An Investigation on the Influence of Technology on Sedentary Behaviour in Adolescents

Kevin Whiteacre

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INSTITIÚID TEICNEOLAÍOCHTA PHORT LÁIRGE

Department of Health, Sport and Exercise Science

School of Health Sciences

Waterford of Institute of Technology

Research Advisor: Paddy Delaney

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Department of Health, Sport and Exercise Science

BB (Hons) Recreation and Sports Management

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Abstract

Background:

There is a lack of research surrounding screen-related sedentary behaviours of Irish adolescents. There have been a number of factors documented as influencing the behaviours of adolescents regarding this topic; however, in specific relation to Irish teenagers there is a dearth of research. The aim of this study was to investigate the influence technology has on adolescents by examining their level of access to screen-related devices, the extent to which they engage with such devices, the role demographic factors play in such behaviours and whether restrictions imposed on them affect their screen-related sedentary behaviours.

Method:

This study adopted quantitative methodologies in the form of a self-designed questionnaire, based on previous research and validated questionnaires. The study sample consisted of first, second, fourth and fifth year pupils (n=105) from a secondary school in Wexford County.

Results:

Girls possessed more of their own screen-related devices than boys; however, boys engaged for a longer time in screen-related activities than girls. Results showed an increase of usage in certain devices as the participants got older; notably, the usage of personal computers and browsing the internet. Adolescents from a higher affluence background owned a greater number of screen-related devices per household in comparison to those from low/middle affluence background. The majority of the students (69.2%) had no restrictions on their usage of screen-related devices; while a greater percentage of boys were found to be under restrictions than girls.

Conclusion:

Adolescents have extensive access to screen-related devices. Screen-related devices are becoming an integral part of adolescent life, and as result has led to them engaging for longer in sedentary behaviours and thus exceeding the maximum two-hour daily recommendation. Social class appears to play a role on adolescents' sedentary behaviour, while a lack of restriction on their usage only escalates their screen-related sedentary behaviour.

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Chapter 1
Introduction

1 Introduction

The term "sedentary behaviour" has been the subject of increasing attention and debate over the recent years, amongst academics in particular (Brodersen et al., 2007; Iannotti et al., 2009; Pearson et al., 2014). Continuous engagement in sedentary behaviours has been linked with the risk of developing several health problems in the future. Increase risk of developing obesity, diabetes, chronic illnesses and a detrimental effect on mental health are but a few health concerns one could be risking with extended engagement in sedentary behaviours (Biddle et al., 2010; Tremblay et al., 2011; Wilmot et al., 2012; Hoare et al., 2016). The rapid advancements in technology have intensified the exorbitant sedentary behaviours in recent years (Pate et al., 2011). Due to the swift developments of technology, screen-related devices have become more popular than ever, particularly amongst adolescents (Biddle et al., 2010; Madden et al., 2013). Mobile phones, televisions and laptops are but a few screen-related devices commonly used.

In relation to studies emerging from Ireland on screen-related sedentary behaviour, specifically amongst teenagers, there appears to be a sincere lack of research surfacing. There are but a handful of studies focusing on this issue (Growing Up in Ireland, 2009; Woods et al., 2010; O'Neill, 2015). The bulk of the research surrounding this issue has emerged from Europe and America (EU Kids Online, 2014; Madden et al., 2013). Likewise, there appears to be a dearth of literature measuring the influence demographic factors have on Irish adolescent's screen-related sedentary behaviours, as well as the impact restrictions play on Irish adolescent's behaviours regarding this topic.

With regard to the above information, it is evident that there is a need for further academic analysis to expand on the current Irish literature surrounding this topic. As a result of expanding Irish literature, it may provide an improved awareness of this topic within an Irish context. Accordingly, the purpose of this research study is to investigate the screen-related sedentary behaviours of an Irish adolescent population by examining their level of access to screen-related devices, the extent to which they engage with such devices, the role demographic factors play in such behaviours and whether restrictions imposed on them affect their screen-related sedentary behaviours.

Chapter Two
Literature Review

2 Literature Review

2.1 Introduction

The following is a review of literature with regard to technology and its influence on sedentary behaviour in adolescents. Firstly, this review will investigate the development of technology and how it has led to increasing screen-related sedentary behaviours today. Secondly this review will establish what sedentary behaviour is and how technology has come to influence it, i.e. screen-related sedentary behaviour. The third point this review will examine are the influence demographic factors play in adolescent's screen-related sedentary behaviours. The demographic factors which will be examined are age, gender and social class. Fourthly, it will analyse adolescent's participation levels in screen-related sedentary behaviour in the Republic of Ireland and compare these to international statistics. In addition, this review will examine the health-related consequences affiliated with screen-related sedentary behaviours. Lastly, this study will analyse the impact restrictions have on adolescent's use of screen-related devices.

2.2 The Development of Technology and Screen-Related Devices

A previous study has found that due to the significant and rapid growth in the technology industry, there is less of a need for people exert themselves in a physical manner (Owen et al., 2010). The same study found that there have been changes in transportation, communications, workplace and domestic-entertainment technologies. Due to these changes, there has been a reduction in the amount of physical activity completed on a daily basis. A previous study discovered that adolescents are engaging too often in sedentary activities, especially on the weekends (Biddle et al., 2010). This is because they spend less time in school and more time at home with free time to do as they wish. With more free time, they look for something to do with it. For example, in 2015 there were 1.57 billion televisions in the world (Statista, 2016). In Ireland, there has been a jump in the amount of television sets owned by the population. In 2004-2005, 49% of Irish households owned two or more television sets. This jumped to almost 65% in 2009-2010 (CSO, 2012). This has led to young people in Ireland being exposed to the possibility of watching TV and engaging in sedentary behaviours on a more consistent basis.

One particular study has suggested that children under the age of two should rule out watching TV, videos, DVDs and any form of screens from their life totally (Schmidt et al., 2008).

According to Rideout et al. (2006) children under the age of two spend an average of two hours a day engaging in screen-related activities, such as watching television, playing on phones and playing computer games. These times are not only going past the recommendation for children, but also the recommendations for adolescents and adults. While a vast amount research has found that engaging in sedentary activities (such as watching television) for prolonged periods is harmful to health, there is one sedentary activity that has been found to have benefits for children and adolescents. Lonigan et al. (2008) report that there are numerous benefits of reading to children. These include improved literacy skills and a positive effect on children's language abilities. Kuo et al. (1996) also hypothesised that the sooner children start reading the better it is for them.

The continuing improvement of the internet and high speed broadband has opened up the online world to adolescents worldwide and within the Republic of Ireland. For instance, in the year 2000 there were only 400 million internet users worldwide (ICT, 2015). This is in stark contrast with 2015, where there were 3.2 billion active internet users globally (ICT, 2015). In the Republic of Ireland, 85% of households have access to the internet (CSO, 2015). Social networking was the second most common activity carried out online at 66% (CSO, 2015). In terms of individuals' age and internet usage, there was a noticeable difference between the amounts of internet activity that they engaged in. Ninety six percent of 16 year olds to 29 year olds had used the internet in the last three months (CSO, 2015). If the current trends continue, then one can expect the majority of the global population to be online in decades, if not years, which will result in rising figures of people engaging in sedentary activities.

The development and improvement of technology has led to an increase in chance in the number of screen-related devices an adolescent may own. These include game consoles, mobile phones and televisions. Where they are specifically placed in the adolescent's home has been found to be a contributing factor to the increase in their sedentary behaviour levels. For instance, a study revolving around European children found that the children with more media devices in their bedroom are far more likely to have an increased risk of screen-related behaviours than those with less technological devices in their immediate vicinity (Santaliestra-Pasias et al., 2013). These include screen related devices such as TVs or a games console. This evidence is backed up by a previous study completed by Rosenberg et al. (2010). This study found similar results, such as the presence of a screen-related device in an adolescent's bedroom has shown an increase in its usage in comparison to adolescents with no screen-related device in their bedroom. Television sets are not as expensive today in comparison to years ago

which makes it far more likely that households will own more than one, and that adolescents may own one in their bedroom. One may expect that children from families with higher income levels may be more likely to own a television in their room, but evidence points to the contrary (Growing Up in Ireland, 2009). However, there is a definite increase in the accessibility and usage of such technology and screen-related devices which may lead to an increased risk of health-related consequences.

2.3 Screen-related Sedentary Behaviour

The term sedentary behaviour is in indication to any waking activity characterized by an energy expenditure ≤ 1.5 metabolic equivalents, but also a sitting or reclining disposition (Pate et al., 2008). This includes lying or sitting down and watching television. Screen-related sedentary behaviours fall under the umbrella of sedentary behaviour. They are a type of sedentary behaviour which involves the use of screen-related devices, ranging from watching television, playing video games or using a computer (Iannotti et al., 2009). In addition to the devices already mentioned, mobile phones, tablets and kindles are also forms of screen-related devices. Watching television or playing video games only use a low amount of energy expenditure: hence, they are categorised as a sedentary behaviour.

Sedentary behaviour has been the subject of growing attention over recent years. This is due to the increasing wealth of evidence that being sedentary is linked to negative health implications. Emerging research also reveals the potentially negative impact sedentary behaviour has on adolescent's health (Mitchell et al., 2013; Tremblay et al., 2011). Due to the detrimental effects being sedentary has on one's health, the American Academy of Pediatrics (2001) have devised a global recommendation for children and adolescents – that they should spend no more than two hours a day involved in screen-related sedentary behaviour. However, not everyone is meeting this guideline. Technology is starting to play a much bigger role in the lives of children and adolescents. For instance, as children progress through their teenage years, adolescents increasingly start to give more of their time to social media technologies as a form of socialisation. This is shown in the EU Kids Online survey (2014) which was created by Sonia Livingstone. This report found that when children go online 63% of them will visit a social media website. Due to the advancements of technology, adolescents are far more likely to spend their time engaged in sedentary activities, for example, going online, playing video games, watching television, etc.

A number of studies have found that the amount of time adolescents spend engaged in sedentary activities is on the rise. The advancements of new media and technology has contributed to the increase in screen-related activities. For example, a 2010 study found that between 2004 and 2009, there was a 49% increase in the levels of engagement in video games in adolescents (Rideout et al., 2010). If these trends are to hold, there will be a significant percentage of adolescents who are going to be involved in sedentary behaviours and thus at risk of the many health defects associated with it. There are also a number of studies which reveal that adolescents are spending more than the recommended two hours a day on sedentary activities (Rideout et al., 2010; Pate et al., 2011). It would appear that there are a number of reasons for this, with certain demographical factors having a strong influence.

2.4 Demographic Factors and their Influence in Adolescent's Screen-related Sedentary Behaviours

The age of the individual has become a fundamental factor in relation to screen-related sedentary behaviour engagement. Older children and teenagers are more likely to engage in sedentary behaviours than younger children and teenagers (Fakhouri, 2013). The more sedentary a child is at a young age, the more likely they are to be sedentary when they are older. This is shown in the work of Kjonniksen et al. (2008), in which they found that habits developed in younger years are likely to progress later through their life. A study which included 17,807 young people, found that adolescents were 13% more likely to be sedentary than young children. These findings are mirrored in the work of Pate et al. (2011), who showed that there is a distinction in the amount of sedentary behaviour levels engaged in depending on the age of the individual. It outlined that sedentary behaviour levels rise amongst the adolescents, in correspondence with an increase in their age. This is echoed in the work of O'Neill (2015) who found that there was a large increase in daily smartphone usage from 20% to 44% for teenage boys and 61% for teenage girls. The use of such devices often leads to sedentary activities being engaged in.

The association between gender and screen-related sedentary behaviour has seen a rise in academic studies in recent years. Overall, it is accepted that females are more sedentary than males. (Matthews et al., 2008; Azevedo et al., 2007). However, there are certain sedentary activities where males are considered to be more engaged in. This is applicable in the case of the study from Mark et al. (2006), where they outlined that males engage in more screen-related

activities than females on a daily basis. This includes the use of video games which is, as described by O'Neill (2015), as almost exclusively dominated by boys. It has also been documented that male adolescents watch more TV than female adolescents (Fairclough et al., 2009). However, within Ireland, a national study has found results which argues against this point. The Growing Up in Ireland Study (2009) reported that there is little to no difference between the amounts of television the two genders watch. There is one screen-related device which has been used more regularly on a daily basis by females – the mobile phone (O'Neill, 2015). This evidence is supported by a study in Switzerland, completed by Geser (2006). His results argue that women use the mobile phone mainly for communication purposes, and that the mobile phone is now simply part of their lifestyle.

Social class is an issue which has a significant influence on the levels of engagement that adolescents spend on technology. Pate et al. (2011) have noted that there is an association between the level of household income and screen-related sedentary behaviours. One particular study found an association that children with a higher socioeconomic status were involved in a higher amount of sedentary behaviours (Atkin et al., 2013). There was a total of 2,064 participants in this study. The research sought to determine what influenced children's sedentary time. However, Trang et al. (2013), and their research argues that there is not enough consistent evidence for the association between socioeconomic status and sedentary behaviour activity levels to be accepted as fact. Coombs et al. (2013) sums it up with their research by explaining that associations between sedentary time and socioeconomic status differ depending on the type of sedentary behaviour.

2.5 Adolescent's Screen-related Sedentary Behaviour Participation Levels in Ireland and Internationally

The physical activity habits a child picks up on as a child is a strong indication of the habits that the child will have when they are older (Kjonniksen et al., 2008) are. Therefore, the younger the child starts to engage with technology, the more likely they are to do so in their adolescence. However, it is important to note that the parents of the child play a significant role in their children's future behaviours (Siegler et al., 2011). Included in these future behaviours are the physical activity levels of the adolescent. A study by Zecevic et al. (2010) has found that the parents of a child influence the amount of physical activity the child will do when they

are older. Thus, it can be argued that the more physically active the parent is, the more physically active their child will be.

The mobile phone is currently one of the leading screen-related devices that is dominating the lives of the average adolescent, particularly in Ireland. For instance, 96% of 15+ year olds own a smart phone, with 60% of these owning an iPhone (Thinkhouse, 2014). Due to the advancements made in the smartphone industry, access to the internet is easy. The same study also found that Irish adolescents are likely to use their smartphone whilst engaging in sedentary behaviours. Such sedentary behaviours include using their smartphone when they wake up (90%) and watching the television (84%). The majority of today's teenagers got their first smartphone between the age of 11 and 15, meaning that the ownership of the first mobile phone is getting younger (Thinkhouse, 2014). In comparison to worldwide statistics, the ownership of mobile phones has seen a rise in the United States, from 35% in 2011 to 64% in 2015 (Smith, 2015). The number of American adolescents owning a mobile phone is consistent with Irish adolescents. Madden et al. (2013) found that 78% of adolescents had a mobile phone in their possession. As the number of mobile phones owned by adolescents increases, there is evidence which points to the levels of sedentary activities increasing.

Ireland, as a whole, is not very active. In the 2015 annual report from the Irish Sport Monitor, they found that only 30.2% of the population are meeting the national physical activity guidelines (ISM, 2015). This is a slight decrease on the 2013 report. These findings are consistent across the globe. For instance, in England 42% of children aged 11-15 are sedentary for 2 to 4 hours a day (British Heart Foundation, 2015). Again, there is evidence to back up that sedentary behaviour is becoming a serious problem. In Scotland, adults engage in over five and half hours a day on sedentary activities (British Heart Foundation, 2015). The same study found that in Northern Ireland nearly one in five adults (19%) watch TV for more than four hours a day on weekends. The consistent watching of TV is a major problem not only in Ireland and the UK, but also throughout Europe. The television is the most popular medium amongst Europeans: 86% of them watch it every day, with over nine out of ten Europeans watching it at least once a week (96%) (European Commission, 2014).

Another screen-related device which is common amongst adolescents are video games. The amount of time adolescents spend on video games is increasing, particularly in the United States. Ninety-three billion dollars were spent on video games in the US in 2013 (Gartner, 2013). The increase in these sales may be due, in part, to the release of the new consoles, the

Xbox One and Playstation 4. A report conducted in 2015 discovered that 67% of young people surveyed played video games (Duggan, 2015). There has been very little recent research carried out with regard to Irish adolescents and their engagement with video games.

While examining adolescent's participation levels in screen-related devices, particularly on laptops and mobile phones, it is important to consider what they are actually doing whilst active in the online world. According to EU Kids Online (2014) the most popular use of the internet is to visit a social networking website, followed by instant messaging. Watching videos and using the internet for school work are also on the list of what children do when online. However, there are a number of risks that are posed to children when they use the internet, such as the possibility of exposure to sexually explicit material, cyber-bullying and internet addiction (Whitaker et al., 2009). As mentioned previously in this study, the habits which children pick up when young often lead into their adolescent and adult life, meaning that they could be addicted to the internet for years to come. Internet addiction has already started to be seen in Ireland, with 87% of children in Ireland using the internet from home, which is well above the average in Europe of 62% (O'Neill et al., 2011). A rise in the use of internet related activities will ultimately lead to an increase in the levels of sedentary behaviour.

Alongside the risks that are posed when the Internet is accessed by children (mentioned above), there are a number of other problems which can arise due to the use of the Internet. One of such problems are the social issues created by technology. Within a family household, communication is often cited as a key process for the development of relationships within a family (Smith et al., 2009). Therefore, a lack of communication can have a detrimental impact on the interaction between families and on the relationships between individuals in a household. A study found that as new technologies (e.g. the internet) are introduced into a home there is the potential that the technology could have an adverse effect on the relationships in the household (Smith et al., 2009). Valkenburg et al. (2009) found that prolonged use of the internet is associated with an increase with depression, loneliness and smaller social circles. It is important for parents to limit the amount of time their child spends engaged on the internet.

 Due to the rising participation levels in various screen-related devices, research has found a number of health-related consequences from engaging with them.

2.6 The Health-related Consequences of Screen-related Sedentary Behaviours

Sedentary behaviour has been the subject of growing attention and debate over the recent years, particularly amongst the academic community (Iannotti et al., 2009; Matthews et al., 2008). Prolonged engagement in sedentary behaviours has been linked to the development of obesity, which provoked the American Academy of Pediatrics (2001) to create their worldwide recommendation. Biddle et al. (2010) study backs up this recommendation; they found a strong relationship between those engaging in sedentary activities and obesity. Along with obesity, sedentary behaviour is associated with numerous other poor health consequences. Recent literature has found that increased sedentary behaviour in individuals may lead to the development of chronic diseases (Wilmot et al., 2012). These chronic diseases include, as stated by the WHO (2002), diabetes, lipid disorders, depression and anxiety, amongst others. There are a number of recent studies which have found that sedentary behaviour does have an adverse impact on health, particularly in children and adolescents. Examples of such studies include Mitchell et al. (2013) and Tremblay et al. (2011).

It is important to note that there is a clear distinction between being physically active and being sedentary. As Pate et al. (2008) explain in their research, sedentary behaviour is not just a lack of physical activity. It is appropriate to note this distinction as there is evidence which indicates that even those who regularly meet the daily physical activity guidelines, as compiled by the WHO, may still be compiling a significant amount of time being sedentary. A report completed by AusDiab (the Australian Diabetes, Obesity and Lifestyle study) in 2008 confirms this evidence. This study explored the relationships of TV viewing time with metabolic risk in individuals who disclosed that they were meeting the WHO guidelines of 150 minutes of moderate to vigorous intensity of physical activity on a weekly basis. From this group of individuals who met the guidelines, the study found an adverse response to the participant's waist circumference, systolic blood pressure and 2-hour plasma glucose in men and women in relation to their television viewing time. These associations were found to be stronger in women than men. This phenomenon is referred to as the 'Active Coach Potato' (Owen et al., 2010). The 'Active Coach Potato' refers to individuals who are meeting physical activity guidelines but are still accumulating significant time engaging in sedentary behaviour. Therefore, those who are engaging in regular physical activity can still obtain the negative health-consequences associated with sedentary-behaviour (Thorp et al., 2011). The effect screen-related devices and sedentary behaviour has on mental health is starting to come to light.

Recent evidence has found that there is a link in the amount of time spent sedentary and a detrimental effect on adolescent's mental health. Hoare et al. (2016) completed a review which found numerous mental health issues with adolescents who spent time being sedentary. The strongest and most consistent evidence which they found was the association between both depressive symptomatology and psychological distress. Low self-esteem was linked with frequent screen use, while even poorer mental health was discovered among adolescents engaging in screen related devices for longer than 2-3 hours per day. While these findings are consistent with other studies such as Teychenne et al. (2015), Hoare et al. (2016) notes in their research that more analysis must be conducted before it can be accepted as fact that screen-related devices play a major part on adolescent's mental health.

Sedentary behaviour has garnered much attention from both the academic field and the world of health of late due to the plethora of evidence being discovered and released year on year. As the negative health consequences reach across the globe, there have been calls for some guidelines to be put in place with regard to sedentary behaviour and the time adolescents spend sedentary. The Australian Government have put guidelines in place for children (5-12 years), young people (13-17 years) and adults (17-64 years). Implementing such guidelines and attempting to reduce sedentary behaviours may result in a number of health benefits such as an increase in life expectancy (Katzmarzyk et al., 2012).

2.7 The Restrictions Placed upon Adolescents' Use of Screen-related Devices.

One of the most important ways to analyse adolescent's screen-related sedentary behaviours is to examine the restrictions that are placed upon their usage (Mesch et al., 2010). There are several different type of restrictions parents may place upon their child, with some of the more common ones including: the length of time they can use a device; the type of usage on a device: and only using a device at a certain time of day. For many teenagers, control over their use of technology has decreased to some degree. This could be due to the parents noticing the substantial amount of time they are investing in to screen-related devices. However, there are a certain number of challenges that parents face with the implementation of such restrictions. Such challenges include the rising number of technological devices in the home and the escalating complexity of screen-related devices (Livingstone et al., 2008). Children are becoming more accomplished users of technological devices, and as a result it is becoming harder for parents to monitor their usage.

One area which parents are concerned with is their child's use of the internet. One study which focused specifically on Ireland was O'Neill et al. (2011), in which they found that almost 90% of Irish teenagers in the survey indicated that their parents monitored their Internet use on a consistent basis. One of the most prominent restrictions imposed upon adolescents is related to the possibility of teenagers giving out their personal information online (Madden et al., 2012). This study included an over-the-phone survey to 802 parents and asked them about their concerns regarding their children's use of the internet. Eighty-one percent of parents have concerns about their children giving out their personal information. Another parental concern regarding their child's use of the internet is cyberbullying (Farrukh et al., 2014). Cyberbullying is defined as "an aggressive, intentional (repetitive) act carried out by a group or individual, using electronic forms of contact" (Smith et al., 2008). However, in contrast to these concerns parents have regarding the internet and its usage, their perception of the internet is a positive one. Forty-two percent of parents felt that their children are safe online; with only 3% of parents feeling that their child is very unsafe online (Farrukh et al., 2014). Previous literature has also indicated that parents are more likely to have concerns about girls' use of the internet in comparison to boys (Livingstone et al., 2008). Research in the area of restricting children's usage of technological devices is somewhat lacking. In the coming years, research looking specifically at mediation strategies in relation to screen-related devices is essential.

2.8 Rationale

Screen-related sedentary behaviour has become an extreme matter of interest in the health industry because of the sizeable amount of evidence being released over the years. This is due to the negative health defects and problems arising because of prolonged engagement in sedentary activities. There have been a number of national and international studies which have investigated sedentary behaviours (Ianotti et al., 2009; Woods et al., 2010; Tremblay et al., 2011; Fakhouri et al., 2013). Regardless, there is a sincere lack of literature regarding screen-related sedentary behaviours in Ireland, particularly with adolescents. There are a number of studies which look at sedentary behaviours in Ireland, with a handful in particular mentioning briefly the screen-related devices (Growing Up in Ireland, 2009; Woods et al., 2010; EU Kids Online, 2014; O'Neill, 2015). However, they do not go into much detail with regards the screen-related sedentary behaviours of Irish adolescents. In relation to this, there is a dearth of research which measures the influence demographic factors have on adolescent's screen-

related sedentary behaviours. There are a number of studies which briefly allude to the influence demographics have on an adolescent's screen-related sedentary behaviour, with little going significantly in depth in this area. This absence of research has led to the following research questions.

2.8.1 Research Questions

RQ1: What screen-related devices do adolescents have access to from their home?

RQ2: To what extent do adolescents engage in screen-related sedentary behaviour?

RQ3: What impact do demographic factors have on adolescent's screen-related sedentary behaviour?

RQ4: What type of restrictions are placed upon adolescent's use of screen-related devices?

Chapter Three
Methodology

3 Methodology

3.1 Introduction

This chapter describes in detail the research methodology used for the purposes of this study. The aim of this study was to analyse screen-related sedentary behaviours of adolescents from a secondary school in Co. Wexford. A thorough explanation of this study's research methodology will be given. This will include the reasons why this particular approach was adopted and why it was considered to be the most applicable method of answering the research questions.

3.2 Research Design

This study will adopt a cross sectional design that will integrate a descriptive quantitative approach in the form of questionnaires to answer the research questions. A cross-sectional study is a research design which happens at only one point in time. The population is selected and data is collected to help answer the research questions of interest. The questionnaires will be self-designed with adaptations from research carried out by Hardy et al. (2007), Delaney (2011) and Currie et al. (2012).

3.2.1 Study population & sampling

Second level students attending CBS New Ross in County Wexford represented the cohort for this study. This school is a mixed gender school. This study will include both males and females in its results, from the ages of 12-18. Having a mixed gender school as the setting for this study provided benefits, such as convenience and the possibility of comparing and contrasting the information gathered from the two genders. It also eliminates the need to access two separate schools independently.

The sample consisted of 105 students (n=105). Of the 105, 76 were male (n=76) and 27 were female (n=27). The study will be focused on adolescents; therefore, CBS New Ross was deemed appropriate to get the information required to complete the study. As all students were easy to recruit and fit the description needed for this study, purposive sampling was used for this study. Adolescents from 1st, 2nd, 4th & 5th year will be participating which will aid the

researcher in attempting to determine a link between age and screen-related sedentary behaviour activities.

3.2.2 Variable/Concepts

There variables/concepts that were addressed in this study were access, usage, demographical influences and restrictions. This study sought to determine whether the adolescents had access to screen-related devices such as: televisions; mobile phones; games consoles; laptops & computers. 'Access' refers to the screen-related devices adolescents had in their homes. The 'usage' variable indicated the amount of time during the day and week the adolescents spend using screen-related devices. For instance, this will include the amount of time they spend during a typical day using screen-related devices mentioned above. The 'demographical influences' which were examined in this study were age, gender and social class/socioeconomic status. In relation to social class, this study referred to the model of social stratification in which people are grouped into a set of hierarchical social categories, specifically lower, middle and higher classes. How the social class is to be calculated will be addressed in section 3.3.1. 'Restrictions' referred to the influence parental regulations have on adolescent's screen-related sedentary behaviour. Whether or not the age of the individual plays a role in adolescent's screen-related sedentary behaviours was investigated; whether or not males or females engage in more screen-related devices was investigated; and whether or not the social class of the participant has a role in the screen-related sedentary behaviours was also examined.

3.3 Data Collection Methods

3.3.1 Questionnaire

A questionnaire was used as the data collection method for this study. The questionnaire can be easily administered and is a practical tool in terms of collecting large quantities of data in a quick manner. There is less of a chance of bias from the researcher because of the detachment from the answering process (Sarantakos, 2005).

In addition, the questionnaire was selected because of the cohort which will be participating. The researcher believed that a questionnaire would allow the collection of applicable data in a fashion that the adolescents would understand. As the questionnaire will be completed in a school environment, it was important that the information gathering technique did not take too long to complete, as the average length of a class in a secondary school is 35-40 minutes, i.e. it is important not to disturb a class for an extended period of time.

It is important to note that there are limitations to questionnaires in general, despite it being chosen as the most appropriate tool to gather the information. There is the possibility that the participant may not understand a specific question, they may forget information whilst completing it, and they may also not be truthful when answering some questions (Brown, 2001).

The first section of the questionnaire comprised of questions which sought to determine access the participants have to screen-related devices. This section was adapted from the work of Delaney (2011), which will determine what screen-related devices the adolescents had in their houses. The second section will be comprised of questions in relation to the amount of time the participants spend engaged in sedentary activities & screen-related sedentary activities. This section was adapted from the Adolescent Sedentary Activity Questionnaire (ASAQ) devised by Hardy et al. (2007). This questionnaire has been tested over the years and has been established to provide good to excellent reliability (≥0.70 reliability score) in the measurement of a broad range of sedentary behaviours among adolescents (Hardy et al., 2007), which was why it was chosen for this study. The third section aimed to identify demographical influences, including social class. This section will be completed using the Family Affluence Scale (FAS), devised by Currie et al. (2000). This questionnaire has been updated over the years and is proven as a reliable questionnaire in terms of quantifying the participant's social class in a non-discriminatory way. It is important to note that this questionnaire has been designed specifically for adolescents, making it an excellent resource to use for this study. This questionnaire also takes into account the current trends family consumption patterns across the EU, the US and Canada (Hartley et al., 2015). The reliability of the FAS is why it was chosen for this specific study, with a reliability score of >0.75 (Liu et al., 2011). The fourth section addresses the restrictions the adolescents are placed under regarding their usage of screen-related devices.

3.3.2 Procedure

The first procedure was the granting of ethical approval by the Ethics committee within the Department of Health, Sport and Exercise Sciences, at Waterford Institute of Technology (WIT). Once approval was given by WIT, a pilot study of the questionnaire was completed to ensure that it did not exceed class times and was easily comprehendible. Following the pilot study, some minor changes were made to ensure utmost efficiency.

The researcher organised a date to attend the school and distribute the questionnaires followed a phone call with the participating school. Questionnaires were then administered in CBS New Ross on the 10th of February, 2017, in hard copy to the students who were partaking in the study, which were subsequently collected by the researcher.

3.4 Data Analysis

The data was collected using questionnaires, which was then analysed and broken down by the researcher using the statistical programme for social sciences (SPSS). Descriptive statistics were used to identify and present basic results, e.g. age, gender, school year etc. The following is how the information was generated, by research question:

Research Question 1: Descriptive statistics in the form of percentages and mean scores were generated. These were used to illustrate the mean number of screen-related devices in the home and the adolescent's accessibility to such devices. Inferential statistics were generated by comparing personal ownership of devices by gender, age and school year. The Chi-Square test of independence was used.

Research Question 2: Descriptive statistics were used to illustrate the average amount of time the participants spent on a screen-related device. Inferential statistics were generated to compare the average amount of time spent of a screen-related device by school year. Mann-Whitney U tests were used.

Research Question 3: Descriptive statistics in percentage scores were produced to demonstrate the difference in the average number of screen-related devices in a household and the average number of hours spent on each device per week by the corresponding Affluence Group. Inferential statistics were also produced to compare socioeconomic status by time and access. The Independent Samples T-Test, One Way Anova and Spearman rho correlation test were used.

Research Question 4: Descriptive statistics were used to illustrate the percentages of those who had restrictions and also which gender had more restrictions imposed on them. Inferential statistics were used to compare and contrast the restrictions by gender and device, in a percentage score.

3.5 Ethical considerations

Ethical approval was granted by the Department of Health, Sport and Exercise Sciences. Permission was granted from the principal of the school. Complete confidentiality was granted throughout the course of the study for the students who completed the questionnaires; no names were recorded. The students had the option of withdrawing from the study at any time during the completion of the questionnaire. The hard copies of the completed questionnaires were then kept in a locked cabinet where no one had access to them but the researcher.

Chapter 4
Presentation of Results

4 Presentation of Results

4.1 Introduction

The purpose of this section is to present the results found from the questionnaires that were distributed. This section will include descriptive statistics and inferential statistics. The purpose of this study was to investigate the screen-related sedentary behaviours of adolescents. The data was collected through the distribution of questionnaires to pupils in CBS Secondary School in New Ross, County Wexford.

4.2 Description of Participant's

In total, 105 students participated in this study. Overall, there were nearly three times as many boys in this research compared to girls. Boys accounted for 74% (n=76) while girls accounted for 26% (n=27). There were four school years involved with the study, 1st, 2nd, 4th & 5th. The number of students per year was divided equally. First year accounted for 21.9%, 2nd for 23.8%, 4th for 38.1% and 5th for 16.2%. Of the students who stated their nationality in the study, 86.3% of them were Irish, while 13.7% of them came from various other countries. The majority of the participant's socio-economic class was evenly spread between medium and high affluence. Low Affluence accounted for 2.9%, Medium Affluence accounted for 48.6%, and High Affluence accounted for 48.6% also. The participant's socio-economic class was calculated using the Family Affluence Scale (See appendix B for scoring details). The entire population of the study came from the CBS in New Ross, County Wexford.

Table 1: Description of Study Population

		Boys (%)	Girls (%)
Age	12-13 Years	28.9 (n=22)	18.5 (n=5)
	14-15 Years	19.7 (n=15)	33.3 (n=9)
	16+ Years	51.3 (n=39)	48.1 (n=13)
School Year	1st Year	21 (n=16)	22.2 (n=6)
	2nd Year	25 (n=19)	22.2 (n=6)
	4th Year	36.9 (n=28)	40.8 (n=11)
	5th Year	17.1 (n=13)	14.8 (n=4)
Nationality	Irish	87.7 (n=64)	81.5 (n=22)
	Other	12.3 (n=9)	18.5 (n=5)

Affluence	Low	2.6 (n=2)	3.7 (n=1)
	Medium	52.6 (n=40)	37 (n=10)
	High	44.7 (n=34)	59.3(n=16)

4.3 Research Question 1*:*

What screen-related devices do adolescents have access to from their home?

Figure 1 illustrates the average number of devices which the population study sample had access to from their homes. The most common type of screen-related devices to be found in their household were mobile phones, with just over 4 mobile phones found per home. The second most popular screen-related device was television, with an average of 3.5 televisions found per household. Tablets/iPads and game consoles were also found to be popular with adolescents. The least popular device that were available in households were desktop computers, with less than 1 being found per household.

Figure 1: Average Number of Screen-related Devices in the Home

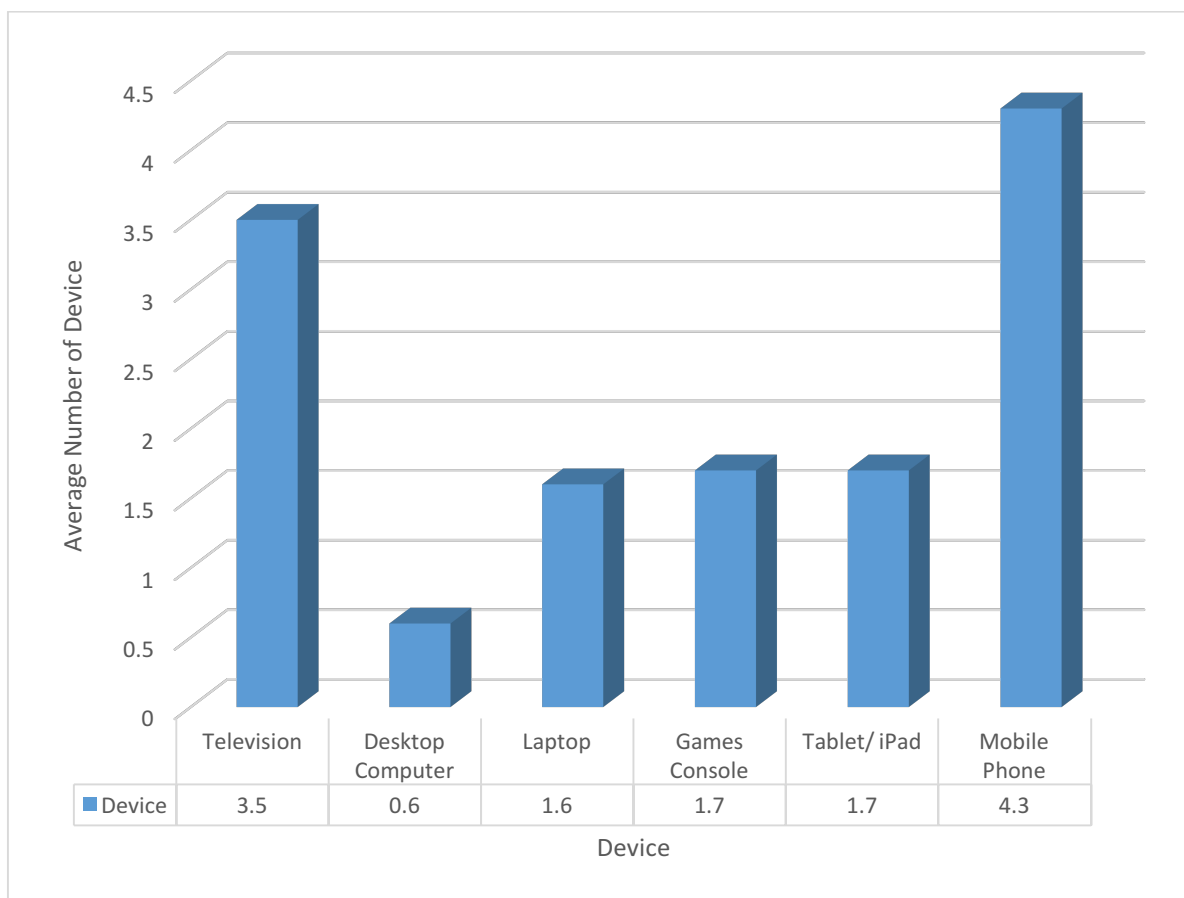| Device	Television	Desktop Computer	Laptop	Games Console	Tablet/ iPad	Mobile Phone
Device	3.5	0.6	1.6	1.7	1.7	4.3

Table 2 illustrates students' access to a specific device. By "access", it is meant if the student had a device at home with which they could use (whether they own it or not). This question asked if the students had access to the device by answering "Yes" or "No". The students only proceeded to this question on the survey if they stated they had one or more of the device in their household. Thus, the purpose of Table 2 was to discover if they had access to the device itself. For comparisons sake, the results have been broken down by the adolescent's school year. In relation to the screen-related devices, there were no sizable differences between accessibility to each device from the participating school years. The only noteworthy distinctions were that 4th and 5th years had greater accessibility to desktop computers than the 1st and 2nd years. Fourth years also had the highest access to laptops and games consoles than the remaining other three years. Every participant in the study across the entire four years had access to a television and a mobile phone. As represented in Table 2, 4th years appeared to have the highest level of accessibility to screen-related devices on average, with their lowest percentage being 93.1% for tablets/iPads.

Table 2: The percentage of students who had access to the device categorised by school year

	Device	1st Years (%)	2nd Years (%)	4th Years (%)	5th Years (%)
Device Accessibility =	Television	100 (n=23)	100 (n=25)	100 (n=40)	100 (n=17)
Yes	Desktop Computer	77.7 (n=9)	66.6 (n=15)	94.7 (n=19)	100 (n=8)
	Laptop	95.2 (n=21)	82.6 (n=23)	97.4 (n=38)	93.3 (n=15)
	Games Console	100 (n=22)	95.7 (n=23)	100 (n=35)	93.3 (n=15)
	Tablet/iPad	89.5 (n=19)	100 (n=22)	93.1 (n=29)	85.7 (n=14)
	Mobile phone	100 (n=23)	100 (n=24)	100 (n=39)	100 (n=17)

Figure 2 represents the percentage of the students who owned their screen-related device personally. By "personal ownership", it is meant that the student possessed had a device solely for themselves, i.e. they do not share the device with anyone else. For comparisons sake, this figure has been divided up by the gender of the adolescents. Boys possessed significantly more of their own games consoles than girls (Chi-Square, p<.05). Boys also had more televisions in their possession than girls; however, following a Chi-Square test it was found that there was not a significant association between gender and television ownership (Chi-Square Test of Independence, p>.05). Girls were also found to own more tablets/iPads than boys; however, again, there was no significant association found between the two (Chi-Square Test of Independence, p>.05). With respect to television ownership with adolescents, there is an association between age and television ownership. For instance, 71.4% (n=5) of 12 year olds were found to be in possession of their own television, compared to 87.5% (n=7) of 17 year olds who were found to possess their own television. In relation to the participant's ownership of mobile phones, 100% of each gender owned one. Ownership of mobile phones did not increase with age nor did it decrease, it stayed at 100% across all ages and school years of the study. Laptop ownership increased when comparing 1st year levels of personal ownership with 5th year levels of personal ownership. With respect to the 1st years in this study, 42.9% of them owned a laptop; this increased to 73.3% levels of laptop ownership with the 5th years.

Figure 2: Personal ownership of screen-related device by gender
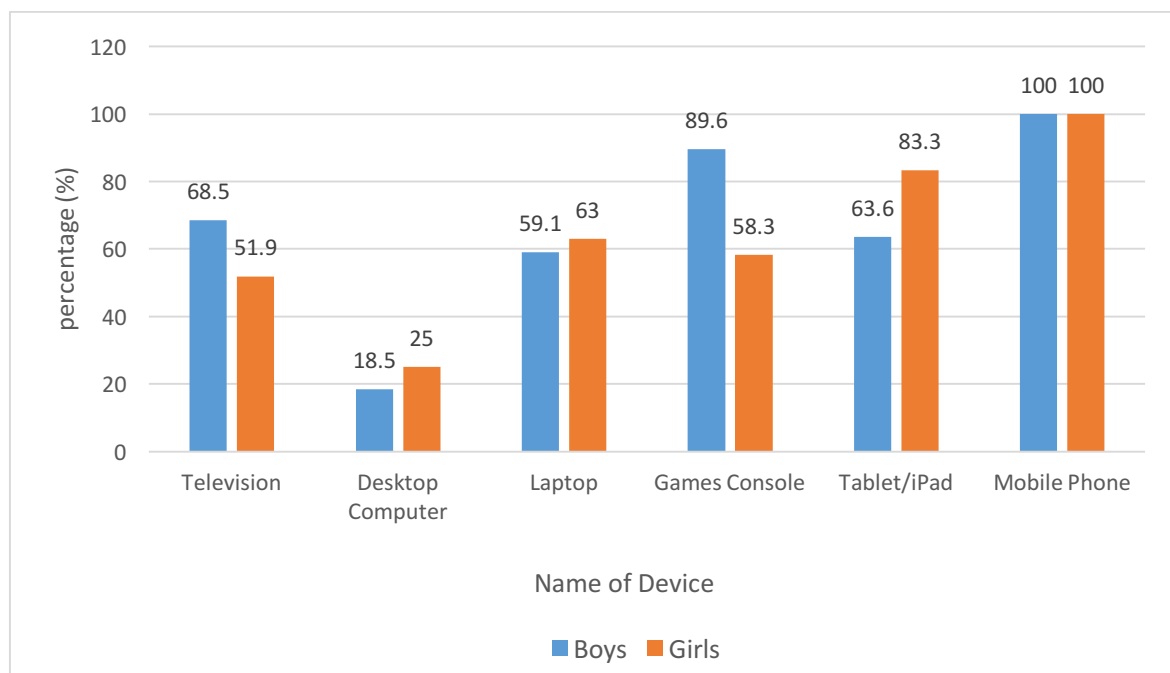
Table 3 illustrates the percentage of the surveyed adolescents who owned their own device, characterised by their school year. Levels of personal ownership either remained the same or increased from 1st to 4th year, followed by a decrease of personal ownership amongst 5th years.

Table 3: Percentage of adolescents who owned a personal device by school year

School Year	Own TV (%)	Own Desktop Computer (%)	Own Laptop (%)	Own Games Console (%)	Own Tablet/iPad (%)	Own Mobile Phone (%)
1st	22.5	20.5	22.1	23.7	24.1	22.8
2nd	23.5	29.5	22.1	23.7	25.3	22.8
4th	39.2	38.6	40	37.6	34.2	38.6
5th	14.7	11.4	15.8	15.1	16.5	15.8

4.4 Research Question 2:

To what extent do adolescents engage in screen-related sedentary behaviour?

It is important to note that due to exaggeration with some answer relating to this research question, the researcher has set a maximum of 240 minutes a day of usage per device to be used in analysing the following results. This figure was used after taking into consideration previous literature and research around this topic (Downey, 2007; Thinkhouse, 2014).

Figure 3 demonstrates the number of hours per week the participants spend using screen-related devices, and thus engaged in sedentary behaviours. In total, boys spent the most time using screen-related devices per week than girls. This was particularly evident with the use of the personal computer and browsing the internet. With regard to browsing the internet, boys spent on average nearly 10 hours a week, with girls using the internet nearly two times less at 5.8 hours a week. Tablet/iPad, television watching and the using of mobile phones were all relatively similar between the genders. The only result which showed statistical significance (Independent Samples T-Test, $p<0.05$) was the difference between the boys and girls usage of video game consoles. Boys spend just over double (11.2 hours) the number of hours per week using a video game console when compared to the girls' usage (5.5 hours).

Figure 3: Average amount of time spent on screen-related device (per week)
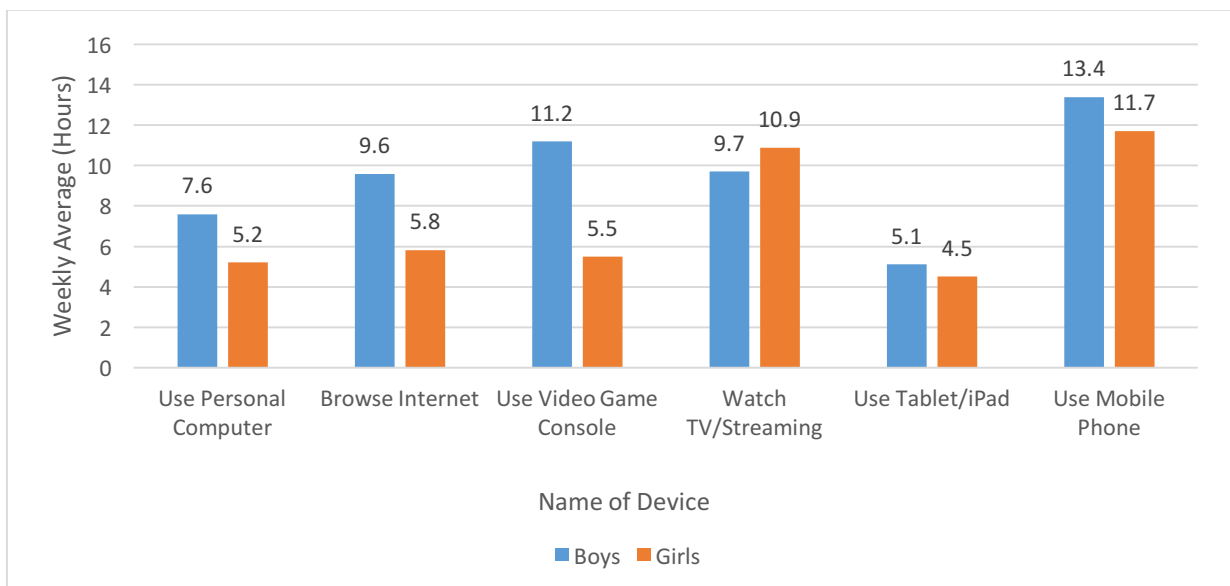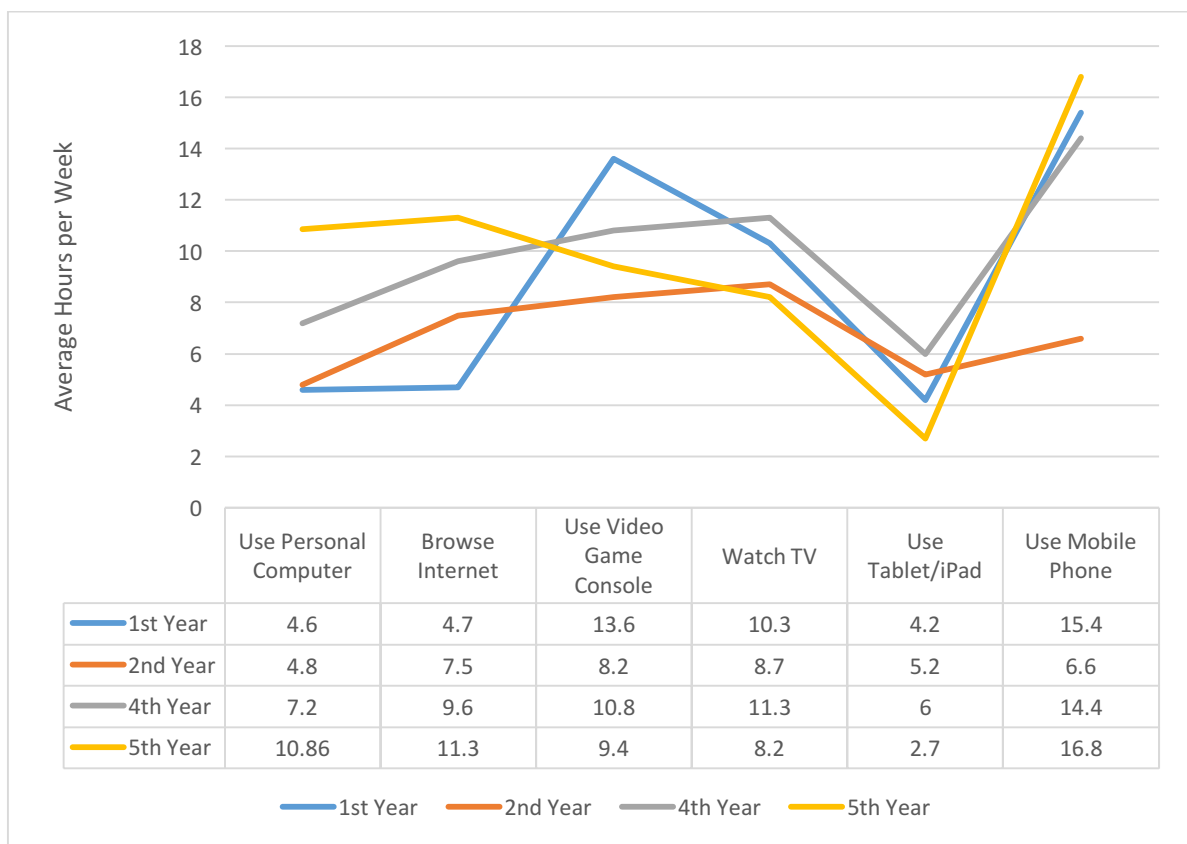
Figure 4 shows the average amount of time (in hours) the participants spent using screen-related devices per week. This figure has been broken down into each of the adolescent's school year. Fifth years spent the most amount of time using their personal computer per week, followed by the 4th years. The use of a personal computer continued to rise yearly, from 1st year to 5th year. For instance, 1st years used a personal computer for 4.6 hours a week; this then rose to 10.9 hours a week for 5th years. Although 5th years spent more time engaged in their personal computer than 1st years, following a Mann-Whitney U test, this result was not found to be significant. Browsing of the internet also rose on a school year by year basis. With regard to video game usage, first years were found to engage in the device more than the other three years surveyed. The fifth years were the year which spent the most time on their mobile phones, amassing an average of 16.8 hours a week. However, this result found no statistical significance. (Mann-Whitney U, $p > .05$).

Figure 4: Average amount of time spent on screen-related device (per week) for each school year

	Use Personal Computer	Browse Internet	Use Video Game Console	Watch TV	Use Tablet/iPad	Use Mobile Phone
1st Year	4.6	4.7	13.6	10.3	4.2	15.4
2nd Year	4.8	7.5	8.2	8.7	5.2	6.6
4th Year	7.2	9.6	10.8	11.3	6	14.4
5th Year	10.86	11.3	9.4	8.2	2.7	16.8

1st Year   2nd Year   4th Year   5th Year

4.5 Research Question 3:

What impact do demographic factors have on adolescent's screen-related sedentary behaviour?

Figure 5 illustrates the mean number of screen-related devices which the adolescents from the study had within their home, categorised based on their low, medium or high affluence status. Participants that are from the high affluence status have, on average, have more screen-related devices per household than those from the low and medium affluence counterparts. For example, the high affluence group had over double the average number of laptops compared to the low affluence group; however, following a Spearman Correlation test, there was no significant association between the number of laptops per household and the corresponding affluence group ($p>0.05$). There was limited difference between the three affluence groups in respect to games consoles and tablets/iPads. The level of mobile phone ownership is one device which does not fluctuate at all, with 100% of the three affluence groups owning a mobile phone. However, as can be seen in figure 5, there appears to be more mobile phone per households with the higher affluence group than the lower affluence group (4.52 compared to 3), although this statistic did not yield any significance (Independence Samples T-Test, $p>0.05$). While interpreting these statistics, it is important to keep in mind that families belonging to the higher affluence group are more likely to have a greater number of kids per household, due to their economic ability to sustain a household with more people. Owing to this consideration, results may slightly skew in favour of the higher affluence group.

Figure 5: Average number of screen-related devices owned per household categorised by Affluence Group
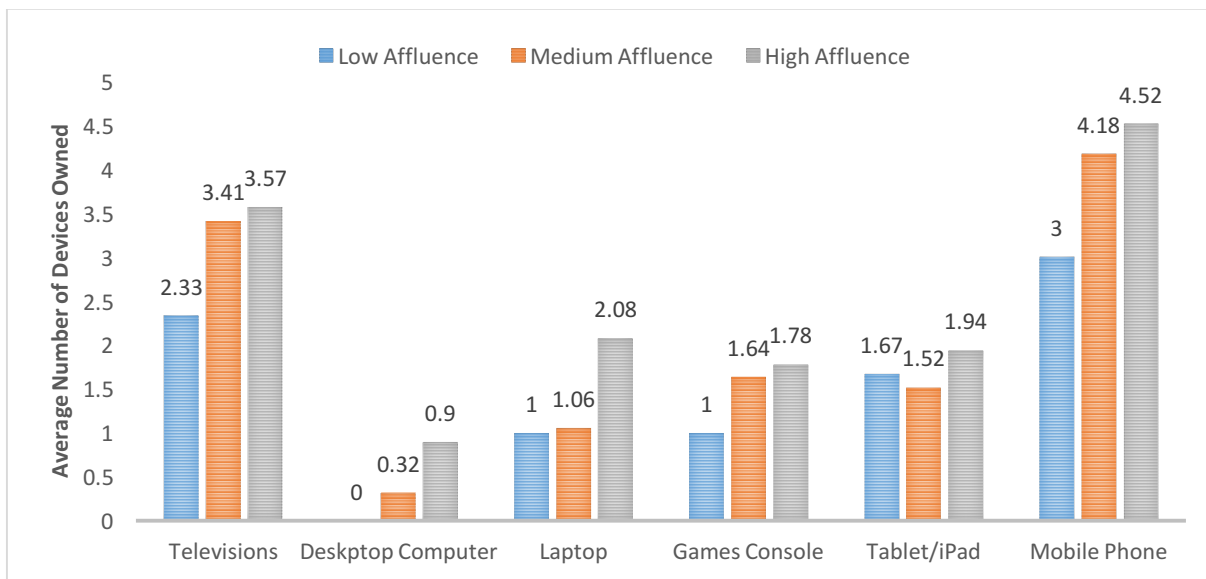
Figure 6 illustrates the average number of hours per week that adolescents from this study spend using the screen-related devices, based on whether they fall into the low, medium or high affluence status. The medium and high affluence statuses engaged with personal computers and tablet/iPads more than the low affluence group. The low affluence group watched less television/streaming devices than the medium and high affluences. A larger number of adolescents from the higher affluence group (64.7%) owned more televisions than those from the lower affluence group (33%). In relation to mobile phone usage, the higher affluence group were found to use the device more consistently than those from lower/medium affluence groups. This result was showing a trend towards statistical significance (Independent Samples T-Test, $p<0.05$). The usage of video game consoles was evenly spread amongst the three groups, with the higher affluence having slightly the lower amount of engagement with this device per week.

Figure 6: Average number of hours spent on each device per week categorised by Affluence Group
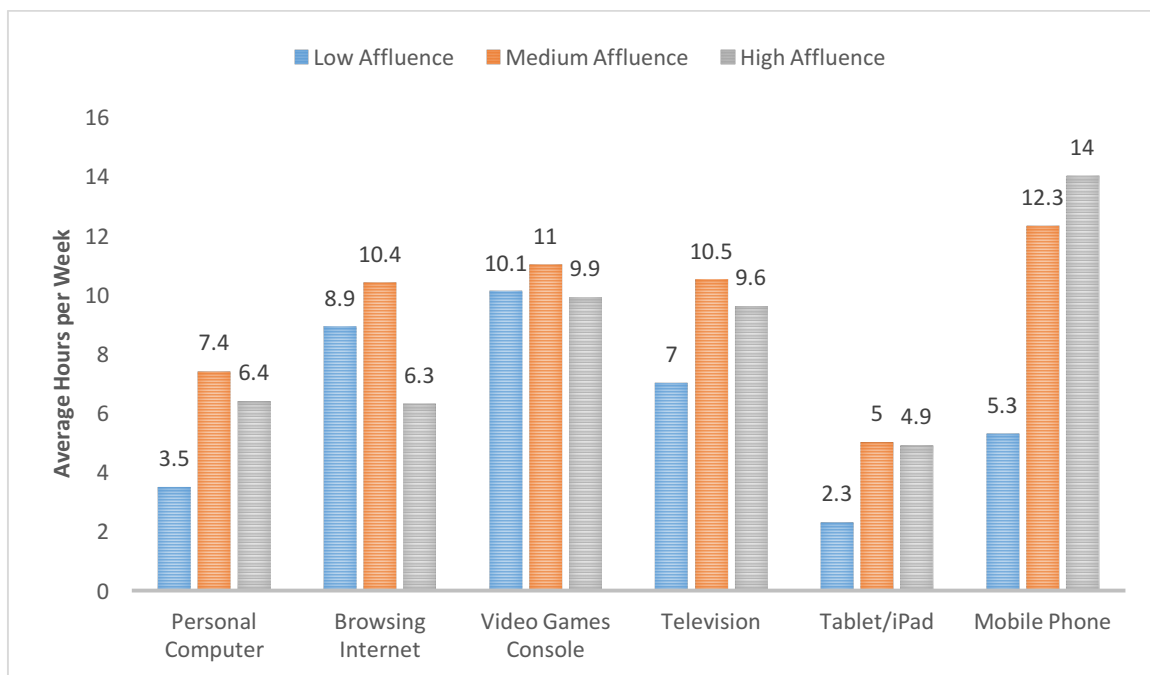
4.6 Research Question 4:

What type of restrictions are placed upon adolescent's use of screen-related devices?

Figure 7 represents the level of parental restrictions placed upon the adolescent's screen-related devices. Three out of every ten people surveyed had a restriction placed upon them by a parent/guardian with regard to their screen-related devices. In total, only 30.8% (n=32) of the adolescent's in surveyed had a restriction on their screen-related devices, with the other 69.2% (n=73) having no restrictions on their use of such devices.

Figure 7: Percentage of students who did and did not have restrictions on screen-related devices
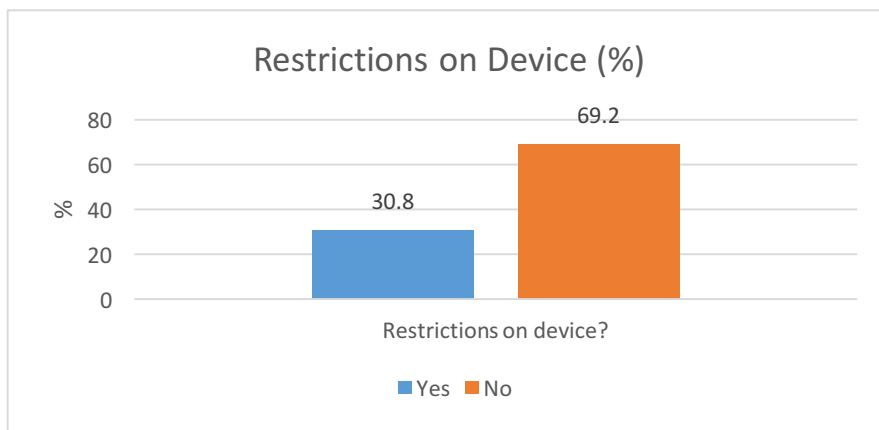
With respect to the specific genders, males have been found to have more restrictions placed upon certain devices than females. Twenty-two percent (n=23) of males were found to have restrictions, while 8% (n=8) of females had restrictions.

Figure 8: Percentage breakdown of restrictions by gender
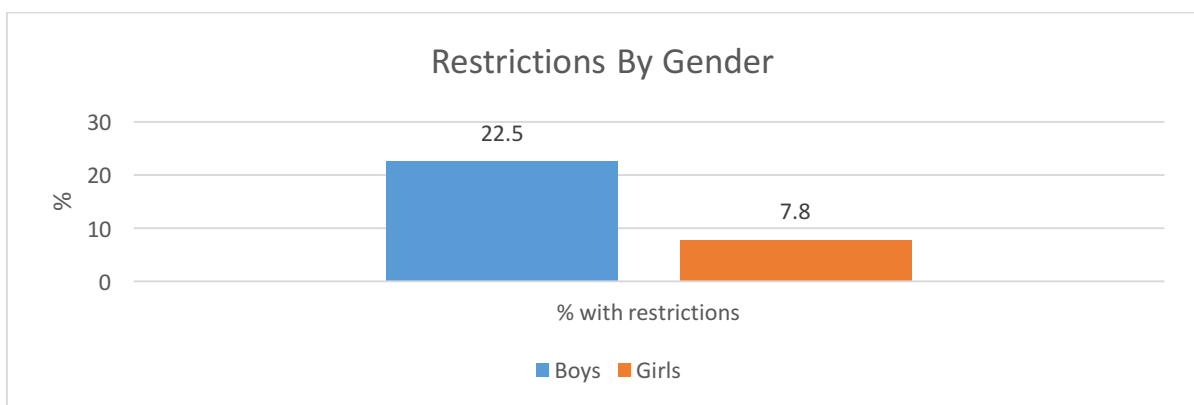
Table 4 illustrates the most popular type of restrictions placed upon adolescent's screen-related devices by their parent/guardians. The top three most popular restrictions parents/guardians place upon their children are: the specific time of use of the device; the time adolescents can use the device for; and the type of usage the adolescent can do on the device. Judging from table 4, the most popular device parents/guardians place restrictions on is the mobile phone.

Table 4: The percentage (%) of restrictions placed upon each device

Restrictions

Device	Specific Time of Use (%)	Time spent using device (%)	Type of usage (%)	Not allowed play certain games (%)	Amount of phone credit spent per month (%)	Other (%)
Personal Computer	12.4	7.6	10.5	4.8	N/A	1.9
Internet	14.3	10.5	14.3	5.7	N/A	1
Games Console	13.3	10.5	6.7	7.6	N/A	1
TV/DVD/ Streaming	14.3	8.6	8.6	4.8	N/A	1
Tablet/ iPad	8.6	7.6	7.6	5.7	N/A	1
Mobile Phone	17.1	11.4	14.3	7.6	12.4	2.9

Table 5 expands upon the statistic found in figure 8; that is that males were imposed with more restrictions on their screen-related devices than females. Table 5 examines each screen-related device and identifies the percentage breakdown of the restrictions imposed on the adolescents, dividing up the results by gender. As can be seen from table 5, males are the more likely to have restrictions placed upon them in relation to their screen-related device in all categories except for one; the type of usage for the tablet/iPad. In particular, males are far more likely to have restrictions placed upon their use of their games console than females. This is most likely a reflection of greater usage of the games console as highlighted in figure 3.

Table 5: The percentage breakdown of each restriction per device by gender (M=Male, F=Female)

Device	Specific time of use (%)		Time spent using device (%)		Type of Usage (%)		Not allowed play certain games (%)		Amount of phone credit spent per month (%)		Other (%)	
	M	F	M	F	M	F	M	F	M	F	M	F
Personal Computer	53.8	46.2	75	25	66.7	33.3	66.7	33.3	N/A		50	50
Internet	64.3	35.7	80	20	70.6	29.4	75	25	N/A		66.7	33.3
Games Console	85.7	14.3	81.8	18.2	62.5	37.5	75	25	N/A		66.7	33.3
TV/DVD/ Streaming	53.3	46.7	75	25	50	50	66.7	33.3	N/A		66.7	33.3
Tablet/ iPad	60	40	62.5	37.5	44.4	55.6	57.1	42.9	N/A		66.7	33.3
Mobile Phone	52.9	47.1	83.3	16.7	60	40	55.6	44.4	57.1	42.9	66.7	33.3

Chapter Five
Discussion of Results

5 Discussion of Results

5.1 Introduction

The purpose of this chapter is to discuss the results found from the above research. The intention of this study was to explore the screen-related sedentary behaviours of adolescents. This is to be done in relation to the adolescent's access, usage, demographic factors and restrictions imposed upon them. The results from this study will be compared and contrasted to previous literature regarding this topic.

5.2 Adolescent's access to screen-related devices.

The pace of technological advancement is growing at a rapid rate. The general population, particularly the youth, have accepted and welcomed the rapid technological advancement. For instance, the average age of first use of the internet in Ireland is nine (Livingstone et al., 2011). This can also be seen with the number of screen-related devices adolescents now possess. The most accessible screen-related device to be found from this study was the mobile phone. Livingstone et al. (2011) found that the likelihood of an adolescent owning a smartphone more than doubles once children become teenagers. Their report found that 16% of boys and 29% of girls aged 9-12 years owned a smartphone; this then jumped to 60% and 64% respectively from the ages of 13-18. However, in the case of the researcher's study it is important to note that there was no correlation between age and mobile phone ownership – 100% of boys and girls from all the age categories that participated had access to and owned a mobile phone. Jones (2014) conducted a report regarding adolescent's behaviours towards mobile phones and it was found that 77.4% feel disconnected, 25.8% feel naked and 25.8% feel stressed when they do not carry their mobile phone. Mobile phones have become a status symbol (Satchell et al., 2005; Chatterjee, 2014). Not only does a mobile phone provide social interaction opportunities, it has also been found to provide an individual with a sense of self (Ling, 2004). These are perhaps some of the reasons why the mobile phone has been found to be so popular amongst adolescents. Ownership of a mobile phone means that adolescents have the opportunity to connect to the internet or Wi-Fi However, despite the device being named a "mobile" phone, the use of the device is most commonly used whilst engaged in sedentary behaviours (Thinkhouse, 2014).

The second most accessible screen-related device found in this study was the television. This study found that 100% of the adolescents across the four school years had access to a television

in their home. This level of accessibility is similar to Orde et al. (2017) findings, where it was found that 100% of households with children have a television. The most common number of televisions per household was three, with 34% of the total number of televisions. However, it is important to note that 45% of the participants in this study had four or more televisions in their household. This result is echoed by Jordan et al. (2006) whose report found that the average number of televisions per household is four. As a result of the high amount of televisions found per home, there is an increased possibility of an adolescent engaging in screen-related sedentary behaviours.

The most popular locations to have a television in the household were the sitting room and the bedroom, this study found. These results are also in line with the work of Delaney (2011), where it was found that the sitting room and the bedroom were some of the more popular locations of television ownership. Rosenberg et al. (2010) identified that the presence of a screen-related device in an adolescent's bedroom shows increased usage of the device, when compared to those with no screen-related device in their bedroom. The presence of a television in the adolescent's bedroom is prominent in this study, with 70% of the participants reporting that they own one. However, the results from this study appears to contradict the aforementioned research as those who own a television in their own bedroom reported to watch it for an average of 46 minutes per day, while those without a television in their bedroom reported to watch it for 44 minutes per day. While there is an increase in the average amount of viewing time, it is not drastically different.

The screen-related device which was the least accessible was the desktop computer. There was a mean quantity of under one (0.6) per home. Despite the relatively low number of desktop computers per home found in this study, 84% of the adolescents reported having access to one. It must be taken into account that some school years may use a desktop computer for specific classes while at school. There was over double the number of laptops per household (1.6), when compared to desktop computers. This study identified that 92.8% of adolescents had access to a laptop, while 61.1% had their own personal laptop. When compared to another Irish report regarding laptop ownership, this figure appears high. O'Neill et al. (2014) identified in their study that only 22% of 9-16 year olds own a laptop. However, when both of these figures are compared internationally, it is quite low. For instance, in America, 80% of adolescents owned a personal laptop (Madden et al., 2013). Tablet computers were the joint third most accessible screen-related device found in this study (1.7). This study identified that 92.9% of adolescents have access to a tablet and 73.5% own one for themselves, however, as per the desktop

computer, tablet computers are becoming increasingly more popular within schools and so this must be kept in mind while analysing the previous statistics.

5.3 The extent that adolescents engage in screen-related sedentary behaviour.

Screen-related sedentary behaviour has attracted much attention over the years, from the academic community in particular. This is due to the time people, notably adolescents, are now devoting to screen-related devices on a consistent basis. Screen-related devices now play such a prominent role in the lives of many that the American Academy of Pediatrics devised a maximum of two hours per day recommendation for using a screen-related device. Results from this study identify that boys spent more time using screen-related devices than girls. Boys distinctly spent more time using their personal computer and browsing the internet than girls, while boys also spent more time using their mobile phone. The latter is in contrast to a number of studies, including those by O'Neill et al. (2015) and Geser (2006), where it was found that females use the mobile phone for longer periods of time than males. Geser (2006) concluded that the mobile phone is now simply part of a female's lifestyle.

The number of minutes the Irish population spend watching television has increased over the past decade and a half. According to the most recent report from the Television Audience Measurement Ireland (2016), in 2001, the average Irish individual watched 181 minutes a day This has increased to 201 minutes a day (Television Audience Measurement Ireland, 2016) on average, which is over three hours a day. These figures are echoed by a number of reports, such as McGinnity et al. (2005) and British Heart Foundation (2015). In relation to this study, the figures are relatively low when compared to previous literature. Girls were found to watch slightly more television per day than boys. Girls watched television on average 94 minutes a day compared to the boys' 83 minutes a day. The increase in television viewing over the past decade and a half is not only noticeable in Ireland, but also in other countries. American adolescents, for example, watched television for 3 hours 47 minutes a day on average (Rideout et al., 2010). This grew to 4 hours 29 minutes by 2009. These figures are supported by Pate et al. (2011), where they found between 29% and 35% of American adolescents watched three hours or more television each day. With regard to the length of time adolescents in this study used a tablet/iPad, the 4th years used it most frequently. Their use of the tablet/iPad accounted for a third (33%) of the total time amongst the participants in this study, closely followed by the 2nd years (29%). First years accounted for 23% of total tablet/iPad usage. These figures

support the hypothesis that the levels of sedentary behaviour rise in correspondence with an increase in age (Mark et al., 2006; Pate et al., 2011 & O'Neill et al., 2015).

Results from this study found that boys were more active in the engagement of screen-related devices than girls. Findings from this study revealed that boys spent an average of 8.1 hours a day and girls spent 6.2 hours a day engaging with screen-related devices. These results indicate that the participants of this study are exceeding the recommended guidelines of no more than two hours a day to be spent using a screen-related device. As a consequence of exceeding the guidelines the participants are more likely to be a victim of the many poor health issues often affiliated with excessive screen-related sedentary behaviours. Such health issues include a rise in risk of obesity, (Al-Nakeeb et al., 2012; Heinonen et al., 2013), development of chronic diseases (Bouchard et al., 2007; Wilmot et al., 2012) and a detrimental impact on individuals' mental health (Hoare et al., 2016). These findings support many other reports which suggest that adolescents are engaging too often with screen-related devices and amassing a significant amount of time being sedentary (Owen et al., 2010; Madden, 2013). It is important to note that each screen-related device is likely not being used separately due to multitasking (Carrier et al., 2009).

5.4 Impact demographic factors have on adolescent's screen-related sedentary behaviour.

The influence demographic factors have on adolescent's screen-related sedentary behaviours has been contested amongst the academic community. It is often accepted that there is a correlation between an increase in age and an increase in the use of screen-related devices (Pate et al., 2011; Fakhouri, 2013; O'Neill et al., 2015). However, this study found that 100% of all ages had access to, and owned a mobile phone, indicating that there is no correlation between mobile phone access and a rise in age, for ages 12-18. This result is in relation to this study specifically and contrasts with O'Neill's et al.'s (2015) report where it was found that there was an increase in age and an increase in mobile phone ownership. Results from this study indicate that there was an increase between the use of personal computers and browsing the internet from school years 1st to 5th. The results show that 1st years used their personal computer for 4.6 hours a week; this then increased to 10.86 hours a week for 5th years. Similar results were found for the browsing of the internet; 1st years totalled 4.7 hours a week compared to 5th years' 11.3 hours a week of browsing. These results are supported by Chele et al. (2005) report

and O'Neill et al. (2015) findings where they found a rise in computer related activities with an increase in age of the adolescent.

A number of recent academic studies have highlighted the association between gender and screen-related sedentary behaviour. There have been many studies which indicate that females are more sedentary than their male counterparts (Matthews et al., 2008; Florindo et al., 2009; Dagmar et al., 2011). However, findings from this study contradict many previous reports, identifying that males are more sedentary than females. Across the six devices, boys spent just over 8 hours (8 hours 5 minutes) a day engaging with them on average. Girls spent slightly over 6 hours (6 hours 12 minutes) a day engaging with the screen-related devices. The device which boys spent the most time on was the video games console – they spent over double the time on video game usage than girls did. This finding echoed the suggestion that video game use is an area almost exclusively dominated by males (O'Neill, 2015). In addition, Lou (2014), claims that boys engage with video game consoles more frequently than females. With relation to television viewing, it has often been associated that boys watch a greater level of the device than females (Fairclough et al., 2013). In contrast to these findings, this study's data suggests females are the gender that watch the most television. This study suggests females are watching it for an average of just over one hour more per day compared to boys (10 hours 54 minutes vs. 9 hours 42 minutes). There is one specific screen-related device which has largely been documented as a female orientated device – the mobile phone (Madden et al., 2013; O'Neill, 2015; UKOM, 2016). However, this study suggests that males use the mobile phone more regularly than females. It is important to note that females use the mobile phone mostly for social media and communication purposes (UKOM, 2016).

The socio-economic status of the adolescent has been documented as an influence on the levels of engagement with screen-related devices (Pate et al., 2011; McDonell, 2011). These reports support the results from this study – that those from the higher affluence had more devices per household on average in comparison to those from the medium and low affluence group. In particular, the higher affluence group had a substantially greater number of desktop computers and laptops per household. This echoes the findings of Anderson (2015), where it was reported that those who own computer/laptops are more likely to fall into the higher socioeconomic class. With regard to mobile phone ownership, this study's results showed no difference of ownership levels across the three affluence groups (low, medium, high). However, in relation to the usage of the mobile phone, higher affluence groups were found to use close to triple (14 hours a week) the amount of time in comparison to those from the lower affluence group (5.3

hours a week). Anderson (2015) supports these findings with results suggesting teenagers from a family with a high household use the mobile phone more frequently on daily basis, when compared to teenagers from a household with low income. Previous studies have found a positive link between an increase in sedentary behaviours (Hanson et al., 2007), and in particular television viewing time with the lower socioeconomic status (Natsiopoulou et al., 2009). However, results from this study in particular found a different association. Those from the medium and high affluence group watched television more hours a week than those from the lower affluence group. It is important to remember that high usage of screen-related devices is intertwined with a low amount of physical activity exertion and a high level of sedentary behaviour. In light of the large volume of research linking socioeconomic status and sedentary behaviour activity levels, there are also arguments against that link. For instance, Trang et al. (2013) mentions there is little consistent evidence to justify this link, while Coombs et al. (2013) describes the relationship between socioeconomic class and sedentary behaviour levels as dependent on the type of sedentary behaviour.

5.5 The restrictions placed upon adolescent's use of screen-related devices.

The role which restrictions adolescent's parents place upon them has been discussed amongst researchers and the affect this has on their sedentary behaviour levels. The results of this study indicate that the vast majority are not under any restrictions regarding their use of screen-related devices. Only 30.8% of those surveyed signalled they were under a restriction in one form or another in relation to their device usage. This result is in contrast to Anderson's (2016) results. The findings from this study indicate the majority of parents do place certain restrictions, as well as monitoring their child's use of specific technological devices. Their children's use of the television is one of the more popular devices for restrictions to be placed upon, with 45.9% under a restriction; the most popular one being when they can watch television (14.3%). In contrast to this finding, Rideout et al. (2010) found that parents are more likely to place restrictions on what they can watch on the television, rather than what time of day they can watch television. This study identified that 44.8% had restrictions on their internet use; the most popular being the type of usage on the internet and the time of day they can browse (both 14.3%). In relation to this, O'Neill et al. (2011) found that nearly 90% of Irish teenagers (15-16 year olds) have their internet use monitored. A total of 69.2% of adolescents are under no restrictions regarding screen-related device usage, based on this study. Slightly

over 55% have no restrictions on internet browsing. This echoes the study of O Briain et al. (2009), with their results illustrating that 72% of adolescents never were under restrictions on their internet use.

Of the 30.8% of the adolescents who had restrictions placed upon them, restrictions on the use of video game consoles were found to be popular. It is worth noting that more males than females have restrictions on their video game console use. However, this is most likely a reflection of greater usage of the device by males as highlighted in Figure 3. Results from this study indicated that 'time spent using the device' was the most likely restriction to be placed on games console usage (Chi-Square Goodness of Fit, $P < 0.001$). This was significantly the circumstance for males (Chi-Square Goodness of Fit, $P < 0.001$). With regard to the restrictions placed on adolescents in Ireland, there is a lack of Irish research on this topic. There are several challenges that parents face when attempting to regulate their children's technological devices use. Included in these challenges are the increasing number of technological devices in the home and the escalating complexity of screen-related devices (Lingstone et al., 2008).

5.6 Conclusion

This research set out to gain an improved understanding of how technology is influencing adolescents with specific interest as to how their levels of sedentary behaviour are affected. Investigated in this study were the adolescents' access to screen-related devices, the amount of time they spend using these devices, the influence of demographics on this topic, and the restrictions that are imposed upon their usage of technological devices. Results from this study found similarities between previous research in the area. As found in the research of Fakhouri (2013) and O'Neill et al. (2015), similarities from this research include an association between an increase in sedentary behaviour levels with an increase in age. In addition, this study identified males as the gender which spent more time engaged in screen-related sedentary behaviours, similar to results from Mark et al. (2006). Demographic factors, including socio-economic status, were found to have an impact on adolescent's screen-related sedentary behaviours. Those from a higher socio-economic class were found to have increased access to screen-related devices which supports the research of Anderson (2015). This study also identified that the majority (69.2%) of adolescents were under no restrictions in terms of their screen-related device usage. These results echo those of O Briain et al. (2009). As a result of

the majority of adolescents from this study being under no restrictions, they are at risk of using screen-related devices too much, which may lead to the development of various health issues in the future. They are also at risk of exposure to an amplitude of negative and inappropriate online activities, due to a lack of restrictions upon their use. It appears a lack of restrictions may increase the risk of poor health amongst adolescents. In summary, the use of technology is inextricably linked to an increase in sedentary behaviours, particularly with adolescents. More should be done to help prevent a rise in sedentary behaviours from a technology perspective, as failure to do so may lead to risk of poor health for the population in the future.

5.7 Limitations

With regard to this research study, there were several limitations identified:

- Throughout the course of this thesis, the researcher was entirely responsible for the research undertook. Therefore, the study was subject to time constraints and researcher inexperience. The data was collected solely from one school which was located conveniently for the researcher to distribute and collect the questionnaires. Due to the nature of this convenient study, the results are limited to this area only, and the results do not represent the entire adolescent population as a whole.

- There was a significant imbalance with regard to the gender of the population sample. Males accounted for 74% of the research population, females for 26%. Due to this imbalance, a smaller portrayal of the girls' use of screen-related devices was obtained. Perhaps a larger sample size, including a more balanced gender population, would help to get more comprehensive results on this topic.

- It was thought likely by the researcher that there would be a marked difference between the participant's socio-economic levels, however, as it transpired, there was little difference between the recorded results. As an outcome of this result, attempting to determine the impact demographic factors have on adolescent's screen-related sedentary behaviours proved difficult. Further, this may account for the low number of statistically significant results.

- As questionnaires were used for this study, this allowed for the possibility of self-reporting bias. This became clear as the researcher analysed the data. A number of the answers from the participants (in particular the amount of time spent on a device) were

dubious and may have been exaggerated. For instance, the amount of minutes the students used a device for per day was often exaggerated (the researcher set a maximum of 240 minutes a day as a cut-off point, after considering previous literature and research on the average amount of time adolescents spend using a device daily).

5.8 Recommendations

5.8.1 Research

A greater sample size should be included in a study such as this one. A bigger sample size may enhance results and provide a greater understanding regarding this topic. A greater number of schools is recommended in order to increase the sample size, and also to attain more widespread results. A greater number of schools would also establish more general results, rather than results which represent a specific area of the country. Distributing the questionnaires to a select number of boys and girls per school would avert an undesirable gender imbalance. Selecting schools with a distinct difference in socio-economic status would rule out an imbalance of this variable, which may result in more consistent results in comparison to previous literature. The involvement of a log book for each student may be an effective tool with which to retrieve results. The log book would allow each student to track what devices they use each day and how much time they use the device for. Along with a questionnaire, the final results may be a more accurate representation of the length of time they engage with screen-related devices.

5.8.2 Practice

A number of countries have already, and successfully, implemented guidelines on screen-related sedentary behaviour. Such countries include Australia and America (Melkevik et al., 2010). The Irish government should introduce such guidelines to help educate Irish adolescents and every age group of the already established recommendations. These guidelines are proven to have a positive effect on children. Maniccia et al. (2011) found a statistically significant reduction in children's screen time following the implementation of interventions and guidelines. Educating the population about potential negative health risks should always be an objective. Furthermore, schools should be required to educate children and adolescents with regard to the most appropriate way to use screen-related devices. Parents should be encouraged

to restrict their children's screen time in accordance with the recommendations. By implementing such practices, children and adolescents may lower the extent to which they engage with screen-related devices; thus, reducing the risk of developing health problems.

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Appendices

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Questionnaire

Thank you for taking the time to partake in this questionnaire. By filling in this survey you are giving consent that the information obtained can be used for research purposes. It should take approximately 10 minutes to complete. All answers you give are confidential and will only be seen by the researcher. Please answer each question as honestly as you can. There is no wrong answer.

Section A – General Information

Please fill in the relevant information and tick the appropriate boxes.

1. Age: _____

2. Gender: _____

3. Nationality: _____

4. School Year: ____

5. Do you have your own bedroom?

   Yes ☐   No ☐

6. Does your family own a car, van or truck?

   Yes ☐   Yes, two or more ☐

   No ☐

7. During the past twelve months, how many times did you travel away on holiday with your family or friends for one week or more?

   Not at all ☐   Once ☐   Twice ☐

   More than twice ☐

Section B – Access to Screen-related Devices

8. Do you have internet access at home?

Yes ☐   No ☐

9. Where in your house is the main computer/laptop typically located? **Please tick more than one box if it applies to you.**

Sitting room	☐	Utility room	☐	Kitchen	☐
Your bedroom	☐	Garage	☐	Dining room	☐
Parent's bedroom	☐	Brother/Sister room	☐	Other	☐

10. Where in your house do you have a television? **Please tick more than one box if it applies to you.**

Sitting room	☐	Utility room	☐	Kitchen	☐
Your bedroom	☐	Garage	☐	Dining room	☐
Parent's bedroom	☐	Brother/Sister room	☐	Other	☐

11. **Please indicate how many of the following devices there are in your household. Please also indicate if you have access to the device and if you own the device personally.**

Device	Number of devices in household?	Do you have access to the device?		Do you have your own device?	
		Yes	No	Yes	No
EXAMPLE: Mobile phone	*2*	✔			✘
Television					
Desktop computer					
Laptop					
Games console (e.g. PS4, Xbox)					
Tablet/iPad					
Mobile phone					

Section C - Amount of Time Spent Using Devices

12. Please fill in the relevant information in the box below. Please state, for each activity, (1) if you have done this activity in the last 7 days, (2) how many days you have done this activity in the last week, (3) how many minutes per day you spend doing the activity, and (4) how many times per day you engage with the device. Thank you.

Activity	Have you done this activity in the last 7 days?		How many days have you done this activity in the last week?	Approximately how many minutes per day on average do you spend doing this activity?	Approximately how many times per day do you engage with this device?
	Yes	**No**			
EXAMPLE: Use video game console:	✔		*4*	*60*	*2*
Use Personal computer					
Browse the Internet					
Use video game console (e.g. Xbox)					
Watch television/Watch DVD/ Streaming (e.g. Netflix)					
Use tablet/iPad					
Use mobile phone					

<u>Section D – Restrictions on Technological Devices</u>

13. Do your parents/guardians place any restrictions on your use of any of the devices mentioned in the previous question? (For example, only allowed use computer for 2 hours a day, or only allowed watch TV for 2 hours a day, etc.)

Yes ☐ No ☐

If <u>yes</u>, please continue to the final question, if <u>no </u>please disregard the rest of this questionnaire and thank you for your co-operation.

14. Please tick the boxes that are relevant to you. **Please tick more than one box if it applies to you. You may ignore the boxes that are not relevant to you.**

Device	Restrictions: Specific time of use (e.g. 7pm-8pm):	How long you can use the device for per day (e.g. 1 hour a day):	Type of use on the device (e.g. internet just used for homework):	Not allowed play games/ specific games on games console:	The amount of phone credit spent per month:	Other (please state):
EXAMPLE: Internet	✔		✔			
Personal computer/laptop:						
Internet:						
Video game console (e.g. Xbox):						
Television/DVD/ Streaming (e.g. Netflix):						
Tablet/iPad:						
Mobile phone:						

This questionnaire is now complete. Thank you for taking the time to complete it.

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Appendix B: Family Affluent Scale Coding System

Question	Response	Codes
Does your family own a car van or truck?	No	0
	Yes, one	1
	Yes, two or more	2
Do you have your own bedroom?	No	0
	Yes	1
During the past 12 months, how many times did you travel away on holiday with your family or friends for one week or more?	Not at all	0
	Once	1
	Twice	2
	More than twice	3
How many computers does your family own?	None	0
	One	1
	Two	2
	More than two	3

The response to each of the four questions has a corresponding value. A combined Family Affluence Scale score is then calculated by combining the values for each response together. 0-2 indicated a low affluence, 3-5 indicates a medium affluence, and 6-9 indicates a high affluence.

Appendix C: Letter of Permission from CBS New Ross