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New Considerations for Sedentary Behaviours: Are They Self-Determined?

by

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The present thesis is submitted as Partial Fulfillment of the Requirements for the Degree of European Master of Sport and Exercise Psychology at The University of Thessaly in 27/06/2012

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ABSTRACT

The use of television, video-games and internet are often thought of as a lack of motivation for other behaviours. However, this study proposes that these screen behaviours also have motives. The purpose of this study was firstly to investigate if these screen motives exist within the self-determination theory framework. The next purpose was to create and provide initial validation for a questionnaire measuring these motives and the final purpose was to see if time spent in the screen behaviour could be predicted with self-determined regulations.

Focus groups and open-ended questionnaires were used to find user motives for using screens. User responses reflected all regulations and all of the investigated screen behaviours (television, video-games and internet). A questionnaire was created from these responses and where possible, items from previously validated questionnaires were used. Content validity was provided extensively from user and expert sources. The questionnaire produced a fully acceptable model and goodness-of-fit indices although further validation and improvements to reliability are needed. To investigate the prediction power of the questionnaire, participants from an Irish secondary school completed the created questionnaire and a single item measure of time using a chosen screen. Findings from these questionnaires did not support this hypothesis fully as the only significant predictors were intrinsic motivation - to know and introjection. Although significant, the prediction strength was low in both regulations.

These findings support that these specific sedentary behaviours are motivated but the pattern of regulation differs from other behaviours. Before the questionnaire can be used, it must be tested in a new sample and further validated. These findings suggest we should treat these behaviours as motivated and design interventions based on this.

INTRODUCTION

In health and exercise psychology there is a growing interest in sedentary behaviour. This is not a lack of moderate-to vigorous exercise as stated in many studies. But instead they are behaviours that expend very low amounts of energy and can be operationalised as behaviours spending between 1.0-1.5 MET's (Pate, O'Neill, & Lobelo, 2008). This low energy is usually expended in activities that involve sitting or lying down. On average people spend over half of their non-sleeping day in these behaviours (58%) with light physical activity amounting to a further 39%. This leaves only a fragmental portion of the day for moderate to vigorous activity (3%) (CDC; http://www.cdc.gov/nchs/nhanes.htm.).

With such a large portion of the day spent in these activities, it is important to understand if consequences exist. A new line of physiology has emerged focusing on this area and despite fewer high quality studies (as compared to exercise physiology), there is strong evidence that time spent in sedentary behaviour is linked to all-cause mortality and type II diabetes (Proper, Singh, van Mechelen, & Chinapaw, 2011). There are mixed results for studies investigating other health outcomes such as body mass and cardiovascular disease risk factors. In young people there is also a lack of high quality studies with only moderate evidence for longitudinal negative consequences on aerobic fitness (Chinapaw, Proper, Brug, van Mechelen, & Singh, 2011).

With more high quality studies it is likely that many more negative health outcomes exist. The most significant point may be that health outcomes of sedentary behaviour are independent of time spent in moderate or vigorous activity (Tremblay, Leblanc, Kho, *et al*., 2011).

As increasing exercise time is not enough for all health benefits we should also focus on reducing sedentary behaviour also, but which ones? The first consideration would be to

identify what behaviours are sedentary. This leads us to a large set of behaviours that incorporate transport, work and leisure. To add further difficulty, in all these areas advancements are being made that allow low energy expenditure. Cars and public transports have replaced traditional active modes such as walking or cycling. Our workdays are increasingly reliant on computer and deskwork and even manual labour jobs are increasingly aided by machinery (Hill, Wyatt, Reed, & Peters, 2003). Dutch workers have been found to spend 7 hours per day sitting, with one third of this while working (Jans, Proper, & Hildebrandt, 2007).

With one-third devoted to work, two-thirds are left for leisure and transport time. From this transport time takes took only an average of 21 minutes. This leaves the remainder (280 minutes) for leisure time sedentary behaviour (Jans *et al*., 2007). As the largest contributor to sedentary behaviour, leisure time seems a worthy target. However let's begin again and consider the number of leisure behaviours that are sedentary, and again we have the problem of a huge variety of potential behaviours that include reading, screens, socialising, meditation etc. To be effective we must again make a sub-target within these behaviours.

While all of these leisure behaviours mentioned do contribute to sedentary behaviour, they also have potential benefits. Even screen time has shown benefits in video-games such as improved reaction time, visuo-motor skills, spatial skills and can be used as a valuable learning aid (Green & Bavelier, 2004). Unfortunately, the benefits of screens are often offset by additional negative consequences, these include aggressive behaviour, poorer academic performance, poorer eating habits and high risk behaviour (Gentile *et al*., 2004). Most studies have focused on television which has specific health consequences, including chronic kidney disease, diabetes, hypertension, abnormal glucose metabolism, metabolic syndrome, obesity and most importantly all-cause mortality (Lynch *et al*., 2010; Owen *et al*., 2010; Sugiyama, Healy, Dunstan, Salmon, & Owen, 2008).

As well as current television behaviour and health outcomes, longitudinal evidence shows that child and adolescent television viewing can effect adult health. Hancox, Milne and Poulton (2004) used a birth cohort study and regularly followed the participants for 26 years. They found that the average weeknight viewing time between the ages of 5-15 was positively and significantly related to having higher B.M.I.'s serum cholesterol and incidence of smoking as well as lower cardiorespiratory fitness as adults.

In addition to this we must realise that screen behaviours are advancing quickly and to coincide with this their rate of use is rising. From 1996 to 2001 the amount of students using internet in leisure time increased from 24.5% to 79.5% (Hendel & Harold, 2004). Hendel and Harold also found increases in music and watching rental movies while reading activities decreased. Television time is usually the main offender with over half of leisure time spent using it, however as other technologies advance they may overtake television as the main concern (ATUS; www.bls.gov/news.release/pdf/atus.pdf).

Computers are faster and can complete an ever increasing amount of functions, televisions are becoming more defined and the size of screens increasing, video-game graphics and consoles are more sophisticated. The rate of advancement and increase in usage means that, the difficulty in avoiding these behaviours will escalate. Due to this, the most relevant area to intervene seems to be in leisure time screen behaviours. They have additional health risks, their potential benefits are in question, and on top of this the time spent in these behaviours dwarfs any other behaviours.

It may be possible to delimit even further to a specific screen, but advances in technology cause them to increasingly converge (e.g. video-games and movies watched on internet, internet and games on phones etc.), so broader studies may have more feasibility and their results may have more longevity than choosing a specific screen. While screens are also

used in work, these behaviours are more constrained and the individual has less chance of change. Now with the behavioural target in mind, the next step would be to see what has already been done to change this behaviour.

The American Academy of Paediatricians constructed guidelines suggesting that less than 2 hours a day should be spent using television (American Academic of Pediatrics, 2001). This guideline is generally not adhered to, as 1/3 of adolescents and youth exceed this on a weekday and 60% on a weekend day (Rey-López *et al*., 2010). Stricter guidelines have called for this two hour limit to apply to combined recreational screen behaviour (Tremblay *et al*., 2011). Adolescents and youths have been also been shown to exceed this guideline with video-games and intern*et al*one, although not to the same degree as television (Rey-López *et al*., 2010). Time spent on these screens combined mean that the majority of young people exceed these guidelines. This problem is not just a child or adolescent concern. Excessive screen time extends to all age groups and researchers have claimed it necessary for making adult guidelines (Owen, Sparling, Healy, Dunstan, & Matthews, 2010).

Interventions in reducing sedentary behaviour have shown limited success. The majority of these interventions have targeted reductions in television time or other screen time. A meta-analysis of interventions in youths found a significant reduction in sedentary behaviour in all interventions, although the effect sizes were small (Biddle, O'Connell, & Braithwaite, 2011). In this study Biddle and colleagues also highlighted that community based interventions were superior than other types and produced moderate effects. Review studies with children support this finding that all types of intervention reduced sedentary behaviour, one even shows support that this also improved weight indices (DeMattia, Lemont, & Meurer, 2007).

There are a limited amount of interventions with adults, in fact only two were found in a recent investigation (Owen *et al*., 2011). Both interventions were successful in reducing television time and overall sedentary time. Every minute of sedentary behaviour that is replaced by light physical activity can expend an additional kilocalorie (for a 72 kg replacing a minute of 1.5 MET's with 2-3 MET's) (Hamilton, Hamilton, & Zderic, 2007).

The need for interventions is clear, but why are people spending their leisure time in screen behaviour in the first place? Several papers have concluded that sedentary behaviours occur as a lack of motivation to exercise (Standage, Sebire, & Loney, 2008; M. Wilson, Rodgers, Loitz, & Scime, 2006). This is mainly due to the use of a poorly outlined definition of sedentary behaviour. Even though, the conclusions made may hold some truth, more benefit would be found from investigating if these behaviours are also motivated. We must also acknowledge that even behaviours with negative outcomes may have different forms of regulation. As sedentary behaviour and physical activity are not opposite sides of the same coin, it is particularly important to find the unique factors for engaging in sedentary behaviour (Biddle *et al*., 2011; Salmon, Owen, Crawford, Bauman, & Sallis, 2003). By treating sedentary behaviour as motivated we can consider reducing motivation in this behaviour alongside traditional responses.

Perhaps it is due to the previous use of this poor definition or the fact that there is less evidence than exercise studies, but it is only now that this line of thinking is starting to emerge. The Theory of Planned Behavior (TPB; Ajzen, 1985) has been used with some success to predict sedentary behaviours. (Rhodes & Blanchard, 2008; Rhodes & Dean, 2009). These studies used the same sample from the community and undergraduate students. Using questionnaires they found prediction of sedentary behaviours through the proposed pathways e.g. attitude, intention behaviour etc. and furthermore intention in some sedentary behaviours undermined intention in physical activity. This occurred for television while sedentary

socialising actually increased intention to be physically active. This finding conveys the complexity of sedentary behaviours.

Cyber psychology has looked at specific screen behaviours and has suggested that they have motivating factors. Raybourn (1997) suggested that intrinsic motivation and several other concepts of self-determination theory exist in video-games (SDT; Deci & Ryan, 1985, 2000). These include optimum level of challenge which can relate to accomplishment and player based control which relates to autonomy.

The internet and video-games have been acknowledged as satisfying basic psychological needs (Ryan, Rigby, & Przybylski, 2006; Zhao, Lu, Wang, & Huang, 2011). Zhao *et al.*, (2011) with 3475 participants from high schools found that perceived autonomy led to curiosity and that intrinsic motivation (enjoyment and curiosity) correlated with flow state in internet. This was done using questionnaire measures. The study of Ryan *et al.*, (2006) found that perceived autonomy, competence and relatedness led to video-game enjoyment and future play. This paper encompassed four separate studies using survey methods and actual video-game playing to compile and affirm their results.

While developing a questionnaire for motivation in online gaming, one paper has even found that addicts are more intrinsically motivated to play than non-addicts (Wan & Chiou, 2007). Addicts were also found to be less extrinsically motivated than non-addicts. However many limitations existed such as discrepancy between intrinsic and extrinsic motives 13 and 6 respectively. Also motivation was not divided into specific regulations so it was impossible to see exactly where motivation levels differed.

SDT stipulates that people engage in behaviours due to a number of regulations. At the broader level these are, for the satisfaction of the behaviour itself (*intrinsic motivation*), for reasons outside of the behaviour (*extrinsic motivation*) or sometimes people are not

motivated to engage in the behaviour (*amotivation*). But within these types of motivation there are further regulations.

These regulations range on a continuum from amotivation to intrinsic motivation, with extrinsic motivation in between (Figure 1). This continuum is based on perceived locus of control with autonomous regulation increasing as the regulations become more self-determined (Ryan & Connell, 1989).

Non-Self Determined **Self-Determined**

Amotivation	**Extrinsic Motivation**				**Intrinsic Motivation**
Non-Regulation	**External Regulation**	**Introjected Regulation**	**Identified Regulation**	**Integrated Regulation**	**Intrinsic Regulation**

Figure 1: The Self-Determination Continuum (Ryan & Deci, 2000)

Vallerand and Fortier (1998) divided intrinsic motivation into three separate categories. *Intrinsic motivation: to know, to accomplish and to experience stimulation*. Intrinsic motivation to know can be found as users can enjoy discovering what can happen next, learn and understand new things (a person who enjoys finding information from Wikipedia). Intrinsic motivation to accomplish occurs in users who experience pleasure in surpassing themselves or others (beating a high-score in a video-game). Intrinsic motivation to experience stimulation is a motivation from fun, excitement or other energising feelings (watching an action movie can excite an individual).

The extrinsic regulations include *integration, identification, intojection and* external. Integration occurs when the behaviour is fully assimilated into the person's life but still do not satisfy intrinsic motivation as the behaviour is done for extrinsic reasons. This regulation

is often perceived as self-expression (High level users of video-games often describe themselves as "gamers"). Identification occurs when and individual consciously values certain aspects of it (a person uses the internet in order to communicate with long distance friends). Introjection occurs when the individual self-imposes pressure through feelings like guilt or anxiety if they do not participate in the behaviour (a feeling of guilt from not liking a friends Facebook status). Finally external regulation occurs in individuals who engage in an activity for reasons outside of the activity such as a reward (a boyfriend goes to a "chickflick" with his girlfriend, as she has pressured him into seeing it).

Amotivation is when a lack of intrinsic or extrinsic motives exists in behaviour. When a behaviour is seen as a waste of time, or when it is perceived that outcomes are not based on actions of an individual (using Facebook for hours after intending to use it only for a few minutes).

A recent meta-analysis in health research has shown that autonomous forms of regulation promote health behaviours and behaviour change while introjection was a positive predictor in the short term (Ng *et al*., 2012). Exercise related studies have also noted this pattern (Silva *et al*., 2011; P. M. Wilson, Mack, & Grattan, 2008). Silva *et al*, performed an intervention incorporating autonomous support into exercise. When compared against a control group the intervention group participants were more autonomously regulated and active after 2 years and had greater weight loss after 3 years. The review by Wilson *et al*, found that isolated studies showed introjection can predict exercise participation, but in most cases significant predictions were found from more self-determined regulations.

Participation and dropout in sport can also be predicted by motivational regulation. One study used adolescent athletes who were still participating and athletes who had dropped out and found that autonomous regulation was associated with persisting in sport and higher

levels of controlling regulations could explain dropout (Garcia-Calvo, Cervelló, Jiménez, Iglesias, & Moreno Murcia, 2010). Similar results have been found in elite athletes and burnout (Lonsdale, Hodge, & Rose, 2009). In this study controlling motivational regulation was associated with athlete burnout.

This pattern of regulation has even been shown in gambling (Chantal, Vallerand, & Valliéres, 1995). In this potentially negative behaviour, the relationship between regulation and behaviour was consistent with other target behaviours. Prolonged engagement in the behaviour was associated with higher scores on self-determined forms of motivation and lower scores on more controlling forms of motivation. Behavioural regulation in sedentary behaviour acts as a niche in all of the listed areas (physical activity, health and "negative" behaviours) and is in want of investigation.

While this is a difficult undertaking, by delimiting to leisure screen behaviours the task becomes more manageable. This study aims to find if behavioural regulations exist within this target area. It is also of great importance to develop scales in order to predict these behaviours. With scales we can screen those who need interventions most as well as have a tool to measure motivational effects of future interventions.

The hypothesis of this series of studies is that motivation (intrinsic and extrinsic) as well as amotivation exists within leisure screen sedentary behaviours. These will be found qualitatively from users of leisure time screens. It is also expected that specific regulations can predict time spent in leisure screen behaviours. In line with previous research, more self-determined forms of motivation should predict behaviour more than less self-determined regulation styles (Deci & Ryan, 1985).

For this purpose a leisure-time screen motivation questionnaire will be created. In the development of this questionnaire, a three phase approach was taken. Phase 1 involved

exploring the motives for leisure-time sedentary screen behaviour from sample participants combined with published research. This allows the users to be active agents in the creation of the questionnaire and adds strength to the limited research in the area. Phase 2 involved the creation of items from the findings of the first phase as well as gaining content validity from theoretical experts and users. Creation as well as modification of items was needed to satisfy the unique findings specific to screen behaviours (from phase 1). A study was conducted in phase 3 in order to test the initial construct validity of the scale. Along with this, the hypothesis was tested that screen behaviours can be predicted by self-determined forms of motivation.

METHOD

Phase One: Finding the Motives for Screen Sedentary Behaviours

The purpose of this phase was to develop a pool of items that reflect motives to use screens in leisure time. The items were developed from two sources, high level users' opinions and from a literature search. Focus groups/open-ended questionnaires were used to explore opinions of high level users of the leisure screens (television, video-games and internet). The literature search was focused on other questionnaires developed in self-determination theory and relevant research to motives for leisure screen behaviours.

Project 1-Developing Items from User Responses

For this project focus groups were conducted along with open-ended questionnaires. These group meetings were conducted in English, with high users of one or more screens. This was done with three groups, with three participants in each (n = 9, n_{males} = 5, n_{females} = 4). The Mean Age was 26.66 years (± 5.76 years). High level users were identified by the owner of a local internet café (n = 6) as well as self-identified high level users within the university (n = 3). From the total sample of nine participants, six were Greek, one was Belgian, one was Iranian and one was Ethiopian. All participants had high competence of the English language. The participants were to first write keywords to their responses and discuss them afterwards.

Two of the three sessions were conducted in a private room in the internet café and the final session took place in a residence to accommodate the participants. Recording was done with a SANYO TRC-590M audio tape recorder and was transcribed verbatim. Open-ended questionnaire responses were also collected.

The meeting began with a brief explanation of the research purpose, how it would be used, what the participants were to do and ensuring anonymity. Following this a brief discussion took place to build rapport. From here a semi-structured interview guide as well as

open-ended questionnaire was used with the participants. The key questions related to motives for using each screen using the framework of (1) Self-Determination Theory and (2) Basic Psychological Needs. These frameworks are highly related and by investigating both further usable motives were found for this study.

As the research was focused on creating a questionnaire with pre-set dimensions, a predominantly deductive approach was used. This is acceptable as most focus groups and research questions are based on previous research (Munroe-Chandler, Hall, Fishburne, & Strachan, 2007). General questions were asked initially and additional probing questions were subsequently asked when participants' comments were relevant to a particular dimension.

To ensure trustworthiness the participants were sent the full transcript of the meeting they participated in. They were asked to perform a member-check by reading the transcript and were instructed that they had the freedom to make any changes they deemed necessary to clarify points. As well as this they were allowed remove or add points.

Project 2-Developing Items from Literature

The literature search was conducted to find already established questionnaires using self-determination theory, as well as this, findings from relevant research on motivation in screen research was sought.

From the questionnaires, items that related to participant responses were sought. The target behaviour in the items was changed to reflect leisure screen-behaviours and slight re-writing was needed in some cases. Items were taken from the following questionnaires: Academic Motivation Scale (Vallerand *et al*., 1992), Gambling Motivation Scale (Chantal *et al*., 1995), Leisure Motivation Scale (Pelletier, Vallerand, Green-Demers, Blais & Brière, 1996), Behavioural Regulation in Sport Questionnaire (Lonsdale, Hodge, & Rose, 2008),

Sport Motivation Scale (Pelletier *et al*., 1995) and the Work Extrinsic and Intrinsic Motivation Scale (Tremblay, Blanchard, Taylor, Pelletier, & Villeneuve, 2009).

A search was also performed on relevant research that explored motivation in leisure time screen use. There is little research in this field, so the items here predominantly came from few papers (Olson, 2010; Ryan *et al*., 2006; Wan & Chiou, 2007; Zhao *et al*., 2011). From these findings many were already mentioned by the users and many had existing validated items from the questionnaires used.

Phase 1-Outcomes

Each of the focus group/open-ended questionnaire meetings lasted between 1.5 to 2 hours. When transcribed this produced 32 pages of single spaced text. The responses given covered every dimension of self-determination theory sufficiently. Every participant responded to the member check but no changes were made to any of the transcripts.

There were sparse relevant findings from previous research. The findings in these papers were generally already found from the focus group meetings. Despite this a few additional relevant findings were found.

Phase 2-Item Generation and Content Validity

From the first phase, a pool of items was created. Where possible, previously validated items were used in the questionnaire. This was done by first gathering the validated items from questionnaires that reflected responses from the collected meaning units. This produced 45 items. The next batch of items was gathered from validated items that reflected research findings producing 4 items and the final batch of 38 items came from responses from meaning units that could not be expressed with already existing validated items. The latter set of items was written in the style of previously validated items. Each of the 91 items were divided into their appropriate dimensions.

Content validity was completed from two separate sources, expert and user. Two professors, who have published papers with Self-Determination Theory, reviewed the items based on the theory, wording and clarity. Comments were made by each professor for the modification of items. Only six items were modified, as many items were already validated from other questionnaires. These modifications were made for improving clarity (2) and to improve theoretical appropriateness (4).

The second source of content validity came from 10 users of all three screens. These 10 participants were asked to rate the appropriateness of each item from 1 “Not Appropriate at All” to 7 “Completely Appropriate”. For each item three ratings were given, one for each screen and an average of the screens was taken. Additionally participants were asked if they had any comments about any of the items, however none of these comments recommended modifying any of the items.

Following this the items were re-sent to the professors with the user ratings of each item. The professors then independently ranked all items in each dimension based on two sets of criterion. The first was based on how well the item reflected its theoretical dimension and the second was the user ratings. From each dimension the top eight items were selected. This reduced the questionnaire to 64 items. This was to allow further reduction in each dimension to four items as already used in a number or validated questionnaires mentioned throughout.

Phase 3-Initial Construct Validation and Hypothesis Testing

In this phase the purpose was to find the strongest 32 items that would satisfy model fit and reliability. Also this was an opportunity to test that all items were understandable. To retain the best 32 items, confirmatory factor analysis and reliability analysis were carried out.

Confirmatory factor analysis is a complex statistical technique that tests hypothesised factor structures. This is crucial in questionnaire development. This techniques allows

comparisons to be calculated between a hypothesised model and observed data and evaluates how well these fit together. This analysis was computed using AMOS 7.0.

Many goodness of fit indices exist and it is possible for researchers to select those that are favourable to publish (Kenny, 2011). To avoid this bias, the most current consensus of values to report was taken (Hooper, Coughlan, & Mullen, 2008, Kenny, 2011). The indices taken are the Tucker Lewis index (TLI), standardised root mean square residual (SRMR), root mean square error of approximation (RMSEA) and the *p* of close fit (PCLOSE). For TLI acceptable values are those above 0.90 and good when above 0.95, for SRMR values of less than .08 are acceptable (Hu & Bentler, 1999). RMSEA values should be less than .07 (Steiger, 2007), also RMSEA has a 90% confidence interval, on the lower bound this should be close to zero or less than .05 and on the upper bound less than .08 (Maccallum, Browne, & Sugawara, 1996). The PCLOSE should also be non-significant at the $p = .05$ level. Current recommendations for CMIN/DF are not clear and have many limitations, however they should always be reported along with its *p* value (Hooper *et al*., 2008).

To establish reliability a test of internal consistency was used using SPSS 15.0. Internal consistency determines if selected items measure the appropriate and same construct. Cronbach alpha is one method of calculating this and produces a value between 0 and 1, with values closer to 1 being more reliable (Cronbach, 1951). DeVellis, (1991) outlined a range by which to judge that Cronbach alpha values. Above .65 is minimally acceptable, above .70 is acceptable, above .80 are very good and scales above .90 are suggested to consider item reduction.

Participants

The 64 item questionnaire was completed by 248 secondary level students. However after eliminating pattern responses, misused questionnaires and those with missing values only 129

acceptable questionnaires remained. The remaining sample consisted of 84 males and 45 females. This high number of unusable questionnaires acts as a limitation in this study. The age range of the participants was from 12 to 18 years (M = 14.5 ± 1.4 years). The participant breakdown of screen choice was 58 for internet, 37 for video-games and 34 for television.

Measures

Measure of Motivation in Leisure Screen Behaviours (MMLSB)

Following this the selected items were input on a questionnaire with a similar format to that of the Gambling Motivation Scale (GMS; Chantal *et al.*, 1995). The GMS allowed the selection of a gambling activity; this option was retained in this questionnaire as participants could select one of three leisure time screens (television, video-games and internet). A Likert scale was used for each of the 64 selected items, ranging from 1 "Does not Correspond at All" to 7 "Corresponds Exactly".

Time spent in behaviour

The time spent in behaviour was measured using a single item scale. The scale instructed the participant to "Think about a normal school week, and write down how long you spend doing the chosen activity before and after school each day. You can write fractions like ½ hour or 30 mins". The participant responded for each day of the week including weekend days. It was emphasised that the time spent in behaviour should be free-time only and not include school work reasons.

Procedure

To ensure high levels of competence in English, the study was carried out in the Republic of Ireland. This may be a further limitation as the sample used in phase one does not represent the participants in this phase. A second level school was contacted and permission granted to administer the questionnaire. A day was selected during school hours to administer the

questionnaire to consenting students. This was completed in six 40 minute batches although this time was more than sufficient for all students to complete the questionnaire.

RESULTS

Questionnaire Development

The model was reduced to 32 items using Confirmatory Factor Analysis. These 32 items would contain four items for each dimension which corresponds with previous questionnaires. The reduction of items was done to gain acceptable Goodness-of-Fit Indices. The Goodness-of-Fit Indices of the model are shown in Table 1. All of these values adhere to currently accepted cut-off points as outlined previously.

Table 1: Goodness-of-Fit Indices of the 32 item version screen behavioural regulation questionnaire.

Model Fit Measure	Goodness-of-Fit Scores
CMIN/DF	1.287, p = <.001
TLI	.913
SRMR	.073
RMSEA	.047 (LO 90 = .035, HI 90 = .058)
PCLOSE	.646

Table 2: Reliabilities of the 32 item version screen behavioural regulation questionnaire.

	IM-K	IM-A	IM-S	INT	ID	INJ	EXT	AMO
Reliabilities (α)	.835	.806	.815	.794	.730	.711	.643	.606

Note: Abbreviations Used: IM-K (Intrinsic Motivation to Know), IM-A (Intrinsic Motivation to Accomplish), IM-S (Intrinsic Motivation to Experience Stimulation), INT (Integrated), ID (Identified), INJ (Introjected), EXT (External) and AMO (Amotivation)

The reliabilities of six dimensions in Table 2 were acceptable or very good with Cronbach alpha values ranging from .711 to .835; except for in two dimensions did not achieve

sufficient reliability. External had a near minimally acceptable Cronbach alpha of .643 and Amotivation had a Cronbach alpha of .606.

Descriptive Behaviour Data

The screen viewing behaviour of the participants is shown in Table 3. A One-way ANOVA was carried out to examine differences in time spent in behaviour for each of the groups (Television, Video-games and Internet). The test showed no significant differences between groups on weekdays F (2,126) = 1.65, p = .196 and on weekend days F (2,126) = 1.32, p = 271. This was confirmed as the Bonferroni post-hoc test showed no significant differences between the groups (all p >.05).

To determine differences between time spent using the screens on weekdays and weekend days for each of the screens, paired sample *t*-tests were carried out. The results showed that for each of the screens, time spent in the behaviour was significantly greater on weekend days than on weekdays (television t (33) = -4.338, p < .001, video-games t (37) = -5.288, p < .001 and internet t (57) = -5.301, p < .001).

The percentage of those spending ≥ 2 hours using a screen was greater at weekends than in weekdays for all screen behaviours. With all screens combined this led to an increase from 34.1% - 62.8%. Independent sample t-tests were carried out to determine if any differences existed between genders for time spent in each screen, during weekdays and weekend days. The only significant gender difference was that during weekends females spent more time (M = 3.63 ± 2.20) watching television than males (M =2.26 ± 1.73) t (32) = 2.042, p = .049.

Table 3: Descriptive information (means, SD and percentage) of screen viewing behaviours.

		Screen Time (Hours)	≥ 2 h/day	
	n	*mean* ± SD	*n*	*%*
TV viewing weekday	34	1.90 ± 1.24	16	(47.1%)
TV viewing weekend day	34	2.87 ± 2.04	22	(64.7%)
Video-Game play weekday	37	1.55 ± 1.29	11	(29.7%)
Video-Game play weekend day	37	3.08 ± 2.41	26	(70.3%)
Internet use weekday	58	1.47 ± 0.94	17	(29.3%)
Internet use weekend day	58	2.41 ± 1.86	33	(56.9%)

Relationship between Screen Behaviour and Motivation

A bivariate correlation was performed to determine correlations between the behaviour (screen time) and the behavioural regulations. It was also carried out to investigate correlations within the set of behavioural regulation. These results can be seen in Table 4. A multiple regression analysis was carried out to determine if daily screen time could be predicted by the dimension in the model. Using the enter method, a significant model was found, F (8,120) = 2.111, p = .040, adjusted R square = .065. There were only two significant predictors; Intrinsic Motivation to Know, β = .329, p = .008 and Introjection, β = .201, p = .050.

Table 4: Correlation table of average daily screen time and behavioural regulations.

	1	2	3	4	5	6	7	8
Screen Time	.228***	.069	.136	.130	.068	.188*	.145	-.093
1. IM-K	1							
2. IM-A	.646***	1						
3. IM-S	.613***	.800***	1					
4. INT	.507***	.717***	.728***	1				
5. ID	.583***	.690***	.453***	.474***	1			
6. INJ	.253**	.385***	.443***	.428***	.380***	1		
7. EXT	.437***	.654***	.706***	.647***	.398***	.358***	1	
8. AMO	.090	.148	.153	.143	.115	.191*	.125	1

Note: Abbreviations Used: IM-K (Intrinsic Motivation to Know), IM-A (Intrinsic Motivation to Accomplish), IM-S (Intrinsic Motivation to Experience Stimulation), INT (Integrated), ID (Identified), INJ (Introjected), EXT (External) and AMO (Amotivation)

*p<.05, **p<.01, ***p<.001

DISCUSSION

The first hypothesis was that leisure time screen behaviours are motivated and regulated. Support for this hypothesis was found initially from the user responses. These responses showed motives for every screen and in every regulation. The items created were triangulated from user responses and literature findings. In addition to this a strict course of content validity was undertaken again with multiple sources to maintain the strength from item creation. This hypothesis was also supported from the model created, in which all goodness-of-fit indices were acceptable by current guidelines.

The correlation matrix showed that the simplex theoretical pattern was supported with only minimal breaks. This simplex pattern supposes that the closer the regulations are together on the continuum the more correlated they should be e.g. integration should have a higher correlation with the intrinsic motivations and identification that with external and amotivation. The main break in the pattern occurred as external regulation correlated unexpectedly with self-determined regulations. Other smaller breaks occurred but still the theoretical pattern was supported.

Weaknesses of the questionnaire must also be accounted for. The reliabilities found were not satisfactory for all dimensions. Further investigation must be done in order to find items that better reflect these dimensions. The next step would be to provide additional validation and re-test reliability to the questionnaire. For this a new sample must be tested to confirm the created model. Convergent and discriminant validity must be carried out in order to obtain a fully acceptable questionnaire.

The descriptive results of the behaviour fall in line with previous research. Time spent in these behaviours increased on weekends. The percentage of those exceeding the guidelines is similar (Rey-López *et al.*, 2010), although in this study the results may be higher than in

other studies as the participants only responded for one screen activity. This screen was most probably the one they use or like the most. In this study the only gender difference was that females spend more time using television on weekend days than males. This contradicts previous research whereby males usually spend more time in sedentary screen behaviours (Rey-López *et al*). This result may have occurred as participants chose only one screen to respond, had every participant reported time spent in every screen some patterns of responses and differences may have been different. This data reveals that the exceeding of screen guideline time and potential health risks associated with this in Irish secondary level students, are similar to other European adolescents.

The next hypothesis proposed was that the time spent in behaviour could be predicted by self-determined regulations. The results of this study did not show full support for this. Although one of the intrinsic regulations (to know) could predict time spent in the behaviour so could introjection, which a not a self-determined regulation. While introjection has been a predictor of behaviour in other studies it has generally been at the beginning of behaviour change or had short term effects (Ng *et al*., 2012; P. M. Wilson *et al*., 2008). In this case the behaviour is stable and no suggestion of change has been made. This suggests that perhaps leisure screen behaviours are regulated differently from behaviours in other.

Furthermore to this the prediction levels were low. There may be several reasons to explain this. These behaviours may be subconsciously regulated which would make questionnaire measures near futile. It may be that novel methods must be created to gather these responses. It may also be possible that the behaviour is more dependent on habitual factors than motivation. Biddle *et al* (2011) outlined that this may be the case but this does not rule out motivations importance. The interpersonal theory of behaviour (Triandis, 1977) may explain this type of behaviour better as this theory states that the combination of motivation and habit predicts a behaviour. When a person is changing a behaviour they rely

heavily on motivation and less on habit but as the person has a prolonged engagement in the behaviour the importance of motivation decreases as habit becomes more important and stable.

The final explanation for obtaining such results is the difficulty in measuring a specific sedentary behaviour. Re-calling the amount of time spent on any of these behaviours is difficult and this limitation cannot be fully dealt with accelerometers. With accelerometers sedentary behaviour is captured at gold standard level, however from the data every period of sedentary behaviour has to be identified and distinguished e.g. transport or television time. The best solution may be to use a combination of accelerometer and day log, unfortunately this can be intrusive and response rates may be very low (Rey-López *et al*., 2011).

Sedentary behaviours are a complex set of behaviours and should be treated as such. The use of screens is not only an amotivation to other behaviours, but screens themselves are regulated. In each behaviour, it is likely that the motives and regulations will be different due to differences in mode and purposes of the behaviour e.g. work vs leisure, screen vs socialising. Because of this the results of this study do not extend automatically to other sedentary behaviours. These other behaviours must also be investigated and it is likely that the types of intervention will differ in each behaviour.

These interventions are needed, especially when you give attention to the descriptive data. Irish second level students spend a similar amount of time in these screen behaviours as in other samples from Europe and around the world. This level of time must be reduced due to the potential health and mortality outcomes that are emerging from the literature. With this in mind creating interventions that motivate alternatives and reduce motivation in screen use is warranted.

One difficulty in designing these interventions arises from the irregular pattern of regulation. Because of this the regulations must be confirmed and tested in experimental and field studies before credible interventions can be designed. Regrettably it is not as simple as providing an external motivation to reduce intrinsic motivation as in other behaviours (Deci, 1971). The difference in regulations found in this study would not support this type of intervention.

Future studies are also needed to confirm the model found from this sample and to provide additional validations and re-test reliability for the created questionnaire. Without this future work the questionnaire will remain unusable. The need for this questionnaire is essential to measure interventions based on reducing motivation. It can also be used as a valuable screening tool so those who are in most need of intervention can be targeted. Correlations with other constructs can also provide insight into sedentary behaviour and its outcomes. For instance, with a fully validated scale, psychological outcomes such as mental well-being may be determinable from motivation for screens.

The limitations of this study must also be highlighted. The samples in phase 1 and phase 3 did not correspond. The differences between the samples were nationality and age. Another limitation in the sample of phase 3 is the high level of drop-off. This may have been due to a large number of items or perhaps flaws in the aesthetic design of the questionnaire. In addition this high level of dropout resulted in having a small usable sample size. A sample of at least 200 would have been ideal for the analysis carried out. The measure of screen time by single item is also a limitation as better measures exist, although they also have downsides e.g. intrusiveness.

Sedentary behaviour is a novel area of research. Motivation is just one idea that may explain participation and the amount of time spent in these behaviours. Finding as many

useful predictors as possible is the only way forward that will allow researchers and practitioners to successfully tackle this concern. The results of this research show that sedentary screen behaviours may be able to be predicted using measures of behavioural regulation. This is one of a very few papers that explored this idea and adds some support to screen behaviours being motivated. From this and future research interventions can be designed to reduce motivation and behaviour along traditional interventions. Along with this the results suggest that introjection may have a more important role in behaviour than previously expected although this needs to be investigated further.

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APPENDICES

Appendix 1: MMLSB

Male ☐ Female ☐ Date of Birth (dd/mm/yyyy): _____

Which Screen would you like to answer for (only 1)?

Television ☐ Video-Games ☐ Internet ☐

Using the scale below, indicate to what extent each of the following items presently corresponds to one of the reasons for which you practice this leisure.

Not True at All			**Somewhat True**			**Exactly True**
1	**2**	**3**	**4**	**5**	**6**	**7**

WHY DO YOU USE YOUR SELECTED SCREEN?

1. for the pleasure I have gotten from making several improvements at a personal level.	1	2	3	4	5	6	7
2. because in life I absolutely need this leisure activity.	1	2	3	4	5	6	7
3. because it's one of the ways that I have chosen to make improvements on a personal level.	1	2	3	4	5	6	7
4. because it allows me to express my feelings and thoughts.	1	2	3	4	5	6	7
5. because I enjoy feeling more capable of making decisions.	1	2	3	4	5	6	7
6. because from it, I can find ideas that are useful for my life.	1	2	3	4	5	6	7
7. for the sense of freedom that I experience while doing the activity.	1	2	3	4	5	6	7
8. because in my opinion, it is a good way to develop social or intellectual abilities that will be useful to me later.	1	2	3	4	5	6	7
9. because I like the feeling of being totally immersed. in the activity	1	2	3	4	5	6	7
10. for the pleasure of choosing whatever I want to see or learn.	1	2	3	4	5	6	7
11. I still use it, but sometimes I feel I am not getting a lot out of it.	1	2	3	4	5	6	7
12. because it’s an opportunity to just be who I am.	1	2	3	4	5	6	7

Not True at All			Somewhat True			Exactly True
1	2	3	4	5	6	7

WHY DO YOU USE YOUR SELECTED SCREEN?

13. I once had good reasons, however, now I wonder whether I should continue doing it.	1	2	3	4	5	6	7
14. because it is very important for me to fill my free time.	1	2	3	4	5	6	7
15. because it is possible to use it free or for only a little money.	1	2	3	4	5	6	7
16. for the pleasure of learning about anything I want.	1	2	3	4	5	6	7
17. because it has become a fundamental part of who I am.	1	2	3	4	5	6	7
18. to escape reality.	1	2	3	4	5	6	7
19. I use it but, sometimes I ask myself if I should continue to do it.	1	2	3	4	5	6	7
20. because sometimes it allows me to be appreciated by others.	1	2	3	4	5	6	7
21. for the pleasure of overcoming mental tests.	1	2	3	4	5	6	7
22. because I can save money over other activities.	1	2	3	4	5	6	7
23. sometimes I don’t have a good reason.	1	2	3	4	5	6	7
24. for the pleasure of feeling many different emotions.	1	2	3	4	5	6	7
25. because without it, filling time in my daily life would be more difficult.	1	2	3	4	5	6	7
26. for the excitement I feel when I am really involved in the activity.	1	2	3	4	5	6	7
27. because what I do in my leisure time is an expression of who I am.	1	2	3	4	5	6	7
28. because it is a good way to learn things which could be useful to me in my life.	1	2	3	4	5	6	7
29. because I experience a lot of pleasure and satisfaction in seeing new things.	1	2	3	4	5	6	7
30. because I enjoy finding all kinds of information from it.	1	2	3	4	5	6	7
31. because I get a sense of accomplishment when I strive to achieve my goals.	1	2	3	4	5	6	7
32. because I want to pass my time.	1	2	3	4	5	6	7

# 10, 16, 29, 30	Intrinsic Motivation – To Know
# 1, 5, 21, 31	Intrinsic Motivation – To Accomplish
# 7, 9, 24, 26	Intrinsic Motivation – To Experience Stimulation
# 4, 12, 17, 27	Integrated
# 3, 6, 8, 28	Identified
# 2, 14, 25, 32	Introjected
# 15, 18, 20, 22	External
# 11, 15, 19, 23	Amotivation