Preventing problematic Internet use through video-based interventions: A theoretical model and empirical test

Abstract

This study relies on the core ideas of the health belief model and suggests that short informational videos on Internet "addiction" can be an effective means toward preventing problematic use of the Internet through their ability to drive changes in viewers' attitudes toward reducing their Internet use. Building on the heuristic-systematic model of information processing viewpoint, it is further suggested that this attitude change is guided by the information the videos provide, as well as the surprise emotion they generate. To test this model, data were collected at three points in time from 223 participants who were exposed to one of two video interventions. PLS analyses indicated that the videos were efficacious in improving viewers' attitudes toward reducing their Internet use, after accounting for viewers' preexisting attitudes, levels of Internet "addiction", demographics and social desirability bias. Consistent with the heuristic-systematic model of information processing perspective this effect was mobilized simultaneously through the information and surprise induced by the videos.

Keywords: attitude change, problematic Internet use, health interventions, health belief model, heuristic-systematic model of information processing

1. Introduction

Over the last two decades the Internet has emerged as an important medium for conducting business, searching and sharing information, "killing time", and managing social ties. However, because the use of the Internet can be highly gratifying, some users may employ it excessively,

develop social, personal, and work or school problems, and even present addiction-like symptoms (Chou and Hsiao 2000). These symptoms include salience (dominating users' behaviors and thoughts) , withdrawal, mood modification, relapse, and a range of negative consequences (Turel *et al.* 2011b). Given the prevalence of this phenomenon and its possible adverse impacts on individuals and society, the concept of "Internet Gaming Disorder" was included in the appendix (section 3, potential disorders requiring further research) of the fifth edition of the American Diagnostic and Statistical Manual for Mental Disorders (DSM-V) (American Psychiatric Association 2013).

While much research has focused on the detection of Internet "addiction" or problematic Internet use, and the treatment of resultant excessive Internet use (Douglas *et al.* 2008, Byun *et al.* 2009), little is known about prevention techniques; i.e., ways to avert people from using the Internet excessively and possibly becoming highly addicted to the Internet. Because such techniques can benefit our society (Block 2008), this study focuses on them. Specifically, it examines the efficacy of one prevention technique, namely instructional videos, in reducing, and possibly preventing problematic excessive use of the Internet.

One way to reduce problematic excessive use of the Internet is by convincing people that they should control their Internet use and reduce it to levels they feel are appropriate (Young 1998a). However, it is not yet clear when people will be willing to do so. According to the health-belief model (Janz and Becker 1984), this will happen if a person believes that a health condition (possible Internet "addiction" in our case) can be avoided by taking a viable action (reducing Internet use in our case). If such beliefs regarding the behavioral outcome exist, changes in one's behavior are driven by the perceived threat of the condition (an aggregated assessment of the susceptibility of obtaining the condition and the severity of the condition and

its consequences). Thus, informing individuals regarding the potential severity of a possible condition (Internet addiction-like symptoms in our case), their susceptibility to the condition, ways to avoid the condition and their ability to take such actions can be an effective means to encourage healthy actions through improving people's attitudes toward behavior change.

Informational videos are one useful means to convey the abovementioned information and drive behavioral changes (Brown *et al.* 1997, O'Donnell *et al.* 1998, Kalichman *et al.* 1999, Abbaszadeh *et al.* 2011). Accordingly, this study employs a video-based intervention aimed at exposing viewers to the threat, their susceptibility to it, and ways to deal with it in the context of Internet "addiction" (the threatening severe condition), and improving their attitudes toward reducing their Internet use. Such attitudes are the basis for actual behavioral change (Ajzen 1991, Ajzen 2001), and by improving them it may be possible to reduce and prevent excessive and problematic Internet use.

The study further suggests that instructional videos, like other sources of information, influence attitude updating through a dual-process of information processing, including rational and cognitive deliberation about the content being viewed, as well as affective, heuristic-based assessments regarding the target object or behavior (Reyna and Farley 2006, Paley *et al.* 2007, Murray *et al.* 2011). This process is described by the Heuristic-Systematic Model of Information Processing (Chaiken and Maheswaran 1994), according to which attitudes can be determined both by rational reflections on the provided information as well as by indirectly related cues, such as emotions. Hence this study manipulates both of these aspects through the employment of two video interventions: one that is very educational, informative and surprising, and the other which is more humorous and less informative and surprising.

A sample of 233 university students watched one of these two videos in their classrooms and completed three surveys: one-week prior to watching the video (pre-survey), immediately after watching the video (post-video survey), and one week after watching the video (post-survey). Data were analyzed with Partial Least Square (PLS) techniques. We used PLS because distributions of negative phenomena such as "addiction" tend to be non-normal, and transformation to normally (and then the use of other SEM-based techniques) makes the interpretation awkward. The results indicated that the videos were efficacious in improving viewers' attitudes toward reducing their Internet use, after accounting for viewers' pre-attitudes, levels of Internet "addiction", age, gender, and social desirability bias. The findings further supported the Heuristic-Systematic Model of Information Processing by showing that the videos influenced viewers' attitudes through relevant information, as well as by inducing surprise emotion.

2. Theoretical Background

The study examines how instructional videos on the topic of Internet "addiction" can improve viewers' attitudes toward reducing their use of the Internet. It is suggested that such changes take place through a dual-process involving cognitive (based on the information the video provided) and affective (based on the surprise emotion the video induced) assessments in response to the videos. Thus, the next subsections first elaborate on the looming condition, i.e., Internet addiction, and then describe attitude change processes as portrayed by the Heuristic-Systematic Model of Information Processing.

2.1. Internet "Addiction"

Using some, mostly hedonic, applications on the Internet can be addictive (Beard and Wolf 2001). Because the Internet can provide constant rewards (e.g., enjoyment when winning bids

on eBay, social belongingness when using Facebook, alleviation of loneliness when chatting with others), vulnerable brains can develop a strong and less-controllable desire to constantly use Internet applications (Turel *et al.* 2011b). In such cases, Internet "addiction", defined as a maladaptive psychological dependency on the use of the Internet which is manifested through obsessive Internet-seeking and Internet-use behaviors that infringe normal functioning, can be developed (Turel *et al.* 2011b). Individuals who suffer from high levels of "addiction" to Internet use often present addiction-like symptoms, including withdrawal, difficulty to reduce or quit their addictive behavior, mood modification when unable to use the Internet, and conflicts with others as well as internal conflicts regarding the use of the Internet (Chou *et al.* 2005).

The problem of Internet "addiction" is fairly prevalent. Many studies estimate that a single-digit percentage of the Internet user population presents very high levels of Internet "addiction" (Fu et al. 2010, van Rooij et al. 2011, Kuss et al. 2013), and that other segments in the population present lower levels of this condition (Turel et al. 2011b). As a result, the American Psychiatric Association decided to include the concept of "Internet Gaming Disorder" (a less constraining term than "addiction") in the appendix of the DSM-V manual (American Psychiatric Association 2013).

Moreover, much research in recent years has been devoted to Internet "addiction" or "addictions" to specific applications on the Internet (e.g., video games, Facebook, eBay, etc.) (Chou et al. 2005, Shaw and Black 2008, Byun et al. 2009). This attention is due to the fact that such "addictions" can deteriorate people's quality of life, the lives of their families and friends, and their social and professional functioning (Turel et al. 2011a). This line of work has revealed several correlates and consequences of Internet "addictions". Outcomes include excessive use of Internet applications and a range of negative repercussions such as arguments, lying to family

and friends, poor work and school achievement, social isolation, fatigue (Block 2008), and increased work and family conflicts (Turel et al. 2011a). Correlates and predictors include personality traits such as low emotional stability, low perceived attractiveness, and high negative valence (Charlton and Danforth 2010), mental states such as depression (LaRose et al. 2003) social anxiety and loneliness (Caplan 2007), family factors such as habitual alcohol use by siblings, lower family function, parents' permissive attitudes toward substance use (Yen et al. 2007), and demographic (e.g., age) and socioeconomic factors (Hur 2006).

While much research has been devoted to measuring Internet "addiction", identifying cases of "addiction", and treating them (Douglas et al. 2008, Byun et al. 2009), much less is known about the prevention of "addiction" or merely excessive use of the Internet. Such prevention efforts can prove fruitful (Xu et al. 2012), especially given that habituated, frequent and growing use of Internet applications is a pre-condition to the formation of addiction (Turel et al. 2011b). Thus, this study focuses on ways to reduce and control Internet use as a means to prevent or alleviate problematic use of the Internet, and possible Internet "addiction".

2.2. Attitude Change

Attitude change is at the heart of behavioral changes, because changes in attitudes can motivate people to stray away from an existing or undesirable behavioral pattern (Petty *et al.* 1997, Ajzen 2001). Thus, this study focuses on attitudes. Attitudes are summative psychological evaluations of a target concept (object, person, behavior, etc.) with some degree of favor or disfavor (Eagly and Chaiken 1993). Attitudes are important to study because they are focal drivers of behaviors (Ajzen 2001). They propel behaviors by informing deliberate goal-oriented reasoning regarding the behaviors, which translates into intentions to perform or avoid behaviors (Fishbein and Ajzen 1975, Ajzen 1991). This crucial role of attitudes as predictors of behaviors has been

demonstrated in various studies and in many contexts (Kraus 1995), including in the case of information systems (Davis 1989).

Attitudes are construed by means of conscious deliberation, and by using information stored in the memory as well as external cues and emotions. Reflecting on such information and emotions, people develop a certain degree of favor or disfavor regarding the target object or behavior; i.e., an attitude (Ajzen 2001). Because attitude formation involves deliberation and the use of various contemporary sources of information, attitudes are unstable and can be subjected to changes in response to new information (Olson and Zanna 1993, Petty et al. 1997). For example, a person may have a negative attitude toward eating apples. However, after understanding that eating apples can improve her health (e.g., after a discussion with her doctor, or watching an informative video), she may update her evaluation of this act, and consequently have a more positive attitude toward eating apples. Nevertheless, well established attitudes are difficult to change because new information needs to undermine the reliability of existing beliefs or add meaningful information to an already accumulated knowledge and set of beliefs. Hence, revised attitudes are often heavily influenced by existing attitudes, but incorporate also the new information (Petty *et al.* 1997, Ajzen 2001).

As noted above, the bases for attitude formation and updating include both cognitions and emotions. Emotions too can provide information, and indicate to people that they may need to update (or retain) their attitudes and behaviors or merely consider doing this. Emotions, as opposed to cognitions, often leave strong traces ("markers") in people's episodic memories. These markers are highly accessible to cognitive deliberation, and are taken into account along with other important semantic memories in thought processes (Cohen and Areni 1991, Westbrook and Oliver 1991). For example, inducing negative emotions (Rogers 1975) or

surprise (Vanhamme and Snelders 2003) in individuals may prompt them to change their attitudes. Thus, it is desirable to consider both emotions and cognitions when modeling attitude change (Mackie and Worth 1989).

One of the key models for explaining attitude change in response to both cognitive and emotive cues is the Heuristic-Systematic Model of Information Processing (Chaiken and Maheswaran 1994). According to this model, people process persuasive messages carefully, i.e., use "systematic processing" when they are motivated and have the ability to do so. When using this mechanism, argument strength and the conveyance of relevant information are the key determinants of attitude change. People, however, do not use this mechanism exclusively. They often take "short-cuts" by using heuristic processing, i.e., considering peripheral cues beyond the key argument of the message such as emotions and social cues. The heuristic processing path is especially active when people are not fully motivated or able to engage in thorough cognitive deliberation. In many cases, however, people engage both the systematic and heuristic processing mechanisms and consider information as well as emotions when changing attitudes. Thus, these mechanisms are not mutually exclusive, and the processing of emotions induced by a message supplements the effects of the persuasive content of a message (Olson and Zanna 1993).

The dual processing path described by the Heuristic-Systematic Model of Information Processing was supported by many studies (Meyer 2000, Griffin et al. 2002). Thus, we also focus on both the roles of cognitions induced by the persuasive information the video provided, as well as a relevant emotion, in driving attitude change. Because one's post-video attitude toward Internet use reduction is also likely influenced by the pre-video attitude as well as by his or her level of Internet "addiction", we also hypothesize such effects. Furthermore, because some

of the responses may be affected by participant's demographics and social desirability we control for such effects. The research model is depicted in Figure 1.

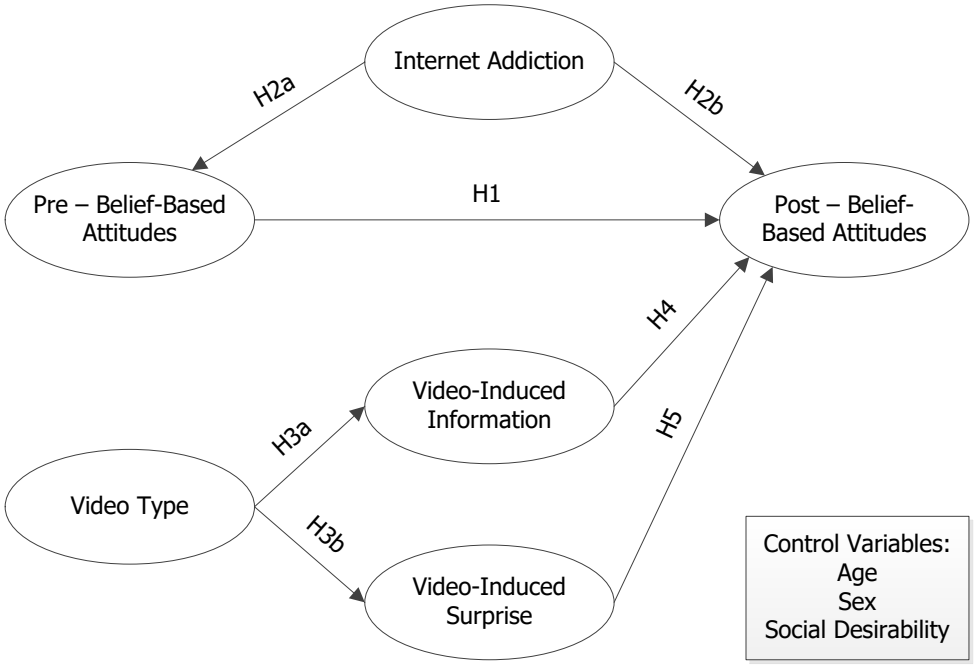


Figure 1: Research Model

3. Hypotheses

While this study focuses on the effects of instructional videos on viewers' attitudes, it should be noted that such effects are meaningful only after accounting for the effects of one's existing attitudes. Accounting for the latter effect is important, because new attitudes are often based, in part on existing ones (Ajzen 2001). This is done because individuals want to minimize their cognitive effort, and thus take advantage of existing evaluations and memories (Bolton 1998). That is, prior attitudes are retrieved from one's explicit memory and act as a starting point which may be adjusted by reflecting on new information or emotions. In the case of information systems use, this process has been termed "sequential updating" and captures how past attitudes

serve as a partial basis upon which current attitudes are formed (Kim and Malhotra 2005). Such attitude updating process received empirical support (Kim 2009). We therefore hypothesize:

H1: Users' post-video attitudes regarding Internet use reduction will be based, in part, on their pre-video attitudes toward the same subject.

Before accounting for the effects of the videos, one should also consider the role of Internet "addiction" in informing attitudes toward reducing the use of the Internet. Addictions, including to the Internet or to Internet applications generate a wide range of negative outcomes, including mood modification, withdrawal, negative emotions, and painful internal conflicts (Byun *et al.* 2009, Turel *et al.* 2011a, Turel *et al.* 2011b). People can often associate these negative consequences with the addictive behavior, feel a personal crisis, and consequently develop a motivation to fix their behavior (Shaffer and Jones 1989). Thus a desire to reduce or even quit the addictive behavior in the face of addiction is a key outcome of addiction (Edwards *et al.* 1981). Addictions and their painful symptoms, in essence, serve as information sources for the reevaluation of one's attitudes toward Internet use reduction. When high levels of addictions exist, it is assumed that the signals regarding the need to reduce or self-regulate the addictive activity (e.g., negative emotions, withdrawal, comments from family and friends, etc.) are strong (Marlatt *et al.* 1988). Consequently, in such situations users should develop more positive attitudes toward reducing their Internet use. Hence:

H2 a and b: Users' (a) pre-, and (b) post- video attitudes regarding Internet use reduction will be positively associated with their levels of Internet "addiction".

The key source of information used in this study was educational videos regarding the characteristics and risks of Internet "addiction". Two videos were employed such that different levels of information and surprise feelings were induced. This was done in order to be able to

examine the mediational effects of the perception and emotion this study focuses on, on changes in one's attitudes. The first video (Video 1) was developed by one of the authors and included a brief compilation of news and reports depicting the current research findings and different types of Internet "addiction". The content of the five-minute video included definition, current data and surprising statistics, description of the symptoms of Internet "addiction", and a brief description of those who are more susceptible to becoming addicted to the internet. It was designed to be informative and to provide insightful (informative) and surprising (i.e., primary emotive response to deviations from one's expected schema of information) facts. The second video (Video 2; also about 5 minutes long) was found on YouTube and was presumed to be less serious and informative, as well as to present less new and surprising information. It involved a person describing possible signs of Internet "addiction" using humor and sarcasm. Thus, it was expected that the two videos induce different assessments of how informative they were as well as different levels of surprise:

H3 a and b: Users' assessments of how (a) informative and (b) surprising the video they watched was will be higher for Video 1 than for Video 2.

Theories that focus on persuasion (Chaiken and Maheswaran 1994, Tam and Ho 2005) or merely attitude change (Petty *et al.* 1997, Ajzen 2001) posit that changes in one's attitudes can be based on reflections on new information. People often use deliberation in order to update their attitudes, and for this purpose they can employ new information to which they were exposed (Olson and Zanna 1993, Petty *et al.* 1997). Similar processes have been observed in IS contexts; system use can provide new information (feedback) which is used in current attitude evaluations (Kim 2009). Because the source of alarming information regarding Internet "addiction" risks in this study is the videos, video-induced information should be one basis upon which one's attitude

is updated. Because the videos imply that self-regulating and reducing one's Internet use is desirable, the attitude update should result in a more positive attitude toward Internet use reduction. Hence:

H4: Users' video-induced information regarding Internet "addiction" and its risks will increase their post-video attitudes toward Internet Use reduction, after accounting for the effects of pre-video attitudes and levels of Internet "addiction".

As per the Heuristic-Systematic Model of Information Processing perspective, new or updated attitudes can also be based in part on peripheral cues such as emotions. In this study we focus on the surprise emotion, because it has a high potential to influence attitude change (Vanhamme and Snelders 2003). Surprise is a primary emotive response to incongruity between an expected stimulus-schema (informal, unarticulated complex set of beliefs about a phenomenon) and the actual one (Izard 1977). For example, if someone assumes that there are only a few people in the world who are addicted to the Internet, and then hears that these may comprise 5% of the Internet user population, he or she may be surprised. Surprise leads to attitude change by adding new information to one's considerations, and this information is highly-accessible in their memories, and ready for attentive deliberation processes (Lee *et al.* 2006, Browning and Harmer 2010). When people are surprised, they typically pay closer attention to the surprising facts, and engage in a more thorough evaluation of their current belief-system, which can result in belief-system and attitude updates (Meyer *et al.* 1997). This effect is particularly strong when the surprising information is threatening, e.g., when it pertains to Internet "addiction" or safety risks. In such cases people should be more attentive to the surprising facts, even when the portrayed risks are not action-relevant (Schutzwohl and Borgstedt 2005). We hence theorize that:

H5: Users' video-induced surprise feelings will increase their post-video attitudes toward Internet Use reduction, after accounting for the effects of pre-video attitudes and levels of Internet "addiction".

4. Methods

4.1. Procedure

The study focused on the Internet because it is a highly prevalent and impactful IT artifact. Many individuals use it and have beliefs about it. However, some of these beliefs may be dangerous, and lead to excessive and maladaptive use of the Internet, or inability to control and reduce the use of the Internet (Young 1998b, Fu *et al.* 2010). One means toward reducing the potentially excessive and maladaptive use of the Internet can be the systematic repair of users' belief systems (Turel *et al.* 2011b), as often practiced in Cognitive-Behavioral Therapy (CBT, King *et al.* 2012). While in this study we did not use a full CBT procedure as an intervention, we employed a key mechanism that can alter and repair people's belief systems, namely instructive videos (Matsumoto *et al.* 2006, Simpson *et al.* 2006) on the symptoms and risks of Internet "addiction". Such videos have the capacity to change viewers' attitudes toward the subject of the videos (Peterson and Pfost 1989, Manchanda and McLaren 1998).

Using the two videos (one informative and surprising and the other humorous and less informative) the study consisted of four major parts. Participation was encouraged with a draw of a $50 gift card. In the first part, participants (undergraduate students who are Internet users) were asked to voluntarily complete an online pre-questionnaire at baseline (one week before watching the video), which captured their descriptive statistics, baseline belief-based attitudes regarding reducing their use of the Internet, Internet "addiction", and social desirability bias (this is a common control variable which is often used when self-reported data regarding a negative

phenomenon such as “addiction” is collected). In the second part, participants were exposed to the intervention by showing video 1 or video 2 in their classes. Because the study was conducted in two colleges at the same university, one college (health science) was randomly assigned to the “video 1” condition, and the other (business) was consequently assigned to the “video 2” condition. In the third part, participants completed a post-video survey capturing the manipulated perception and emotion (level of information, and surprise feelings), immediately after viewing the video. Lastly, a week after viewing the video, participants were sent an email requesting them to complete an online post-questionnaire which assessed their post-video belief-based attitudes regarding reducing their use of the Internet.

4.2. Sample

Excessive and possibly “addiction”-driven use of the Internet is more prevalent among university students, because they often meet the following risk profile: they are highly Internet literate and use the Internet for many purposes, they have flexible schedules and free time, they have little external control over their Internet use (no parental or organizational control), and they habitually use the Internet for developing their identities as well as for escapism (Kuss *et al.* 2013). Thus, this study focuses on this at-risk population.

A total of 370 North American undergraduate university students from business (n=217) and health science (n=153) majors were approached to participate in this study. Out of them, 341 (92%) completed the pre-questionnaire, 310 completed the post-video survey (84%), and 233 (63%) completed the post-questionnaire. The valid sample included only those participants who completed the three questionnaires (n=233). The sample was female dominant (142, 60.9%); and the average age of participants was 22.5 (ranging from 18 to 49). The participants had on average 11.5 years of Internet experience, and they used the Internet for non-school and non-work related

purposes, on average, 5.7 days a week (0 to 7) and for 4.1 hours per day (0.2 to 10). Their overall Internet use time was divided, on average, to the following tasks: work related – 10.1%, school related – 40.1%, social related – 24.5%, and fun related – 25.4%.

Because health science students were randomly assigned to Video 1, and business students to Video 2, we tested for potential differences at baseline between these subgroups as a means to rule out potential differences in the outcome due to a-priori differences. To this end, a Multivariate Analysis of Variance (MANOVA) model which used the video type as a fixed factor was estimated with SPSS 20. It indicated that there were significant preliminary omnibus differences between the groups (Wilks' Lambda=0.86, $F(16)=1.79$, $p<0.034$). An examination of the between-subjects effects indicated that the groups differed in age ($p<0.02$) and gender ($p<0.001$), but not in Internet use patterns, baseline belief-based attitudes, and social desirability (p-values over 0.22). Thus, at baseline both groups did not have significantly different attitudes toward the reduction of Internet use, nor did they differ in their Internet use patterns and social biases. In contrast to these similarities, differences in age and gender were observed, and were deemed reasonable. These differences were expected because the Video 1 group consisted of health science students, and consequently was more female dominant (77.1%) than the business students group (49.6%). Moreover, the sampled health science students were mostly sophomores and juniors (average age = 21.8), and consequently the business students who were mostly seniors, were older on average (average age = 23.0). To account for the potential effects of age and gender, we included these control variables in the estimated model.

4.3. Measures

All three surveys (baseline, post-video, and post) were delivered online, and were based on well-established and reliable scales which were adapted, if needed, to the context of the Internet. The

baseline-survey captured Internet "Addiction" using the 14 item scale by Van Rooij and colleagues (2011) as adapted from Meerkerk at al. (2009). It also included demographics and use statistics measures for descriptive and control purposes. Furthermore, it included the 13-item short-form social desirability scale by Reynolds (1982) in order to account for potential social desirability biases in the data.

The baseline survey also captured participants' belief-based attitudes toward Internet use reduction at baseline, following the recommended Theory of Planned Behavior procedure (Ajzen 1991). This procedure involved the multiplication of behavioral beliefs (beliefs that the behavior will result in a range of outcomes) by their outcome evaluations (how appealing or desirable each of the outcome is) (Byrne and Arias 2004). Based on a review of the literature (Byun et al. 2009, Kuss et al. 2013) ten potential positive outcomes of the reduction of Internet use, such as allowing the development of normal relationships, helping in improving academic achievement, and reducing negative feelings were obtained. Participants were asked to report the likelihood that reducing their use of the Internet would result in each of these 10 outcomes, using a seven-point scale (1=extremely unlikely to 7=extremely likely). For each of the 10 outcomes they were also asked to report how appealing it is (1=extremely bad to 7 = extremely good). Each likelihood score was multiplied by the corresponding outcome evaluation to create a belief-based attitude indicator. The resultant ten indicators ranged from 1 (Very low likelihood that the outcome will be obtained by reducing the use of the Internet, and the outcome is not desirable) to 49 (Very high likelihood that the outcome will be obtained by reducing the use of the Internet, and the outcome is very desirable).

The post-video survey captured surprise using PANAS-X items (Watson and Clark 1994), and how informative the video was using a direct question (1=not at all informative to 5=very

informative) (Ruffinengo et al. 2009). The post-survey (one week after the post-video survey) captured participants' post-video belief-based attitudes regarding reducing their use of the Internet, by using the same scale used in the pre-survey for this purpose. The scales and their sources are outlined in Table 1.

Table 1: Measurement Instrument

Survey	Construct & Source	Items
Baseline Survey (t_1)	Internet "Addiction" (Meerkerk *et al.* 2009, van Rooij *et al.* 2011)	How often…. (1=Never, 7=Very Often) – do you find it difficult to stop using the Internet when you are bored? – do you continue to use the Internet despite your intention to stop or reduce your use? – do others (e.g., parents, siblings, friends) say you should use the Internet less? – do you prefer to use the Internet instead of spending time with others (e.g., family, friends)? – are you short of sleep because of Internet use? – do you think about the Internet, even when not online? – do you look forward to your next Internet session? – do you think you should use the Internet less often? – have you unsuccessfully tried to spend less time on the Internet? – do you rush through your homework or chores in order to use the Internet? – do you neglect your daily obligations (school, chores, or family life) because you prefer to use the Internet? – do you use the Internet when you are feeling down? – do you use the Internet to escape from your sorrows or get relief from negative feelings? – do you feel restless, frustrated, or irritated when you cannot use the Internet?
	Belief-Based Attitude toward Reducing Internet Use (Baseline, t_1) (Ajzen 1991, Byrne and Arias 2004)	1. Please indicate the likelihood that reducing your Internet use would result in each of these 10 different outcomes, (1= extremely unlikely to 7= extremely likely). 2. Also, please indicate how good or bad each of the 10 possible outcomes presented would be for you, using a 7-point scale ranging from (1=extremely bad to 7=extremely good). -- Reducing my Internet use would: o Free up my time o Allow me to develop normal relationship with friends o Help me improve my academic achievement o Reduce my stress o Improve my mood o Reduce my negative feelings o Help improve my life o Enable me to be a better person o Enhance my effectiveness o Make it easier to manage my life
	Social Desirability (Reynolds 1982)	Please indicate whether the statements below are true (T) or false (F) with respect to yourself (consider your true typical behaviors, and not how you want to be): – It is sometimes hard for me to go on with my school work if I am not encouraged. – I sometimes feel resentful when I don't get my way. – On a few occasions, I have given up doing something because I thought too little of my ability. – There have been times when I felt like rebelling against people in authority even though I knew they were right. – No matter who I'm talking to, I'm always a good listener. – There have been occasions when I took advantage of someone. – I'm always willing to admit it when I make a mistake.

		– I sometimes try to get even, rather than forgive and forget. – I am always courteous, even to people who are disagreeable. – I have never been irked when people expressed ideas very different from my own. – There have been times when I was quite jealous of the good fortune of others. – I am sometimes irritated by people who ask favors of me. – I have never deliberately said something that hurt someone's feelings.
Post-Video Survey (t_2)	Video-induced Surprise	Please reflect on your experience while watching the video and indicate to what extent you have felt: (1= Not at all/ very slightly to 5=Extremely) -Amazed – surprised
	Video-induced Information	– How informative was the video? (1=Not at all informative to 7= Very informative)
Post-Survey (t_3)	Belief-Based Attitude toward Reducing Internet Use (t_3)	– Same as in the baseline survey

5. Analysis and Results

Several preliminary analyses were performed before estimating the proposed model. First, Table 2 which presents descriptive statistics, reliability scores and correlations was generated, and assessed against common reliability and validity criteria (Gefen *et al.* 2011). As can be seen, all multi-item constructors were reliable with Cronbach's alphas and composite reliability scores over 0.80. Hence, sufficient convergent validity was established. In addition, the Average Variance Extracted (AVE) scores were over 0.5, which further substantiated convergent validity, except for the scale for Internet "addiction". Multiple tests were conducted to examine this issue. Using SmartPLS version 2.0.M3, it appeared that all loading for this scale exceeded 0.5 and were significant at $p<0.001$ (see Table 3). Retaining only the five items with the highest loadings increased the AVE score to an acceptable level (0.57). But, modeling Internet "Addiction" with the 14 items or the five items with the highest loadings did not make a difference in the significance of the model's paths. Thus, the 14-item scale was retained in order to ensure content validity.

Table 2: Descriptive Statistics, Reliabilities†, and Correlations

	Mean	Std. Dev.	CR (AVE)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Internet "Addiction" (t_1)	2.01	1.05	.91 (.42)	***.90***							
(2) Belief-Based Attitude at Baseline (t_1)	21.35	7.81	.92 (.53)	.31**	***.90***						
(3) Video Type	NA	NA	NA	.18**	-.07	***NA***					
(4) Video-induced Information (t2)	3.20	1.17	NA	-.13	.10	-.47**	***NA***				
(5) Video-induced Surprise (t2)	2.18	1.04	.92 (.86)	-.01	.15*	-.39**	.50**	***.84***			
(6) Post Belief-Based Attitude (t3)	21.63	8.71	.93 (.60)	.24**	.68**	-.20**	.22**	.25**	***.91***		
(7) Age (t_1)	22.53	4.07	NA	-.07	-.12	.14*	.04	-.07	-.11	***NA***	
(8) Gender (t_1)	NA	NA	NA	-.07	.08	-.27**	.09	-.02	.09	-.02	***NA***
(9) Social Desirability (t_1)	6.97	2.77	NA	-.41*	-.10	-.05	.20**	.04	-.14*	.07	.03

* $p < 0.05$ ** $p < 0.01$

† Reliabilities are reported only for multiple-item scales. Cronbach's alphas are reported on the diagonal. Average Variance Extracted (AVE) and Composite reliability (CR) are given in the designated column.

Sufficient discriminant validity was demonstrated by the fact that the square root of the AVE score for each multiple-item construct was larger than the corresponding correlations (see Table 2). It was further supported by observing the pattern of loadings and cross-loading (see Table 3) which indicated high and significant loadings of items on the intended constructs, and low cross-loadings. Moreover, all correlations (Table 2) were in the expected direction, and some of them were very low (r = -.01, ns), which indicated low likelihood of a significant common method variance (CMV) component. While the potential for CMV was reduced by the temporal separation between the three surveys, we tested for significant CMV using a Harman's single factor test. It produced seven principal components explaining 67% of the variance, out of which the first component explained only 27% of the variance. Thus, it was concluded that CMV is unlikely to be pertinent in the collected data, and should not be controlled for in the model.

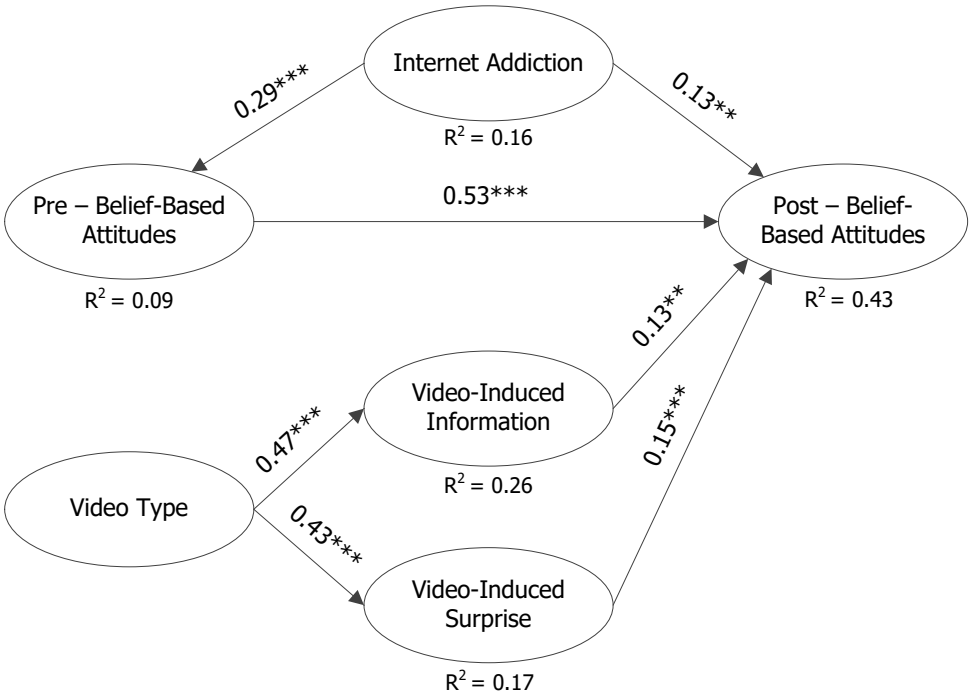
Table 3: Loadings and Cross-loadings†

	"Addiction"	Pre Attitude	Video Type	Video-induced Information	Video-induced Surprise	Post Attitude	Social Desirability

InternetAdd1	**0.68**	0.21	-0.04	-0.11	-0.05	0.19	-0.33
InternetAdd2	**0.70**	0.27	0.04	0.03	0.06	0.25	-0.25
InternetAdd3	**0.51**	0.20	-0.08	-0.11	-0.04	0.16	-0.14
InternetAdd4	**0.64**	0.10	-0.18	-0.07	-0.08	0.02	-0.17
InternetAdd5	**0.66**	0.23	-0.05	0.02	0.10	0.19	-0.26
InternetAdd6	**0.65**	0.14	-0.17	-0.15	0.05	0.11	-0.21
InternetAdd7	**0.59**	0.11	-0.21	-0.15	-0.06	0.05	-0.14
InternetAdd8	**0.70**	0.28	0.01	0.03	0.09	0.29	-0.27
InternetAdd9	**0.60**	0.27	-0.04	0.06	0.12	0.32	-0.18
InternetAdd10	**0.63**	0.09	-0.22	-0.20	-0.12	0.05	-0.26
InternetAdd11	**0.68**	0.16	-0.03	-0.10	-0.02	0.13	-0.34
InternetAdd12	**0.69**	0.17	-0.06	-0.07	0.08	0.23	-0.33
InternetAdd13	**0.68**	0.15	-0.05	-0.04	0.05	0.18	-0.33
InternetAdd14	**0.62**	0.03	-0.13	-0.05	0.00	0.01	-0.21
PreAttitude1	0.31	**0.73**	0.05	0.10	0.10	0.41	-0.14
PreAttitude2	0.17	**0.65**	0.05	0.15	0.21	0.41	0.00
PreAttitude3	0.17	**0.65**	0.12	0.08	0.06	0.40	-0.07
PreAttitude4	0.20	**0.77**	0.08	0.00	-0.02	0.46	-0.01
PreAttitude5	0.15	**0.77**	0.09	0.03	0.05	0.42	-0.01
PreAttitude6	0.13	**0.73**	0.06	-0.05	0.01	0.47	-0.06
PreAttitude7	0.31	**0.75**	-0.02	-0.01	0.01	0.42	-0.13
PreAttitude8	0.20	**0.77**	0.06	0.01	0.04	0.46	-0.04
PreAttitude9	0.26	**0.75**	0.05	0.07	0.07	0.46	-0.08
PreAttitude10	0.20	**0.68**	0.06	0.03	0.07	0.39	-0.03
VideoType	-0.10	0.08	**1.00**	0.47	0.39	0.18	0.04
Informative	-0.08	0.06	0.47	**1.00**	0.50	0.23	0.20
Surprise1	0.04	0.05	0.41	0.46	**0.94**	0.23	0.04
Surprise2	0.04	0.11	0.31	0.47	**0.92**	0.26	0.05
PostAttitude1	0.24	0.45	0.11	0.18	0.16	**0.67**	-0.14
PostAttitude2	0.15	0.47	0.09	0.20	0.22	**0.76**	-0.06
PostAttitude3	0.28	0.49	0.12	0.14	0.19	**0.73**	-0.13
PostAttitude4	0.10	0.44	0.20	0.20	0.19	**0.77**	-0.03
PostAttitude5	0.06	0.46	0.14	0.18	0.15	**0.79**	-0.02
PostAttitude6	0.08	0.36	0.20	0.13	0.14	**0.75**	-0.03
PostAttitude7	0.24	0.45	0.19	0.18	0.27	**0.83**	-0.08
PostAttitude8	0.21	0.43	0.17	0.19	0.28	**0.77**	-0.10
PostAttitude9	0.35	0.49	0.11	0.17	0.17	**0.76**	-0.14
PostAttitude10	0.32	0.43	0.07	0.13	0.21	**0.73**	-0.11
SocialDesirability	-0.39	-0.08	0.04	0.20	0.05	-0.12	**1.00**

† All loadings are significant at $p < 0.001$

Because the measurement model was deemed to be valid and reliable, the structural model was estimated with SmartPLS version 2.0.M3 using bootstrapping for assessing the significance of the coefficients. Initially, the structural model included age and gender as control variables that influence the entire model's constructs (except for Video Type), because as per Table 2 and the MANOVA analysis the video groups differed by these demographic facets. Social desirability was also controlled for in the same manner in order to account for potential social desirability bias in the results, because some of the reported constructs were possibly socially sensitive. This is expected in the studied context. For example, people with high social desirability rated their levels of "addiction" to be lower than those of others; and rated the video to be more informative than others did (see Table 2). This was done presumably in order to conform to socially desirable views. All hypothesized paths were significant ($p<0.01$), but some of the control variable effects were not significant. These were removed for parsimony reasons, and the model as depicted in Figure 2 was estimated. The paths and their levels of significance did not change from the fully-controlled model. Thus, we report on and discuss the model which retains only the significant control variable effects.



Significant Control Paths	Path Coefficient	P-value
Age → Video-induced Information	0.09	0.01
Gender → Pre-Belief-based Attitudes	-0.10	0.05
Gender → Video-induced Surprise	0.13	0.01
Social Desirability → Video-induced Information	0.18	0.05
Social Desirability → Internet Addiction	-0.39	0.001

Figure 2: The Structural Model[†]

[†]For the Gender variable, women were coded as 0 and men as 1. For the Video Type variable the less informative video (Video 2) was coded as 0, and the informative video (Video1) was coded as 1.

** $p<0.01$

*** $p<0.001$

As can be seen, the videos produced their intended effects and this manipulation worked. The informative video was perceived to be more informative and to produce a stronger surprise than the other video. The video-induced information and surprise, in turn, improved viewers' post-video attitudes toward reducing the use of the Internet, after accounting for the effects of social

desirability, Internet "addiction" levels, and existing pre-video attitudes. Thus, the intervention was successful. These variables explained 42.9% of the variance in post video attitudes. In order to further assess the effect of the videos on one's attitudes, a model without the video effects was estimated. It explained only 36.6% of the variance in post-video attitudes. Consequently, the effect size of the video, f^2 was calculated[1] to be 0.15, which is a fairly high moderate effect. This strengthens the conclusion that the videos were efficacious in modifying users' belief-based attitudes toward reducing the use of the Internet.

6. Discussion

The results of this study show that instructional videos can be efficacious in improving users' attitudes toward Internet use reeducation. They point to the fact that when such videos are informative and present surprising information, viewers see the act of Internet use reduction more favorably, even after accounting for the effects of social desirability, demographics, and preexisting attitudes and levels of Internet "addiction". The findings therefore provide support to the core ideas of the health belief model, and the heuristic-systematic model of information processing, and synthesize them. Moreover, the supported model integrates IS phenomena with public health intervention techniques. This integration is warranted, because various aspects of IS use can become a public health concern, as already recognized by various countries (Block 2008). Ultimately, the findings of this study can pave the way for further research on the relatively untapped, yet important topic of excessive problematic Internet use prevention; and point to practical recommendations.

[1] The effect size of the video, f^2 was calculated by using the formula [R^2(full model) - R^2(model without video effects)] / R^2(full model).

6.1. Implications for Theory

The heuristic-systematic model of information processing (Chaiken and Maheswaran 1994) suggests that attitude change regarding a specific behavior (e.g., Internet use) can occur when both cognitive and affective processes are simultaneously engaged in response to a stimulus (e.g., an informative, surprising video). The model assumes that attitude change is possible when (1) information that is contrary to an individual's current beliefs is brought to his or her attention, and (2) the manner in which the information is conveyed facilitates recollection of that information through cognitive and emotion arousal. In this study, attitude toward internet use reduction was conceptualized as a function of the extent to which individuals (1) believed that a specific outcome would occur if Internet use was reduced (e.g., improve academic achievement), and (2) how much they valued that specific outcome in the first place. The assessment of attitudes towards a health-related behavior is important from a prevention standpoint. For example, research suggests that such attitudes toward particular substances are associated with long-term substance use trajectories among adolescents (Fulton *et al.* 2012). Hence, reductions in attitudes toward health-compromising behaviors (e.g., problematic or excessive Internet use), or an increase in attitudes toward health-promoting behaviors may have long-term impacts on that actual behavior (e.g., excessive use of the Internet and possible Internet "addiction").

In this study we intended to enhance favorable belief-based attitudes about reducing Internet use by having participants view an informative, compelling video about Internet "addiction". Consistent with our intent, we did find that the informative video that was designed to elicit surprise and provide new information actually did so, relative to another Internet "addiction" video that was more humorous in nature. Second, consistent with the assumptions of the heuristic-systematic model of information processing (Chaiken and Maheswaran 1994), we did

find that the degree to which participants believed that the video was informational and surprising was positively associated with post-video scores on attitude toward Internet use reduction. It was not feasible to conduct long-term follow-up assessments on Internet "addiction" and excessive use behaviors; however we did find that baseline levels of Internet "addiction" were positively associated with both baseline and post assessments of attitude toward Internet use reduction. That is, one's level of Internet "addiction" made the act of Internet use reduction seem more appealing, before and after the video-based intervention. This is consistent with addiction theories and models (Shaffer and Jones 1989, Marlatt 1996), and hence shows that, at least in this respect, "addiction" to the Internet may resemble substance addictions – both types of addictions generate favorable attitudes toward reducing the addictive activity due to reflections on its negative consequences.

Ultimately, this study focused on the enhancement of attitudes toward a possibly well-being-promoting behavior (Internet use reduction) and pointed to several aspects of an intervention that can matter in this case. While our findings provide initial support to the ideas of excessive Internet use prevention through instructional videos, as well as to the core ideas of the health belief model and the heuristic-systematic model of information processing, more research on interventions for Internet use reduction and their attributes should be explored. For example, future research may expand our model and include factors, such as personality traits, that can moderate the effects of persuasive messages (Haugtvedt and Petty 1992), mood states which can moderate the effects of emotions induced by a persuasive message (Petty et al. 1993), and attributes of the message source which can affect assessments of the persuasive message (Kim and Benbasat 2009).

6.2. Implications for Practice

The addition of the term “Internet gaming disorder” to the DSM-V (American Psychiatric Association 2013), combined with the relatively high prevalence of Internet “addiction” or merely excessive use among college students (anywhere from 0.8% to 18.3%, Kuss *et al.* 2013), illustrates the need for timely primary prevention efforts on college campuses, and possibly elsewhere. To date, Internet “addiction” studies have primarily targeted the tertiary treatment of individuals who have been formally diagnosed as addicted to the Internet (Tao *et al.* 2010, van Rooij *et al.* 2012). The present study shifts the attention to an undergraduate student population that most likely is not addicted to the Internet. Nevertheless, this population may be susceptible to excessive and problematic use of the Internet, and may be experiencing some symptoms of Internet “addiction” (Kuss *et al.* 2013). The consequences of Internet “addiction”, especially among this population can be devastating (Young 1998a, Lin and Tsai 2002). Moreover, most likely, prevention efforts are less expensive than treatment efforts. Thus, trying to prevent excessive Internet use and the formation of higher levels of “addiction” in this population, rather than treating Internet “addiction” conditions posteriori, is desirable.

The findings of this study suggest that a video as short as 5 minutes can facilitate students’ attitude-based beliefs that reducing their Internet use can result in positive outcomes in their lives. At a relatively low cost, universities could provide their students with the opportunity to watch such a video, for example online through the student portal, at freshmen orientations, in general education courses, in dormitories, and in student health centers. The National Institute on Alcohol Abuse and Alcoholism (NIAAA 2005), for example, recommends that to reduce alcohol abuse in colleges, non-addicted drinking students should participate in one-hour, on-campus interventions that involve lectures and role-playing that are facilitated by a trained professional. Similarly, this study demonstrates that it is possible that the same approach with regards to

Internet use can have merit. Future research, however, is needed to determine the length, depth, and content of materials needed for an effective Internet "addiction" prevention curriculum. Moreover, prior to implementing video interventions at a campus-wide level, longitudinal research is needed to confirm the long-term causal relationship between belief-based attitudes and Internet use reduction.

6.3. Limitations

Despite the robustness of our findings, there were some limitations in this study that should be noted. First, only North American undergraduate students participated in this study. Therefore the study findings may not generalize to other cultural, age or education-level groups.

Second, the self-report assessments utilized in this study are subject to self-report bias. Controlling for social desirability in the analyses alleviated concerns of intentional under-reporting or over-reporting endorsements of attitudes, "addiction" and video-induced information and emotions. However this statistical adjustment does not account for unintentional errors in recall or lack of understanding.

Third, the duration of this study (two weeks) was enough for demonstrating modest short-term effects, but is too short to assess the long-term intervention effects for Internet use. For example, it would be of great interest, in a longer-term study, to determine whether the video that was informative and invoked surprise among viewers led to subsequent decreases in Internet use and to the prevention of addiction-like symptoms in the long run. Moreover, note that the observed effect of the videos was modest. This is expected given that users presumably already have strong established attitudes regarding Internet use (changing exiting attitudes may be more difficult than establishing new ones), and we used a short, simple, inexpensive and non-recurring

intervention. It would be nice to see if the effect can grow when using more sophisticated interventions (e.g., video combined with exercises) over longer periods of time.

7. Conclusion

This study sought to examine the capacity of a video intervention to improve users' attitudes towards Internet use reduction, as a means to prevent excessive and harmful Internet use. It did so by focusing on a relatively at-risk population of university students. The findings showed that such videos can achieve their goal, at least in the short run, when they are informative and provide surprising information. With the growing prevalence of problematic Internet use, and the initial recognition of this problem by the American Psychiatric Association, it is imperative that more research on this topic is conducted, and that prevention techniques are considered by institutions such as universities.

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