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Abstract

The purpose of this study was to analyze the relationship between the Internet Addiction Test (IAT) score and academic performance in college students. The IAT measured the students' addiction to the internet based upon their use. Academic performance was measured by grade point average (GPA). A sample of 692 traditional-aged college students from both public and private institutions was used to examine if IAT scores were related to and predictive of GPA. This study found a negative relationship between students' IAT scores and GPAs. As IAT scores increased, students' GPAs decreased. A better understanding of how internet addiction is related to GPA may prove helpful for higher education leaders. As technology innovations continue to rapidly increase, it is imperative that educators understand the impacts technologies have on college students.

Introduction

Technology is a norm in contemporary society, and the use of technology in daily life has grown at a breakneck speed (Derbyshire et al., 2013). This rapid growth, not only in the proliferation of technology but also its accessibility, has provided little time to evaluate its benefits and potential negative effects, specifically in relation to college students.

Even though the benefits of technology are often easier to witness, researchers are also finding that technology is creating challenges for students. Not only has students' access to personal technologies drastically increased, but also their levels of distraction, which competes with academic interests (Schmitt & Livingston, 2015). Although, historically, many studies examined the relationship between student demographic factors such as sex, major, and academic performance, the predominance of internet use potentially introduces a new variable for researchers studying college student engagement and success (Christakis et al., 2011; Fried, 2008; Masood et al., 2020). Thus, this article presents a research design aimed first at analyzing the relationship between student academic success as measured by grade point average (GPA) and internet addiction, as measured by the Internet Addiction Test (IAT). Next, the design explores if a student's score on the IAT is predictive of GPA. Given that both authors work at Christian institutions and that one of the surveyed institutions was Christian, we will offer suggestions for how our study applies to a Christian college environment.

From books to chalkboards to television to modern day tablet computers, smartphones, and smart boards in the classrooms, technological innovations impact the higher education community (Haran, 2015). One visible change technology has on education is how instruction is provided to students. Even before the COVID-19 pandemic, online instruction increased across higher education institutions at rapid rates and provided colleges and universities the ability to reach populations of students unable to attend brick and mortar campuses (Kenney, 2011; Kurt, 2010; Lin & Yang, 2011; Mango, 2015). Additionally, technological innovations have impacted web portals, course management, and learning systems in higher education. Studies have shown that each of these innovations enhanced student learning and persistence (Christen, 2009; Costley, 2014; Keser et al., 2012). Literature has also highlighted the positive relationships between technology and

student engagement, student confidence, and motivation (Costley, 2014; Kenney, 2011; Lin & Yang, 2011).

However, studies have also revealed negative effects of technology use on college students, challenging many of the positive presuppositions of educators regarding its use in educational settings (Edwards, 2015; Fried, 2008). Compared to previous generations, college students today spend less time studying (Arum & Roska, 2011) due to the many distractions vying for their time, and technology use is one of the most glaring. Indeed, many 21st-century students are becoming addicted to technology (Agarwal & Kar, 2015; Young, 1998). Technology addiction is a psychological dependence on technology and is characterized by increased investment of time on technological pursuits (Nalwa & Anand, 2003; Young, 2008). College students are entering institutions addicted to technology at rates that far outpace previous generations (Christakis et al., 2011), and this addiction may inhibit their intended learning outcomes in higher education (Agarwal & Kar, 2015; Young, 1998). Furthermore, students' addiction and distraction may also interfere with enrichments specific to the Christ-centered college such as chapel and intentional community building. Anecdotally speaking, part of the reason this topic interests both authors came from observing students "check out" during chapel by looking at the phones and seeing them walk across campus looking at their phones or inserting ear buds instead of talking with the person next to them. It is possible that internet Addiction and the associated distractions created by technology use may be partly responsible for these behaviors.

Scholars suggest that technology use may have negative impacts on student engagement, learning, and persistence in higher education today (Christakis et al., 2011; Edwards, 2015; Fried, 2008) and that students exhibiting signs of technology addiction show decreases in student success and persistence in higher education (Krumrei-Mancuso et al., 2013). Additionally, a student's use of personal computers, smartphones, and video games are linked with negative psychosocial behaviors which impact student learning (Hui-Jie et al., 2014; Schmitt & Livingston, 2015) and likely impact student social engagement. Furthermore, neurology research is revealing relationships between extended technology use and negative impacts on brain chemistry and development (Small et al., 2020). Further research is needed to determine how technology addiction is impacting college students' academic performance.

Researchers have studied academic achievement for decades, specifically focusing on the demographic differences of college students in relation to student success and retention (Astin, 1964; Astin, 1997; Bayer, 1968; Braxton, 2000; Tinto, 1987; Tinto, 1998; Vaughan, 1968). The primary demographic metrics presented throughout the literature used to study academic achievement are race, sex, and GPA (Reason, 2009). In addition, researchers have studied a wide array of other variables seeking to find predicting variables for student success. Some of these include age, economic class, academic preparation, and declared major (Keller, 2001; Murdock & Hoque, 1999; Reason, 2009).

Terenzini and Pascarella (1998) recommended that with the ever-changing demographics within higher education, researchers should continue to change how, who, and why they research the student population. Furthermore, it is vital that, with the increasing diversity in college students, researchers should attempt to understand how predicting variables interact with each other. Although the literature is relatively shallow on the topic of modern technology use related to academic performance, studies are beginning to reveal that there may be some serious issues pertaining to technology use and the implications this use may have on academic performance (Christakis et al., 2011; Dontre, 2020; Edwards, 2015; Fried, 2008; Masood et al., 2020).

The outcomes of this study contribute to current literature, presenting that modern technology use might be a wolf in sheep's clothing; technology generally is accepted as a positive addition in educational settings, even though scholars are beginning to better understand the underbelly of modern technological inventions. These innovations create, for some, a tension to focus, higher levels of stress, and depression—which all can negatively impact a student's ability to complete academic tasks and persist. The findings of this study are intended to offer insight into the relationship between IAT scores and student success as measured by GPA. In addition to contributing to the understanding of links between demographics and IAT score, as well as IAT scores and academic performance, longstanding theories of student learning and engagement are also challenged, including such effects on students attending Christian colleges.

Grade Point Average

Grade point average, while questioned over its true representation of student capability or knowledge, is a metric generally accepted across higher education for gauging academic achievement. The

literature shows that it is a significant variable in studies analyzing student persistence and achievement (Nakajima et al., 2012). First-year GPA, high school GPA, and cumulative college GPA have all been shown to predict college student achievement (Reason, 2001; Reason, 2009). Studies show that students with higher GPAs at all levels of education have higher levels of academic success at the end of their college experience as compared to students with lower GPAs.

Technology Use and Psychosocial Issues

In addition to the strain technology use has on academic success, numerous studies have focused on troubling psychosocial byproducts of extended technology use among college students. Moderate to severe levels of internet addiction may lead to a range of psychosocial issues in college-aged young adults (Derbyshire et al., 2013). For example, college students using technology more than their peers exhibit higher levels of stress (Kim et al., 2007; Pennebaker et al., 2001; Turner et al., 1995). Many students today are plugged into various forms of technology, and the stress associated with technology use—and in more severe cases technology addiction—is creating negative experiences such as loneliness and depression (Turel, 2015; Velezmoro et al., 2010; Wei, 2001).

Theory

Multitasking research and theories are not new. In fact, researchers have studied and theorized about multitasking over the past century (Craik, 1948; Navon & Gopher, 1979; Telford, 1931; Welford, 1952). Additionally, researchers have studied the way students engage and process information in academic settings for decades (Biggs 1987; Biggs & Telfer 1987; Bronfenbrenner 2001; Martin et al. 2012). The introduction of personal technologies is creating a new variable in the discussion of learning and focus. This new variable may begin to challenge many of the conventional theories of learning, distraction, and multitasking.

The findings of this study attempted to provide further evidence supporting the distraction–conflict theory pertaining to the tension created by distractions relating to student academic achievement. The distraction–conflict theory presents that distractions negatively affect learning and competence, particularly when an individual is experiencing challenging activities (Zajonc, 1965). A basic premise of distraction–conflict is that the more difficult the task, the more impact distractions have (Sanders, 1981). For this study, the hypothesis was that students who attend demanding college classes or read and study challenging college content will experience lower academic achievement

due to the use of technology or distractions that non-academic technologies present.

Additionally, the study expanded the use of rational addiction theory to include internet addiction and explained why students may choose to use the internet over accomplishing academic tasks, thus hindering academic performance. The rational addiction theory describes how an individual has an understanding that behaviors are, or may be, addictive, yet rationally chooses the behaviors regardless (Gruber & Koszegi, 2001). For this study, the rational addiction theory presents that even though college students might recognize that non-academic technology and internet use are potentially hurting academic endeavors, the students still choose to spend time on social media or video games rather than study.

Method

The purpose of this study was to analyze the relationship of the Internet Addiction Test (IAT) score and academic performance and identify differences between student demographic variables and IAT scores. This study used Young's (1998) Internet Addiction Test (IAT). The IAT score was used to determine a student's addiction to the internet, and a student's academic performance was measured by GPA. The following research question guided this study: "Is there a relationship between a student's IAT score and GPA?"

Sample

Traditional-aged students from both public and private institutions in Oklahoma participated in this study. The institutions selected for this study were a public, four-year research institution with more than 20,000 students; a private, four-year, liberal arts institution with more than 3,000 students; and a religiously affiliated, private, four-year liberal arts institution with more than 2,000 students. These schools were selected to create a broad sample from the region of traditional college students from both public and private institutions.

Sampling

This study used convenience sampling within the population requirements. Convenience sampling is a non-probability sampling method (Marshall, 1996). Because the number of all traditional public and private college students across the United States is large and may differ regionally, we decided to focus the study on a regional selection of schools, making convenience sampling the method selected for the

study. Convenience sampled participants were those who were available at the time of the study, were willing to participate in the study, were accessible, and met the criteria of the study in relation to the population parameters.

We worked with the Institutional Research Board (IRB) at each site to collect email lists of students 18 to 25 years of age. Emails were crafted for each participating institution and sent to each institution separately. All participants received an email with a link to the Qualtrics survey in the spring of 2019. Students were informed that the study was voluntary and were asked to electronically sign an IRB-approved informed consent form prior to completing the questionnaire.

Instrument

The Internet Addiction Test comprises of twenty questions, each using a six-point Likert scale (Young, 1998). The first eight questions are modeled after pathological gambling criteria outlined in the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders, which was the version available at the time (American Psychiatric Association, 1994). Twelve additional questions were added to help provide a better understanding of the types of dependencies clients had regarding internet use (Widyanto et al., 2011).

Some sample IAT questions taken from the questionnaire are:

1. How often do you find that you stay online longer than you intended?
2. How often do you neglect household chores to spend more time online?
3. How often do you prefer the excitement of the internet to intimacy with your partner?
4. How often do you form new relationships with fellow online users?
5. How often do others in your life complain to you about the amount of time you spend on-line?

The results of the IAT are divided into four categories. Respondents scoring 80 to 100 are identified as severely dependent on the internet. Moderate levels of internet addiction are scored ranging from 50 to 79. Scores of 31 to 49 are classified as mildly addicted to the internet, and scores of 0 to 30 are normal internet users (Young, 1998). For the purpose of this study, the raw numerical score was used.

Arguably the first generally accepted test to measure internet addiction, the IAT receives much scrutiny from researchers and has withstood

numerous tests of validity and reliability. Many tests have shown the IAT to have high face value validity, but Wiyanto et al. (2011) desired to run a psychometric test on the properties of the IAT. Using factor analysis, Wiyanto et al. ran a basic scree test with eigenvalue > 1.0 criteria and found three factors from the IAT. These three factors, which were rotated to position of maximum orthogonality in six iterations, explained 56.3% of the variance (Wiyanto et al., 2011). High reliability was found with a high Cronbach's alpha score ($\alpha = .86$).

Design

The purpose of this study was to analyze the relationship of the IAT score and academic performance—measured by GPA. All respondents completed the IAT online using the link provided to the Qualtrics questionnaire. Data collection was scheduled for a period of 45 and not exceeding 60 days following receipt of IRB approvals in the spring of 2019.

Data were analyzed to ensure that there were not any corrupted or incomplete data sets. This was done by importing the data collected in Qualtrics into IBM's Statistical Package for Social Sciences program version 24 (SPSS). The completed surveys were sorted in the database and all incomplete data sets were removed. Furthermore, any dataset not answering at least two of the three internal validity check questions correctly was discarded. Once the data set was validated and complete, all data analysis was conducted using SPSS.

Results

At the conclusion of the study in July 2019, 783 individuals had responded to the instrument. After eliminating respondents who did not fulfill the research criteria for this study, the sample size for the study was 692, which was 88.4% ($n = 692$) of respondents. Students participating at a regional, public institution comprised 59.5% ($n = 412$). Students participating from the two regional private institutions made up 23.4% ($n = 162$) and 16.8% ($n = 116$) of the participants, with the former being from the religiously affiliated institution. Two students (.3%) abstained from selecting an institution.

This study used three phases of data analysis: A descriptive analysis provided an overview of the study respondents (See Table 1), Pearson's r analysis was used to analyze the relationship of IAT score and GPA, and a linear regression (OLS) analysis was utilized to show if the independent variable (IAT score) is predictive of the dependent variable (GPA).

Table 1

Descriptive Data of Study: Sex, Race, and Classification

Demographic Variables	*n*	%
Sex		
Female	442	63.9
Male	245	35.4
Chose no answer	5	0.7
Total	692	
Race		
No answer	11	1.6
Native American	16	2.3
Black/African American	72	10.4
Hispanic	73	10.5
Asian	30	4.3
Two or more	5	0.7
White/Caucasian	485	70.1
Total	692	
Classification		
1st year	184	26.6
2nd year	172	24.8
3rd year	148	21.4
4th or more years	187	27.0
Total	692	

Pearson's r was used to address whether there was a relationship between IAT score and GPA. The analysis found there was a significant, negative correlation between the two variables (r = -.320, n = 692, $p < .001$) for the two-tailed test.

Next, a simple linear regression was calculated to explain a student's GPA based on the IAT score. A significant regression equation was found ($F(1,690) = 78.958$, $p < .001$), with an R^2 of .103. The study participants' predicted GPAs decreased 0.011 for every unit increase in IAT score. According to this study, IAT score appears to predict at least ten percent of GPA.

Discussion

The purpose of this study was to analyze the relationship of IAT score and academic performance. Through a linear regression, we found a negative relationship between students' IAT scores and GPAs: As IAT scores increased, students' GPAs decreased. Results showed that IAT scores may significantly predict GPAs for this study's respondents, as demonstrated by 10% of the variance in GPA explained by the IAT score. The results of this study support a growing area of the literature (Krumrei-Mancuso et al., 2013) suggesting that technology addiction is related to student success. Like this study shows, students with higher IAT scores may experience lower success in college.

Two theoretical frameworks—distraction-conflict theory and rational addiction theory—were selected to inform the study findings. While the test scores and GPA do not exhibit a cause and effect relationship, the finding that IAT scores have a negative relationship with GPA aligns with the distraction–conflict theoretical framework chosen for this study. Distraction–conflict theory posits that when a person is experiencing a challenging event or activity, like a college course or lecture, higher levels of distraction (or splitting of attention) lead to lower levels of learning or competence (Sanders, 1981). The literature on distraction–conflict theory indicates that students will struggle with complex tasks when higher levels of distraction are present (Nicholson et al., 2005).

Concerning the topic of internet-addicted students, rational addiction theory posits that students will choose technology use over healthy behaviors like studying (Becker & Murphy, 1988). For example, and related to this study, a student might choose to play a video game or spend time on social media at the expense of the grade on an assignment, a course grade, listening in chapel, or engaging in conversation with a fellow student walking across campus. It is important to note that rational addiction theory suggests that individuals are not blind to the future consequences of present actions and are actually forward looking (Becker & Murphy, 1988; Gruber & Koszegi, 2001). Thus, students who show higher levels of internet addiction are not blind to the academic consequences of choosing time on technology over academic tasks; they rationally choose the addiction, even though they realize negative outcomes are possible.

Limitations

This study included multiple limitations. One limitation of this study was socioeconomic status. Socioeconomic status may inhibit a student's ability to have technology. A larger sample size and choosing a more regional population was an attempt to control for socioeconomic differences. An additional limitation acknowledged in this study was how competent a student was with individual technologies. Some students are highly competent with various forms of personal technologies while others are not. For this study, the level of competence was not studied, rather the links between IAT score and GPA, along with other student demographics and IAT score, were researched.

This study also relied on self-report data with all the potential pitfalls therein. However, self-reported instruments can provide useful data when respondents feel they are anonymous and the reporting will not negatively impact them (Boca & Noll, 2000). Furthermore, the literature discusses how students' self-reported GPAs, are as valid an indicator of success as actual GPA (Cole & Gonyea, 2010; Schwartz & Beaver, 2014; Sticca et al., 2017).

Another limitation was the type of technology a student had and used. Students have a variety of technology devices at their disposal and the number of devices likely varied among respondents, with some having and using many devices whereas others may only have and use one or two. Although the number of devices may or may not have an impact on student success, this study was more concerned with the IAT score, and the literature is not clear on any relationships between number of devices and internet addiction. Additionally, student success may be attributed to multiple confounding factors, many of which fall outside the scope of this study and serve as potential foci of future research.

Implications for Practice

The number of students entering higher education with technology addiction is increasing (Agarwal & Kar, 2015; Young 2008). Higher education practitioners and leaders would be well served to have an awareness of this phenomenon, begin to consider systems to identify it, and create systems to support students who may struggle with technology addiction. We offer three areas of implications of the study's findings related to higher education practice: identifying students with internet addiction, supporting students with internet addiction, and using technology wisely and intentionally in educational settings.

College students are entering college with higher levels of depression, mental illness, and substance abuse disorders (such as alcohol or drug addictions) compared to previous generations (Hunt et al., 2010; Perron et al., 2011). As this study presents, technology addiction is a growing issue in addition to the others listed. Because of the study's results, technology addiction should be added to the list of student issues that higher education leaders and practitioners need to be prepared to support and address. Student development professionals are routinely attempting to improve services for students struggling with addiction, and students report that these types of services offered by institutions greatly help academic success (Bell et al., 2009).

Furthermore, student development educators might consider assessing the internet addiction of students who seem detached from the communities on campus, including the Christian college campus. By staying on one's smartphone during chapel, in class, or while walking across campus, one is missing out on the kind of educational and social opportunities that Christian college campuses (and others) provide. Helping students identify that they may be addicted to technology seems to be a positive first step in addressing a problem that many students have, with serious consequences for their spiritual and social development.

Consequently, pertaining to this study, this choice of addictive behavior leads to GPAs that are lower. Like other addictions, students who are addicted to the internet need support in college to help first recognize the addiction and second address the addictive desires, otherwise the addiction may lead to lower levels of success. Student development professionals ought to recognize students who may be struggling with excessive internet use. Examples include students who are holed up in their residence hall gaming all hours of the night, students who are not engaged with peers in the cafeteria while on their phone, students walking across campus by themselves staring at their phone, or students distracted in chapel services by their personal technology.

Although phone usage has become a norm across college campuses, it does not mean student development professionals have to accept this behavior as healthy and adjusted. Recognizing that this behavior might be an addiction will help college professionals begin to provide support for their students. The following are some examples of practices college leaders might use to help address technology addiction. Professors can institute a no phone policy but allow students a three to five-minute break in the middle of class to check their phone if needed.

This provides less distraction during the class while also allowing the student to not focus on what they might be missing throughout the entire class. Residence hall directors might host an interactive game night to draw students out of their room. Even if playing video games together in a lobby or conference room, getting students in closer proximity to each other helps foster community that often grows into deeper relationship. Dining halls can create "no tech Tuesdays/Thursdays" (all day or during dinner) and encourage students to leave their phones in their backpacks. Providing ice-breaker questions on table tents is a great way to help students engage with each other. Student development professionals might address the dangers of technology addiction at health and wellness fairs along with the other common addictions discussed. Offering services through counseling or health centers to address technology addiction can also provide support for students who self-identify as addicted to technology.

The primary implication for student development professionals is to recognize that students likely are struggling with their technology use, but they may not recognize it. Having technology addiction on their radar will help professionals reach out to struggling students and begin a conversation. This is a critical step in students receiving the support needed to address any addiction, but especially technology addiction.

Implications for Research

This study provides a starting point or base for future studies seeking to better understand how technology addiction is impacting college students and is also related to studies of student success, retention, and student engagement. As previously posited, technology, and more specifically technology addiction, is a new variable that is emerging in higher education literature. Continued research is essential to help scholars and practitioners better understand precisely what implications technology has on college students. We particularly recommend studies of internet addiction that are restricted to Christian college campuses in order to isolate the potential problems and solutions within that specific environment.

Additional research is needed to better comprehend how internet addiction is impacting college students, not only pertaining to GPA, but also socially through engagement and cognitively relating to overall learning as well. This study provides an initial platform for future researchers to continue to explore intersections of technology use and distraction, internet addiction, and student success in higher education.

Conclusion

As mentioned throughout this study, technology is woven into the fabric of contemporary higher education. The complexity of understanding both the benefits and detriments of technology is quite challenging because the benefits are typically quite obvious, while the detriments are often more hidden and personal. Just as it would be unacceptable to place alcohol on the desk of a recovering alcoholic in class, this is similar to what is happening to students with technology addiction. Students are asked to open a laptop and take notes, research, or work together on a shared Google doc—interfacing with the very item of their addiction. For many reasons, including the many positive benefits technology brings to the higher education classroom, it is not realistic or useful to suggest that technology should not be present. However, coming to a better understanding of how college students are engaging with technology, both positively and negatively, is critical.

This study explored the notion of internet addiction and considered a tool that practitioners and scholars could use to help identify struggling students. Technology addiction is a newer phenomenon and growing in student populations, yet it is often difficult to identify. By recognizing internet addiction as a potential new variable in the student success conversation, higher education leaders, scholars, and practitioners will be able to provide more specialized support to students throughout the higher education experience in the hopes of increasing levels of student success.

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