical context with promising results. The current research sought to test additional components of the model in a clinical domain of Problematic Internet Usage (PIU). All three studies used goal-congruent behaviors of academic and social achievement and incongruent goal behaviors of personal time spent on the Internet. The studies tested various cues and constructs that the model predicts will produce

commitment or progress mental frameworks and continued to investigate how they affect future behavior choices. Successful self-regulation is a fundamental tenet of mental well-being (Hoyle, 2010), is the target of many clinical therapies (Beck, 2011; Harris, 2009; Hayes, 2004; Kuyken et al., 2010) and furthering the understanding the dynamics of self-regulation holds significant clinical importance.

Overall, the commitment and progress frameworks were produced and their opposite effects on subsequent behavior evaluations were observed as predicted by the model (Fishbach et al., 2009). The first study showed that questions about commitment or progress can prime the associated mental frameworks (Fishbach & Dhar, 2005); the second study showed that level of goal commitment can determine the framework (commitment or progress) that an individual will adopt when evaluating goal actions (Koo & Fishbach, 2008); and the third study demonstrated that focusing on the high-level goal will establish a commitment frame whereas focusing on concrete goal steps will establish a progress framework (Fishbach et al., 2006). The studies demonstrated the effects of how successful and unsuccessful goal actions are interpreted under commitment or progress mental representations and produce opposite outcomes in behavior evaluations (Fishbach et al., 2009). Study 1 used specific positive and negative feedback relating to a single day's outcome regarding the goal directed behavior. Study 2 focused participants on the accomplished tasks to-date or unaccomplished tasks which were inferred as successful and unsuccessful goal accomplishments respectively. Study 3 also used specific positive and negative feedback but this time relating to goal outcomes over a period of time. Results showed that predictions of the dynamics of self-regulation model held true in the Internet and academic domains, but there was little support found in the social domain (See Limitations section for further discussion). The study adds more evidence to confirm that the dynamics of self-regulation model can be successfully applied in a clinical domain.

The results do not easily lend themselves to other current models of self-regulation. For example, the ego depletion or strength model of self-control (Baumeister & Heatherton, 1996; Baumeister, Bratslavsky, Muraven, & Tice, 1998) cannot account for the opposite effects of behavior. Specifically, how can negative feedback cause more incongruent goal behavior in the Study 1 commitment group, but then cause less incongruent goal behavior in the Study 1 progress group. Negative feedback cannot seemingly deplete self-control resources in one instance and replenish them in another. The cybernetic models of self-regulation (e.g. Carver & Scheier, 1998; Powers, 2005) can explain the progress groups' behaviors as responding to discrepancies from a reference value (i.e. goal) but have little to say about how the commitment groups perform. Similarly, the hot/cool system of willpower (Metcalf & Mischel, 1999) can explain the devaluation of incongruent goals in one direction but cannot support the opposite effects. It is difficult to explain how the hot (emotional and impulsive) system can be turned on in one condition and the cold (neutral and reflective) system be turned on in another, and then explain why these systems would switch when faced with negative versus positive initial goal action. Construal level theory (Trope & Liberman, 2010), in simple terms, states that high level or abstract thinking gives rise to better self-control, whereas low level or concrete thinking decrease self-control. This is specifically contradicted by Study 3 where the abstract participants are shown to perform well and poorly and concrete participant shown to perform poorly and well simply by providing positive and negative feedback.

The dynamics of self-regulation model is one of cognitive reconstrual (e.g. Fujita, Trope, Liberman, & Levin-Sagi, 2006; Magen

& Gross, 2007), with commitment and progress mental frameworks providing the mechanisms to support how individuals can reconstrue or interpret the same events with opposite outcomes. The results from the current study support the assertion of the dynamics of self-regulation model that commitment and progress are competing mental representational frameworks with opposite motivational and behavioral outcomes (Fishbach et al., 2009).

5.1. Implications for clinical practice

5.1.1. Questions on commitment and progress combined with positive or negative feedback

Questions about goals can prime either a commitment or progress representation framework (Fishbach & Dhar, 2005). When individuals have a commitment representation they are more likely to highlight goal congruent actions and less likely to pursue competing goals whereas when individuals have a progress representation they are more likely to balance between actions and are more likely to seek a balance between the focal goal and competing ones.

During the course of treatment clinicians provide considerable feedback to clients and this can take many forms including summarising a client's improvement or non-improvement towards a certain behavioral goal (Beck, 2011; Harris, 2009; Sommers-Flanagan & Sommers-Flanagan, 2015; Wright et al., 2006). If the words chosen when summarising progress towards a goal influences subsequent behavioral choices a client makes – and indeed, can have opposite effects given a self-regulation framing – then it is important for a clinician to know how to frame the feedback in order to ensure the best possible outcome for the client that is in line with the client's stated goals. For example, consider a clinician who starts the session asking the client how they have progressed since they last met and after receiving information from the client about their achievement follows that up with a statement praising the client's achievement. Will the original question from the clinician induce a progress frame in the client and will the positive feedback then signal partial goal attainment leading the client to adopt a balancing pattern? Should the clinician phrase the feedback to focus on the outstanding and unaccomplished work in order to emphasise a discrepancy? Should the clinician open with a question about commitment instead? Would any of it make a difference? These questions would be of interest to a clinician.

Results from the present study indicate that simple questions about commitment or progress do invoke commitment and progress frameworks respectively. Furthermore, positive feedback activates a highlighting pattern in committed individuals and a balancing pattern in progress-oriented individuals which produces opposite effects in congruent and incongruent behavior ratings. Conversely, negative feedback causes committed individuals to disengage from the focal goal and progress-oriented individuals to act on the discrepancy between their current and desired focal goal states; again producing opposite effects in congruent and incongruent behavior ratings.

It would appear that clinicians should construct their conversations with these results in mind, especially when it is clear that a client will undergo a self-control dilemma in regards to the congruent and incongruent behaviors at hand. Importantly, clinicians should identify if clients indeed hold these goals (or automatic behaviors or cognitions that activate them) as clients will not benefit from the construction of questions and feedback as dictated by the model if the internal self-control dilemma does not exist.

5.1.2. Engaged versus ambivalent clients

Clients seek treatment with varying degrees of engagement and willingness. Some clients come highly willing to engage and

complete treatment, while others may have little interest or desire and may perceive coercion by a well-meaning partner, a government service provider or even a court authority. Regardless of the reason for seeking treatment, clients are often ambivalent about change (Miller & Rollnick, 2012) and it would seem reasonable that clients could have low or high levels of engagement. This is supported by the approach of Motivational Interviewing that is designed to elicit change talk and evoke motivation to take individuals from being uncommitted and ambivalent to being ready and committed to change (Miller & Rollnick, 2012).

Feedback provided by clinicians can take many forms, including providing feedback on the client's level of progress so far and/or the amount of work left to go (Beck, 2011; Sommers-Flanagan & Sommers-Flanagan, 2015). If having a high or low level of engagement and then choosing to focus on the progress done so far or progress that is yet to be completed influences subsequent behavioral choices a client makes, then it is important for a clinician to know how to frame the feedback in order to ensure the best possible outcome for the client.

When clients have a low level of engagement or are uncertain about their level of engagement towards treatment, homework, or behavioral changes, emphasis should be placed on accomplished actions, or the achievements to-date. This will emphasize their engagement to therapy and increase the likelihood of compliance to future work. Conversely, when clients are certain or have a high level of engagement, emphasis should be placed on the remaining work, or tasks to-go as that will emphasize their remaining tasks to be completed and increase the likelihood of compliance to complete them.

Results show that engaged individuals display a progress focus and will have more motivation to complete a goal if they focus on progress to go (“I still have work to do”, “I need to action this”, etc.) versus focusing on completed progress (“I have already completed a lot”, “I can balance my actions for the moment”, etc.). Unengaged individuals, on the other hand, display a commitment focus and will have more motivation to complete a goal if they focus on completed progress (“have already done so much, it must be important”) versus focusing on progress to be completed (“there is still lots to do, it can't be that important to me”). Engagement to therapy may be assessed and developed with motivational interviewing techniques (Miller & Rollnick, 2002).

5.1.3. Abstract goal versus concrete goal actions

Clinicians and clients can work together to develop a plan, vision and goals for treatment; assignments, tasks, and homework are also set as steps for clients to undertake as part of therapy (Beck, 2011; Harris, 2009; Wright et al., 2006). Clients, then, can work on concrete tasks for treatment as well as have a high level and abstract goal or plan in place for the whole process. If focusing on concrete actions has a different effect than focusing on a high-level goal then clinicians need to be aware of how best to provide feedback in relation to specific tasks as well as the ongoing treatment plan in order to best serve the client's needs for the topic under discussion and develop the best outcome for treatment.

Individuals who focus on concrete actions will form a progress framework. When presented with feedback on performance, individuals who get high performance feedback will focus on balancing their goals and will be more likely to choose more goal incongruent actions. Individuals who get low performance feedback will focus on the discrepancy between the feedback and their goal and will more likely choose more goal congruent actions than individuals with a commitment framework.

Individuals who focus on abstract goals will form a commitment framework. When presented with feedback on performance, individuals who get high performance feedback will highlight focal

goal behaviors at the expense of temptations and will be more likely to choose more goal congruent actions whereas individuals who get low performance feedback will focus on the low importance of the goal, likely rejecting the goal in the process and subsequently choose more goal incongruent actions than individuals with a progress framework.

5.2. Clinician practice outcomes summary

The results from the current study suggest teaching clients to appropriately frame and construe the outcomes of their current goal results would be helpful for progress towards their stated goals. If individuals have experienced goal failure then they should frame their thinking in terms of progress, such that they notice the discrepancy between their current and desired end goal states. This should lead to the likelihood of higher evaluations of future goal congruent behaviors. An example of self talk to promote after goal failure might be: "Have I made progress towards my goal? I want to achieve my (concrete) steps towards my goal. I still have more to do." However, if individuals experience goal success they should frame their thinking in terms of their commitment to their desired goal which should lead to the likelihood of higher evaluations for goal congruent behaviors in the immediate future. An example of self talk to encourage after goal success might be: "How committed to my goal do I feel? I have accomplished much already. I want to achieve my (high level) goal."

5.3. Limitations

Throughout the three studies, the social domain failed to provide results that supported the model. Indeed, on many occasions the results were opposite to the predicted direction. All three studies used very similar methods, stimuli and population samples, and all three studies consistently produced the predicted results for the Internet and academic domains. Limitations of the individual studies have been discussed above, but it is unlikely that separate issues in each study produced the same effect of working for Internet and academic domains but failing for the social. The study designs and manipulations are an unlikely source for this phenomenon.

A possible explanation is that, in relation to the social domain, individuals did not actually consider themselves to be in a self-control dilemma to begin with. Fujita (2011) gave the example of a dieter and the self-control dilemma of a chocolate cake. The dieter has a dilemma because there is a conflict between their higher and long-term goal and the lower and proximal temptation and the dieter can only satisfy one of the goals. Fujita (2011) noted that a non-dieter has no such self-control dilemma because they hold no higher and long-term goal to stick to a diet. The non-dieter then is free to choose the chocolate cake or not. According to this argument, participants, in general, held no concerns about their Internet actions in order for them to hold a high level and long-term goal to succeed in their social domain. The studies presented a literature review and video on PIU and the relationship to poorer academic and social outcomes in order to prime a motivational conflict, but this appears to have not been effective in the social domain. Examination of the priming vignette and video revealed that the information presented established that PIU correlates negatively to social relationships rather than stating that increasing real-life social contact would aid in the reduction of PIU. The same message was delivered for academic behaviors. It is possible that participants were implicitly aware that increasing academic actions would reduce PIU but did not hold the same implicit awareness for the social behaviours and this difference is what caused the indistinct results in the social domain. This phenomena might be

specific to a younger student population. If the above interpretation is correct, then clinicians will need to ascertain that a motivational conflict exists between whatever incongruent behavior is desired to be decreased and the congruent goal behavior that is desired to be enhanced.

Previous research (Fishbach & Dhar, 2005; Fishbach & Shah, 2006; Trope & Fishbach, 2000) has successfully used social behavior items and found the effect predicted by the model, but those studies were constructed such that academic actions conflicted with social actions. For example, Fishbach and Dhar (2005) primed academic achievement as the focal goal and used social behavior actions (e.g. hang out with friends at night) as incongruent goal behaviors. There was little potential for social behaviors to be confused as congruent and incongruent goal behaviors in those studies. The current study took special care to separate socialization and Internet use, but given the ubiquity of the Internet in our daily and social lives (Correa, Hinsley, & de Zúñiga, 2010) it is possible that this was not successful. Future research could consider what makes the social domain different in this context.

Readers would note that the present studies dealt with an individual's interest to behave rather than real behaviour. Numerous meta-analyses (e.g. Sheeran, 2002; Webb & Sheeran, 2006) have shown that intention to behave in a certain manner is a good predictor of behavior, but generalising to actual behaviors must be done with caution. Future studies will need to test the model with real world behaviors. The present studies also operated on a general population rather than one identified to have PIU. Future studies could test if the effects exist in a clinical population of individuals classified with PIU.

5.4. Future research and clinical directions

Dunbar et al. (2017) began the testing the model on the dynamics of self-regulation in a clinical context and the current paper has taken this further by testing additional components of the model. The research has demonstrated that consistent effects can be found in general student populations for Internet and academic domains. While remaining components of the model could be tested in a clinical domain, there appears to be enough evidence of support for the model to justify further application to a clinical population. It would be important to see if the strong effects found for Internet behavior evaluations would translate into real life behavior decisions and applying the theory in a PIU population would put its clinical utility to the test.

Results from the current research and the Dunbar et al. (2017) study have shown that the dynamics of self-regulation theory can be applied in the clinical domain of PIU. Those results could inform the development of new interventions to support behavioural change. Ironically, Internet or smartphone application interventions would seem ideally suited to those who experience PIU, as they are already engaged with the platforms. An example of such an application could be tracking an individual's personal Internet usage on a daily basis and comparing it against a pre-set desired goal amount. If the result for the day was positive, then the application could provide a commitment framework response that would put the individual in a highlighting frame such that they would then be more likely to choose congruent behaviors and avoid the temptation of other Internet use. Whereas, if there was too much personal Internet usage the application could give a response to prime a progress framework that would highlight the discrepancy between the current and desired end goal state. This should also encourage more congruent goal behaviors. Future research could consider these possibilities.

Disclosure statement

No competing financial interests exist.

Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.chb.2017.12.039>.

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Appendix C: Information Provided to Participants for Manuscripts 1 and 2 Presented in Chapters 3 and 4

Figure C1

Vignette for Manuscript 1 Presented in Chapter 3

As part of another study I am running I have developed the following literature review. Can you please read this carefully and then answer a few questions about it on the following page.

Please read the following literature review. Take as much time as you need to understand the content.

Problematic Internet use is a growing and global public health concern (Jelenchick et al., 2014; Spada, 2014). Despite the first published case being recorded in 1996 (Young, 1996) Psychological research has not kept up with the technological advances (Aboujaoude, 2010) and growing popularity of internet usage (Internet World Stats, 2014). There are now a multitude of platforms that can be used to access the internet such as mobile phones, iPods, iPads and other tablets. In fact, internet usage via mobile phones has grown over 500% in the last five years (Australian Communications and Media Authority, 2014) and new terms are being coined such as nomophobia standing for “no-mobile-phone phobia” to describe the issues individuals are experiencing (Bragazzi & Del Puente, 2014).

Problematic internet use is particularly concerning for adolescents and young adults with numerous recent studies relating excessive use of the internet with poorer academic achievement and poorer personal relationship quality (Aboujaoude, 2010; Jelenchick et al., 2014; Lopez-Fernandez, Honrubia-Serrano, Freixa-Blanxart, & Gibson, 2014; Muusses, Finkenauer, Kerkhof, & Billedo, 2014; Wang, Jackson, Gaskin, & Wang, 2014; Yau, Potenza, & White, 2013) and problematic internet use can be seen as a precursor to later maladaptive behaviours such as drug and alcohol use (Fisoun, Floros, Siomos, Geroukalis, & Navridis, 2012).

Given the newness of the phenomenon, few long term studies exist. However, those that have been done confirm the links; with problematic internet use predicting increases in stress, loneliness and depression (Muusses et al., 2014).

In sum, problematic internet use is a real phenomenon that can have serious negative consequences for individuals, especially for academic performance and relationship quality.

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Figure C2

Literature Review for Manuscript 2 Presented in Chapter 4

Please read the following literature review. Take as much time as you need to understand the content.

Problematic Internet use is a growing and global public health concern (Jelenchick et al., 2014; Spada, 2014). Despite the first published case being recorded in 1996 (Young, 1996) Psychological research has not kept up with the technological advances (Aboujaoude, 2010) and growing popularity of internet usage (Internet World Stats, 2014). There are now a multitude of platforms that can be used to access the internet such as mobile phones, iPods, iPads and other tablets. In fact, internet usage via mobile phones has grown over 500% in the last five years (Australian Communications and Media Authority, 2014) and new terms are being coined such as nomophobia standing for “no-mobile-phone phobia” to describe the issues individuals are experiencing (Bragazzi & Del Puente, 2014).

Problematic internet use is particularly concerning for adolescents and young adults with numerous recent studies relating excessive use of the internet with poorer academic achievement and poorer personal relationship quality (Aboujaoude, 2010; Jelenchick et al., 2014; Lopez-Fernandez, Honrubia-Serrano, Freixa-Blanxart, & Gibson, 2014; Muusses, Finkenauer, Kerkhof, & Billedo, 2014; Wang, Jackson, Gaskin, & Wang, 2014; Yau, Potenza, & White, 2013) and problematic internet use can be seen as a precursor to later maladaptive behaviours such as drug and alcohol use (Fisoun, Floros, Siomos, Geroukalis, & Navridis, 2012).

Given the newness of the phenomenon, few long term studies exist. However, those that have been done confirm the links; with problematic internet use predicting increases in stress, loneliness and depression (Muusses et al., 2014).

In sum, problematic internet use is a real phenomenon that can have serious negative consequences for individuals, especially for academic performance and relationship quality.

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Figure C3

Vignette for Manuscript 1 Presented in Chapter 3

Please read the following vignette.

IMAGINE ...

You have a problem with the amount of time you spend on the Internet. Having learned about problematic Internet usage you believe you recognise some of the highlighted traits and patterns in your own behaviour. You enjoy using the Internet but believe your relationships with friends and family could be better and you want to spend more time with them. You also see that your grades could do with improvement. Spending more time on your study would help greatly.

You recognise that you need the Internet for things like work and study but you also recognise you spend a lot of personal time indulging in unnecessary tasks.

You are going to make a change.

You set a goal to reduce the personal hours you spend on the Internet and set a maximum amount of time per day to spend on personal Internet use.

You are going to stick to that goal.

Figure C4

Vignette for Manuscript 2 Presented in Chapter 4 – Abstract Condition Positive Feedback

IMAGINE ...

Having learned about problematic Internet usage you believe you recognise some of the highlighted traits and patterns in your own behaviour. You enjoy using the Internet but believe your relationships with friends and family could be better and you want to spend more time with them. You also see that your grades could do with improvement. Spending more time on your study would help greatly.

You recognise that you need the Internet for things like work and study but you also recognise you spend a lot of personal time indulging in unnecessary tasks.

You are going to make a change.

You set a high level goal to reduce the personal hours you spend on the Internet and set a maximum amount of time per day to spend on personal Internet use.

You are going to stick to that higher goal.

:
:
:

Over a period of time, you have decreased your average personal hours down by a certain amount.

You discover that what you have achieved is well ABOVE the average for what is to be expected during this kind of reduction.

Figure C5

Vignette for Manuscript 2 Presented in Chapter 4 – Abstract Condition Negative Feedback

IMAGINE ...

Having learned about problematic Internet usage you believe you recognise some of the highlighted traits and patterns in your own behaviour. You enjoy using the Internet but believe your relationships with friends and family could be better and you want to spend more time with them. You also see that your grades could do with improvement. Spending more time on your study would help greatly.

You recognise that you need the Internet for things like work and study but you also recognise you spend a lot of personal time indulging in unnecessary tasks.

You are going to make a change.

You set a high level goal to reduce the personal hours you spend on the Internet and set a maximum amount of time per day to spend on personal Internet use.

You are going to stick to that higher goal.

⋮

Over a period of time, you have decreased your average personal hours down by a certain amount.

You discover that what you have achieved is well BELOW the average for what is to be expected during this kind of reduction.

Figure C6

Vignette for Manuscript 2 Presented in Chapter 4 – Concrete Steps Positive Feedback

IMAGINE ...

Having learned about problematic Internet usage you believe you recognise some of the highlighted traits and patterns in your own behaviour. You enjoy using the Internet but believe your relationships with friends and family could be better and you want to spend more time with them. You also see that your grades could do with improvement. Spending more time on your study would help greatly.

You recognise that you need the Internet for things like work and study but you also recognise you spend a lot of personal time indulging in unnecessary tasks.

You are going to make a change.

You set a goal to reduce the personal hours you spend on the Internet and set a maximum amount of time per day to spend on personal Internet use.

You come across a treatment program which is designed to help reduce your Internet usage. It contains a number of psychological measures, instruments, guidelines, processes and procedures to follow.

You have read the planned steps and think following these will help reduce your Internet usage.

You start following the steps in the program and take them one at a time.

⋮

Over a period of time, you have decreased your average personal hours down by a certain amount.

You discover that what you have achieved is well ABOVE the average for what is to be expected during this kind of treatment program.

Figure C7

Vignette for Manuscript 2 Presented in Chapter 4 – Concrete Steps Negative Feedback

IMAGINE ...

Having learned about problematic Internet usage you believe you recognise some of the highlighted traits and patterns in your own behaviour. You enjoy using the Internet but believe your relationships with friends and family could be better and you want to spend more time with them. You also see that your grades could do with improvement. Spending more time on your study would help greatly.

You recognise that you need the Internet for things like work and study but you also recognise you spend a lot of personal time indulging in unnecessary tasks.

You are going to make a change.

You set a goal to reduce the personal hours you spend on the Internet and set a maximum amount of time per day to spend on personal Internet use.

You come across a treatment program which is designed to help reduce your Internet usage. It contains a number of psychological measures, instruments, guidelines, processes and procedures to follow.

You have read the planned steps and think following these will help reduce your Internet usage.

You start following the steps in the program and take them one at a time.

⋮
⋮
⋮

Over a period of time, you have decreased your average personal hours down by a certain amount.

You discover that what you have achieved is well BELOW the average for what is to be expected during this kind of treatment program.

Figure C8

Video on Problematic Internet Use for Manuscript 2 Presented in Chapter 4

Notes: YouTube video titled “Internet Addiction: Signs You Need to Shut Down (Mental Health Guru)” accessed from <https://www.youtube.com/watch?v=D2KmcPWvSw8>

Please watch the following video on compulsive Internet use.

Note that the video talks about Internet Addiction but they really just mean Problematic Internet Usage. These terms are used interchangeably, even in research.

The video goes for 3 minutes.

