

Parental Intention to Support Video Game Play by Children With Autism Spectrum Disorder: An Application of the Theory of Planned Behavior

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Abstract:

Purpose The purpose of this study was to determine parental attitudes regarding engagement with video games by their children with autism spectrum disorder (ASD) and whether attitudes vary based on ASD symptom severity.

Method Online survey methodology was used to gather information from parents of children with ASD between the ages of 8 and 12 years. The finalized data set included 152 cases. Descriptive statistics and frequency analyses were used to examine participant demographics and video game play. Descriptive and inferential statistics were used to evaluate questions on the theory of planned behavior. Regression analyses determined the predictive ability of the theory of planned behavior constructs, and *t* tests provided additional descriptive information about between-group differences.

Results Children with ASD play video games. There are no significant differences in the time, intensity, or types of games played based on severity of ASD symptoms (mild vs. moderate). Parents of children with ASD had positive attitudes about video game play.

Conclusions Parents of children with ASD appear to support video game play. On average, parents indicated video game play was positive for their children with ASD, particularly if they believed the games were having a positive impact on their child's development.

Keywords: Autism Spectrum Disorder (ASD) | video games | parents | children

Article:

Over the past two decades, the number of children identified as having autism spectrum disorder (ASD) has increased substantially. Prevalence statistics in the United States have recently increased from 1 in 88 children (1 in 54 boys and 1 in 252 girls; Baio, 2012) to 1 in 68 children

(1 in 42 boys and 1 in 189 girls; Baio, 2014). Given such statistics, it is logical that significant increases in the number of students with ASD have been reported in all educational and clinical environments. In 2012, schools in the United States served nearly 445,000 students between the ages of 6 and 21 years with a primary educational label of autism. More than half of those students were in the elementary and middle school age range (Data Accountability Center, 2012).

With the growing number of children with ASD being served in schools, it is important to investigate effective methods for engaging them in educational and social activities. This can be challenging for school-based speech-language pathologists (SLPs) as a result of the many effective intervention approaches for teaching children with ASD. There is compelling scientific evidence for 11 different established treatments for individuals with ASD. Of those, eight are specifically stated to be effective for intervention related to communication (National Autism Center, 2009). With so many intervention approaches to consider, a trial and error period may be difficult to avoid. This challenge is further compounded by the fact that research evidence for interventions is constantly changing as new studies and concepts are published. New ideas and innovative practices drive the field forward, and it is important to continue developing clinical practice that is cutting edge. Further, new technological developments may create opportunities for clinical innovation that should be considered in addition to interventions with established scientific evidence. One such clinical innovation is the use of video games with children with disabilities to supplement instruction in therapy rooms and classrooms.

Although research in this area is rather limited, evidence suggests that video games are ubiquitous in the lives of children with ASD (Hickerson, Finke, & Choi, 2014; Mazurek & Engelhardt, 2013; Mazurek & Wenstrup, 2013). Further, consideration of the clinical and educational utility of video games has been bolstered by research in other fields such as neuroscience, social studies education, literacy studies, health, and psychology (Evans, Norton, Chang, Deater-Deckard, & Balci, 2013; Steinkuehler & Squire, in press). Outcomes emerging from initial investigations in these fields have indicated that video games may be an advantageous teaching and learning tool.

Squire (2005) pointed out that some computer and video games could have educational potential for individuals without disabilities from both cognitive and social perspectives. Action games (defined as those with fast motion, many transient events, high perceptual load, and high requirements for peripheral processing, such as first-person perspective games and racing games) have been shown in empirical research involving neurotypical participants to support higher-order cognitive development (Green & Bavelier, 2003), visual acuity, and visual attention (Green, Pouget, & Bavelier, 2010). Video games such as World of Warcraft have been examined for their ability to teach hypothesis testing (Steinkuehler & Duncan, 2008) and literacy skills (Steinkuehler, 2007, 2008), whereas Civilization III has been shown to improve critical thinking, information gathering, and collective problem solving (Squire & Barab, 2004). The advantages of video games likely depend, of course, on the quality of the game and the ways in which players use them. Therefore, research is needed to determine specifically which types of video games have the greatest potential to promote these types of learning. Research is also required to determine how these video games should be implemented educationally to achieve the greatest

benefit for students, as not all investigations of computer-based instruction have resulted in positive outcomes (e.g., Bishop, Adams, & Rosen, 2006; Cohen et al., 2005).

In addition to the educational potential inherent in some video games, Gee (2003) stated that video games could be good learning tools because they are motivating. Motivation drives commitment to engage in new learning activities (Posner & Rothbart, 2007). Therefore, engagement with video games may present a potentially useful medium for learning new skills or building foundational skills for success in school (Gee, 2003; Hoffman & Nadelson, 2010). Many children with and without disabilities are motivated by video games, including children on the autism spectrum (Durkin, 2010; Mazurek & Engelhardt, 2013; Mazurek, Shattuck, Wagner, & Cooper, 2012; Mazurek & Wenstrup, 2013; Shane & Albert, 2008). Video games may be motivating to children with ASD in a variety of ways. Przybylski, Rigby, and Ryan (2010) found that video games are intrinsically motivating, as individuals play them without expectation of an external reward. Children with ASD, like many others who play video games, may be motivated intrinsically by the challenge inherent in video game play or by the autonomy and self-determination a game world affords (Gee, 2003). Children with ASD may also be extrinsically motivated by video games and may engage in nonpreferred tasks in order to “earn” the opportunity to engage with video games.

Although video games may have educational and motivational potential, school-based SLPs need to consider the values and preferences of families before making an intervention plan (Johnson, 2006). Parental support for clinical decisions is necessary, as parental consent is required by the Individuals with Disabilities Education Act (2004) to move forward with the services outlined in an Individualized Education Plan (34 C.F.R. § 300.300). Understanding the factors parents consider is critical to incorporating parents into educational planning and service delivery. Parents consider their perception of the effectiveness of the intervention, the child’s preference for the intervention, the specific needs (including severity of ASD symptoms) of the child with ASD, as well as their perceived control over the intervention among others (Carlson, Carter, & Stephenson, 2013). Parental perceptions and beliefs are central to their participation in Individualized Education Plan meetings and are critical for school-based professionals to understand. Therefore, the purpose of this study was threefold: to determine frequency of video game play for children with ASD, to understand parental perspectives on video game play and parental intention to support future engagement, and to determine whether parental perspectives of video game play vary based on the severity of their child’s ASD symptoms.

Literature Review

There has been limited empirical research on the topic of video game play by children with ASD. Mazurek and Engelhardt investigated the relationship between problem behavior and video game play in boys with ASD (Engelhardt & Mazurek, 2013; Mazurek & Engelhardt, 2013). These researchers suggested that unlimited access to video games, particularly in-room access, was highly correlated with increased oppositional behavior (e.g., temper tantrums, questioning authority) by boys with ASD. It was also reported that the “household media environment,” including the amount of parental regulation provided, was associated with the incidence of problem behavior (Engelhardt & Mazurek, 2013, p. 6). In a second investigation of problem behavior and video games, these researchers reported the most reliable predictors of problem

behavior (e.g., inattention, opposition) were video game genre (i.e., role-playing games) and problematic or addictive tendencies of game play but not quantity of time spent playing video games per day.

There are also a few studies that have investigated video gaming as a therapeutic tool for school-age children with ASD. Gaylord-Ross, Haring, Breen, and Pitts-Conway (1984) trained three children with ASD to initiate and maintain conversations with peers while playing a video game. Results of this intervention demonstrated increases in social interactions with peers across all three participants. Chiang, Lee, Frey, and McCormick (2004) used the video game *Dance, Dance Revolution* as a context for building social relationships between school-age children with and without ASD. Results of this investigation were improvements in relationship quality and improved social expectations among the participants. Bell-Chopra, Chiochio, and Knapp (2009) conducted a similar study in which children with ASD were taught to converse with peers while playing a bowling game on the Nintendo Wii. Results indicated increases in scripted and unscripted conversation with peers while playing.

Despite this evidence, game-based interventions have not proven universally effective in treating individuals with communication disorders. For example, Cohen and colleagues (2005) conducted a randomized controlled trial in which one group received the intervention using *Fast ForWord*, a computer-based intervention for treating individuals with language impairment. The second treatment group engaged with commercially available educational computer games designed to teach language concepts. The third group received no intervention as part of the study. Results indicated the children in all three groups made statistically significant gains in expressive and receptive language. The overall conclusions suggested no additional benefit in language outcomes for children receiving the computer-based intervention.

Bishop et al. (2006) also compared two different language interventions with outcomes from a control group. The intervention conditions included a computer program designed to teach grammatical comprehension and a modified speech program designed to enhance aspects of the speech signal. Results indicated there were no benefits in terms of language comprehension outcomes associated with the computerized intervention. All three groups demonstrated modest gains in the targeted language areas.

The outcomes (positive and negative) associated with video game engagement by children with ASD reported in the research literature should be supplemented with data on parental attitudes toward the intervention (Johnson, 2006). Parents of children receiving intervention in the school context have the right and responsibility to assist school-based SLPs in making intervention decisions and considering clinical innovations implemented in the educational environment. Therefore, understanding parents' attitudes about the video game play of their children with ASD is critical.

Parental Perspectives on Engagement With Video Games

Research regarding parents' attitudes about the video game play of their children with ASD is limited. Shane and Albert (2008) investigated the use of electronic screen media by children with

ASD at home. Results indicated that roughly 61% of the parents regulated the content accessed by their child with ASD, and 48% of the parents set restrictions on the amount of time their child with ASD spent interacting with electronic screen media per day. Two-thirds of the participating families allowed their child with ASD to engage with electronic screen media to complete a task, and half of the parents reported use as a form of leisure. Engelhardt and Mazurek (2013) reported that a larger number of parents (87%) regulated days and hours of video game play as well as the age-specific ratings of the games.

Although it is important to understand how parents monitor and regulate their child's video game play, their attitudes toward engagement with video games is a much broader question. No such research has been conducted with parents of children with ASD. However, Nikken and Jansz (2006) studied parental attitudes about video games and potential parental mediators of video game engagement. These researchers found that parents of typically developing children who held negative opinions of video games controlled their children's play more strictly than did parents with positive views of video games. Further, parents with more negative attitudes about video games restricted game behavior more and discussed game content more frequently with their children. Parents with more positive attitudes were reported to be more likely to be video gamers themselves and to play video games with their children (Nikken & Jansz, 2006).

It is critical to understand parental support for clinical approaches, or nearly any activity that will involve their child, as their support will be necessary to move forward. If parents feel positively about their child with ASD playing video games, it is possible to then consider the implications of harnessing this tool more broadly to train social skills and/or to motivate children with ASD in therapeutic and educational contexts. One method for assessing perspectives on an activity or practice has been through the application of the theory of planned behavior (Ajzen, 1985, 1991). The application of this theory may provide insight about how parental experience, knowledge, and preference affect parental support of engagement with video games.

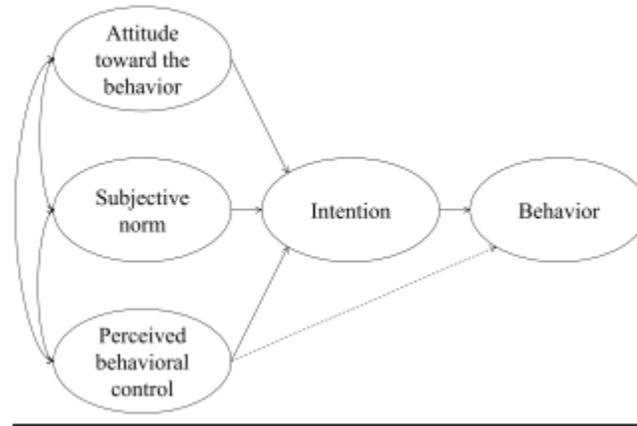
Theoretical Framework: The Theory of Planned Behavior

The theory of planned behavior models a proposed explanation for the relationship between attitudes and behavior. Therefore, if parents have certain attitudes toward video games, they are likely to behave in ways that correspond with those attitudes (e.g., permitting or not permitting their child to play video games). According to this theory, intention to permit or engage in a behavior is determined by three predictors: (a) attitude toward the behavior, the favorable or unfavorable evaluation of a behavior; (b) subjective norm, the social pressure to allow or perform a behavior; and (c) perceived behavioral control, the ease or difficulty of a behavior based on past experience and anticipated obstacles (see Figure 1). Favorable attitudes and subjective norms in addition to a high level of perceived behavioral control would suggest that an individual has an increased likelihood of performing a behavior or supporting another person's engagement in a behavior (Ajzen, 1991).

The theory of planned behavior is a psychological theory that has been empirically validated to predict behavioral intention across many areas of study (e.g., eating, exercise, hygiene, medical treatment, recreation) by linking beliefs and behavior. This theory was first proposed by Icek Ajzen in 1985 and has been found to be a powerful model for explaining human behavior and

intention (Ajzen & Driver, 1992; Armitage & Conner, 2001; Conner & Sparks, 2005; Godin & Kok, 1996). This theory states that a person's attitude toward a behavior or activity (positive or negative) along with their perception about the behavior (social acceptability) and the perceived ease or difficulty of performing the behavior predict behavioral intention, or willingness to perform the particular behavior.

Figure 1. Theory of planned behavior.



Although many studies that have applied the theory of planned behavior have focused on individual behavior, others have used this theory to investigate parental intentions to take action on decisions associated with their children. For example, Atsalakis and Slep (1996) used the tenets of the theory of planned behavior to assess parents' intentions to register their children for a physical activity program. These researchers stated that when parents register their child for an activity, they logically assess the required investment of their time, money, and effort. In this way, registering a child for an activity program is a product of parental decisions and behavior. Results of this investigation indicated that parents' intent to register their child for the activity program was predicted by attitude, subjective norm, and perceived control. Parents with more positive attitudes about the program, higher perceptions of social acceptability of the activity program, and higher perception of control over how, when, and where their child participated in the activity program reported stronger intentions to register their children. This study provides an appropriate foundation for using the theory of planned behavior to assess parents' intentions to support engagement with video games by their child with ASD; however, it has not yet been applied for this purpose.

On the basis of the limited evidence on the perceptions and practices of parents of children with ASD regarding engagement with video games, this study addressed the following questions:

1. According to parent report, what is the frequency of video game play by children with ASD?
2. What are the perceptions and practices of parents of children with ASD related to their child's video game play?
3. Do parents' perceptions and practices related to the video game play of their child with ASD vary based on ASD characteristics (i.e., mild or moderate)?

Methods

Parents of children with ASD between the ages of 8 and 12 years completed an online survey about the video gaming preferences and behaviors of their child with ASD. Parents with more than one child who met the inclusion criteria were instructed to answer questions based on the child most interested in playing video games. To answer the research questions for this study, data were collected on parent and child demographics as well as parent attitudes and intentions to support engagement with video games by applying the principles of the theory of planned behavior. Before the initiation of any research activities, approval was obtained through an Institutional Review Board.

Procedure Prior to distribution, the online survey was piloted to validate the questions and format. A total of 98 parents who participated in the pilot study were given the opportunity to provide feedback regarding the clarity of the questions, appropriateness of the terminology, and any issues with completing the survey. Feedback provided by these parents was used to revise the survey questions and improve survey design.

Recruitment for the study occurred via two approaches. First, parents were recruited through Internet discussion groups and parenting websites. An approved message describing the study was posted to these groups. The message contained a link to the online survey for interested parents. Second, private messages were sent to SLPs who worked with school-age children using the American Speech-Language-Hearing Association membership directory. SLPs were contacted based on their employment setting and the state in which they were employed. An equal number of SLPs was contacted from each of the four Census-classified geographic regions (United States Census Bureau Geography Division, 2011).

The message sent to each SLP described the study and asked for help with distribution of recruitment materials to parents of children with ASD between the ages of 8 and 12 years. Interested SLPs were sent a letter to distribute to parents who they felt met the inclusion criteria for the study. Site supervisors (e.g., school principals) approved this letter prior to distribution. The letter described the study and provided a link to the online survey. Participation in this study was voluntary and based on parent self-nomination. As incentive to participate, parents were informed that \$100 gift cards to a major book retailer would be given to six randomly selected respondents. Data for this study were collected via standard parent report, as this method has been used previously to investigate the preferences and activities of children with ASD (Hickerson et al., 2014). Some children with ASD may have difficulty reporting accurate information via a survey format (Orsmond, Krauss, & Seltzer, 2004). Standard parent report has also been used previously to investigate media use of children without ASD (Roberts, Foehr, Rideout, & Brodie, 1999). Further, several studies have examined how well parent-reported information corresponds with developmental tests and/or expert clinical judgment. Although most researchers have studied parents with children younger than those in the current sample, correlations between parent report of development and results of standardized testing in young children have been found to be moderately high (Dale, Bates, Reznick, & Morisset, 1989) to very strong (Pulsifer, Hoon, Palmer, Gopalan, & Capute, 1994). Parent report has also been used by the Centers for Disease Control and Prevention to assess changes in prevalence of ASD in school-age children (Blumberg et al., 2013). The Centers for Disease Control and Prevention

collected data from parents regarding ASD diagnosis, ASD severity, age when first diagnosed, and approximate calendar year of first diagnosis. These data were used to estimate the prevalence of ASD in children aged 6 to 17 years in the United States. Parental report has been used in the research literature as well. Lee and colleagues (2010) used Internet-based parental report to evaluate concordance of parental report of ASD characteristics in children aged 4 to 18 years with clinical diagnosis measures. These researchers found that the Internet-based parental report was highly reliable, with a 93.4% concordance rate with Autism Diagnostic Interview–Revised (Lord, Rutter, & Le Couteur, 1994) or Autism Diagnostic Observation Schedule (Lord et al., 2000) clinical diagnoses in verbal children with ASD.

This appendix suggests that items should be developed for each category of attitude, perceived norms, perceived behavioral control, and intention. The items should then be piloted to reduce the constructs for parsimony and high internal consistency. We also reviewed the question development process used in similar studies (e.g., Ajzen & Driver, 1992; Montaña & Kasprzyk, 2008; Tickner, Leman, & Woodcock, 2010). As in other studies that applied the theory of planned behavior to assess attitudes and perceptions, parental agreement with intentions, subjective norms, perceived behavioral control, and behavioral beliefs was assessed using a 5-point Likert-type scale where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. A 7-point semantic differential scale was used to assess parental attitudes about engagement with video games. This question asked parents to indicate their attitudes about whether video game play was bad/good, harmful/beneficial, risky/safe, foolish/wise, irresponsible/responsible, difficult/easy, unnecessary/necessary, and frustrating/satisfying for their child with ASD.

Data Preparation

All theory of planned behavior constructs used in this study were examined for internal consistency before proceeding with data analysis (see Table 2). A minimum Cronbach's alpha of .70 was chosen as the cutpoint for internal consistency (Bland & Altman, 1997). To meet acceptable levels of internal consistency, some items were removed from the analysis because they did not correlate well and decreased Cronbach's alpha. For perceived behavioral control and intention, the constructs were reduced to a single item (i.e., perceived behavioral control: "I am confident that I can control the number of hours my child with ASD spends playing video games"; and intention: "I intend to support the video game play of my child with ASD in the future"). Without removing any items for the remaining constructs, Cronbach's alpha was acceptable for attitude ($\alpha = .907$), subjective norms ($\alpha = .707$), and behavioral beliefs ($\alpha = .884$).

Data Analysis

Statistical analysis of the survey data was conducted using SPSS 19.0 software. Descriptive statistics and frequency analyses were used to examine participant demographics. Descriptive and inferential statistics were used to evaluate responses to theory of planned behavior questions. Regression analyses were used to determine the predictive ability of the theory of planned behavior constructs. First, ordinary least squares regression was used for the direct predictors of intention. The ability of attitude, subjective norm, and perceived behavioral control to predict intention was determined. R^2 was calculated to determine the percentage of variance in parents'

intentions explained by these three constructs. Next, a simple linear regression was used to assess behavioral belief, the predictor of attitude. Pearson’s correlation coefficient was calculated to determine the strength and direction of the correlation between behavioral belief and attitude.

Table 1. Theory of planned behavior questionnaire items.

Constructs	Question	<i>M</i>	<i>SD</i>	Range
Intention	I intend to support the video game play of my child with ASD in the future.	3.75	0.83	4.00
Behavioral beliefs	I think video gaming contributes to the quality of life of my child with ASD.	3.54	1.02	4.00
	I think my child with ASD benefits socially from video gaming.	3.35	1.14	4.00
	I think video gaming is an activity that promotes the development of social skills.	3.03	1.15	4.00
	I think video gaming is an activity that helps my child with ASD develop his/her fine motor skills.	3.82	0.93	4.00
	I think video gaming is an activity that helps my child with ASD develop his/her language skills.	3.05	1.12	4.00
	I think video gaming is an activity that helps my child with ASD develop his/her reading and writing skills.	2.94	1.20	4.00
	I think video gaming is an activity that helps my child with ASD develop his/her critical thinking skills.	3.70	0.97	4.00
	I think video gaming could lead to career and/or employment opportunities for my child with ASD.	3.20	1.23	4.00
Subjective norms	Most people who are important to me believe I should support my child with ASD in playing video games.	3.10	0.91	4.00
	Most people who are important to me would allow their children with ASD to play video games.	3.71	0.86	4.00
	Most parents like me would support their children with ASD in playing video games.	3.72	0.83	4.00
Attitudes	Bad:Good	5.14	1.36	6.00
	Harmful:Beneficial	4.97	1.33	6.00
	Risky:Safe	5.39	1.29	6.00
	Foolish:Wise	4.46	1.15	6.00
	Irresponsible:Responsible	4.56	1.10	6.00
	Unnecessary:Necessary	4.76	1.63	6.00
Perceived behavioral control	I am confident that I can control the number of hours my child with ASD spends playing video games.	3.95	1.09	4.00

Note. ASD = autism spectrum disorder.

Finally, an independent samples t test was used to provide additional descriptive information. The t test assessed differences between the responses from parents of children with mild ASD characteristics and parents of children with moderate ASD characteristics. The means of both groups were calculated for each construct, and t statistics and p values were computed to determine the significance of any differences between groups. The alpha level for determining statistical significance in these t tests was adjusted using a Bonferroni correction. Because of multiple comparisons, the alpha level was adjusted from a typical level of .05 to a more conservative .01.

Table 2. Internal consistency and means for theory of planned behavior constructs.

Construct	α	<i>M</i>	<i>SD</i>
Behavioral beliefs	.884	3.33	0.82
Attitude	.907	4.88	1.09
Subjective norm	.707	3.51	0.69
Perceived behavioral control		3.95	1.09
Intention		3.75	0.83

Results

In total, there were 152 complete cases of data provided by parents of children with ASD. Of the 152 parents who completed the survey, most were female (82.2%), married (86.8%), White (92.8%), and had a degree from a higher education institution (82.8%). The average age of these participants was 41 years. Household income was varied but normally distributed: less than \$50,000 (19.7%), \$50,001 to \$100,000 (40.8%), \$100,001 to \$200,000 (30.7%), more than \$200,000 (8.8%). The number of children with ASD per family ranged from 1 to 3, although only 12 parents of 152 reported having more than one child with ASD. On average, the parents had a total of 2.5 children, including their children with and without ASD.

The children with ASD, about whom the parents answered the survey questions, were predominantly male (93.4%) and the same ethnic and racial background as their parents (94.1%). The disproportionate ratio of boys to girls has similarities to national data reports, but the number of boys exceeds the estimated prevalence rates of 4.5 boys for every 1 girl with ASD (Baio, 2014). These children ranged in age from 8 to 12 years, with an average age of 9.8 years. The majority of the children were in third grade (24.0%), fourth grade (21.3%), fifth grade (25.3%), or sixth grade (15.3%). The mode of communication varied across participants, and some children used more than one mode; however, the communication mode used by most children was speech and/or vocalizations (93.4%), followed by gestures (24.3%), and tablet or smartphone (12.5%). Less frequently reported communication modes included sign language (2.0%), communication board or book (0.7%), picture exchange communication systems (3.9%), and computer with speech output (0.7%).

The children varied in terms of their specific ASD diagnosis reported by their parents, which included autistic disorder (39.1%), Asperger's syndrome (33.8%), and pervasive developmental disorder—not otherwise specified (PDDNOS; 27.2%; see Table 3). The categories based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR; American Psychiatric Association, 2000) criteria were used for parental reporting of formal ASD diagnosis. Children between the ages of 8 and 12 years would have been diagnosed when the DSM-IV-TR was in use. Parents further reported their subjective assessment of the severity of their child's ASD symptoms and reported the areas in which they felt their child's functioning was affected by ASD. Parents provided ratings of the severity (0 = not at all affected to 3 = severely affected) of their child's ASD symptoms in the areas of communication, social interaction, and/or restricted/repetitive interests or behaviors. As a result of these rankings, each child with ASD was assigned an overall severity score on a scale of 0 (not affected in any of the three characteristic areas) to 9 (severely affected in all three areas). Based on parental report in the current study, children were fairly evenly divided into two categories: mild ASD characteristics (50.7%) or moderate ASD characteristics (49.3%).

To investigate the validity of parental ratings of ASD severity, a comparison using an independent t test was completed. The mean severity score for the mild ($M = 4.55$, $SD = 1.46$) and moderate ($M = 6.09$, $SD = 1.45$) groups was calculated, and t statistics and p values were computed to determine whether parental report indicated a difference in ASD symptom severity between these two groups (i.e., mild and moderate). The results of the analysis showed a statistically significant difference in severity scores between groups ($p < .05$), indicating parents of children in the mild group reported significantly less severe ASD symptoms than the parents

of the children in the moderate group. Ultimately, the mild ASD group was composed of 30 children with a diagnostic label of autistic disorder, 24 children with Asperger's syndrome, and 23 children with a label of PDD-NOS. The moderate ASD group was composed of 29 children with autistic disorder, 27 children with Asperger's syndrome, and 18 children with PDD-NOS (see Table 3).

Video Game Play

A primary objective of this study was to investigate the frequency of use of video games by children with ASD. Results indicated that children with ASD frequently played video games, anywhere from 1 to 7 days per week, with an average of 5.99 days per week ($SD = 1.56$). The number of hours spent playing video games each week was variable. The average reported by the parents was 12.24 hr ($SD = 9.66$). There were no significant differences in the behavioral involvement with video games based on parental report for children with mild or moderate forms of ASD. This indicated that the severity of ASD symptoms did not affect the quantity of engagement with video games in terms of total number of hours or number of days per week video games were played.

Children with mild and moderate forms of ASD also did not differ in the types of video games played. Parents reported up to five of their child's favorite, most frequently played video games; a total of 602 preferred video games were listed. The top five games reported were some variation of a Mario game (16%), some variation of a LEGO game (8%), Angry Birds (8%), Pokemon (7.5%), or Minecraft (4%). Other games reported regularly (7 to 10 occasions each) were Call of Duty, Plants vs Zombies, Skylanders, Sonic, and Wii Sports.

Parental Intention to Support Video Game Play

Another objective of this study was to investigate parents' intent to support the video game play of their child with ASD. Parents completed items in the survey that applied the theory of planned behavior: behavioral beliefs, attitudes, subjective norms, perceived behavioral control, and intention. Demographic variables (i.e., child age, child sex, parent age, parent sex, marital status, income level, and parent education level) were controlled but were not significant and were therefore removed from any statistical models.

Parents indicated they intended to continue supporting the video game play of their child with ASD in the future, with an average score of 3.750 (on a 5-point scale) for intention. For the direct predictors of intention (i.e., attitude, subjective norm, and perceived behavioral control), the average scores suggested that parents of children with ASD had generally positive perceptions of their child's video game play. Specifically, parents had moderately favorable attitudes about their child's video game play, with a mean of 4.880 (on a 7-point scale) for attitude. They also agreed that social norms are supportive toward the video game play of children, with an average subjective norm rating of 3.511 (on a 5-point scale). Parents believed they had control over the video game play of their child with ASD, as the mean for perceived behavioral control was 3.954 (on a 5-point scale). Finally, the mean score for behavioral beliefs of 3.330 (on a 5-point scale) suggested that parents generally believed video game play resulted in positive outcomes for their child with ASD.

Ordinary least squares regression was used for inferential assessment of the direct predictors of intention. Attitude, subjective norm, and perceived behavioral control were regressed on intention to determine the predictive ability of the model. R2 was .456, and adjusted R2, which accounts for the number of variables, was .445. R2 indicated 45.6% of the variance in parents' intentions to support their child's video game play was explained by their attitude, subjective norm, and perceived behavioral control. Analysis of the standardized beta coefficients and p values revealed that attitude, subjective norm, and perceived behavioral control were not all equally significant (see Table 4). Attitude and subjective norm were the only predictors significantly related to intentions. Attitude was the strongest predictor ($b = .546$), followed by subjective norms ($b = .243$). These data indicated parents with more positive attitudes or more positive perceptions of social support regarding their child's video game play were more likely to intend to support the video game play of their child currently and in the future.

Using a simple linear regression, behavioral belief was regressed on attitude. According to the theory of planned behavior, behavioral beliefs, or beliefs about the outcome of a given behavior, influence attitude (Ajzen, 1991). The correlation between behavioral belief and attitude was statistically significant ($r = .586$; $p < .001$). The results indicated that a parent with more positive beliefs about the outcomes of their child's video game play is more likely to have positive attitudes about their child's video game play.

Comparison of Mild Versus Moderate ASD Characteristics

Finally, to investigate differences between parents of children with mild versus moderate ASD characteristics related to intent to support video game play, a comparison using an independent t test was completed (see Table 5). The means of both groups were calculated for each construct, and t statistics and p values were computed to determine the significance of any differences between groups. An alpha level of .01 was selected to account for multiple comparisons in these t tests. Based on these comparisons, no significant differences between groups (i.e., mild and moderate) were found.

Table 4. Ordinary least squares regression: attitude, subjective norm, and perceived control on intention.

Construct	β	t	p	R^2
Attitude	0.546	8.306	.001	.456
Subjective norm	0.243	3.732	.001	
Perceived control	0.007	0.119	.905	

Table 5. Theory of planned behavior: comparison of mild versus moderate autism spectrum disorder (ASD) characteristics.

Construct	ASD		<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
	characteristic					
Behavioral beliefs	Mild		3.41	0.83	1.250	.213
	Moderate		3.25	0.79		
Attitude ^a	Mild		4.97	0.98	1.008	.315
	Moderate		4.79	1.19		
Subjective norm	Mild		3.64	0.59	2.293	.023
	Moderate		3.38	0.77		
Perceived control	Mild		4.00	1.11	0.528	.599
	Moderate		3.91	1.07		
Intention	Mild		3.86	0.72	1.612	.109
	Moderate		3.64	0.92		

^aMeasured on a 7-point scale. All other constructs were measured on a 5-point scale.

Discussion

This study used standard parental report via an online survey to examine parents' perceptions about engagement with video games by their children with ASD. Results indicated parental support for video game play through an application of the theory of planned behavior.

Use of Video Games by Children With ASD

Results from the current study further established that children with ASD play video games. The average duration of play for children with ASD reported by the parents in the current survey was 12.24 hr each week. In comparison, Mazurek and Wenstrup (2013) reported that school-age children with ASD play video games for 2.4 hr per day or 16.8 hr per week, whereas their typically developing siblings engaged with video games for approximately 1.6 hr per day or 11.2 hr per week. The data from our project, as well as previous research, indicate that children with ASD spend more time video gaming per week, on average, than children without ASD.

Therefore, if the assertion by Ryan and Deci (2000) is correct, and time spent in an activity is a measure of motivation to engage with that activity, it is reasonable to suggest that playing video games is intrinsically motivating for children with ASD.

Parental Support of Video Game Engagement

The results of the current investigation indicated that parents of children with ASD had relatively positive attitudes about engagement with video games and intended to support their child's video game play. Parents of children with ASD generally believed that positive behavioral outcomes were associated with video gaming in areas such as social skills, fine motor skills, language skills, reading and writing, and critical thinking. These beliefs were significantly related to the development of positive attitudes toward the use of video games. Further, parental support and positive perception of engagement with video games did not vary substantially based on the severity of their child's ASD symptoms, whether their child was reported to experience mild or moderate forms of ASD. These findings appear to indicate that parents would be supportive of the use of video games in educational and therapeutic contexts. The parents in this study specifically reported perceived positive behavioral outcomes for their child with ASD that

included key areas of functioning for academic achievement and learning. Positive behavioral outcomes associated with video game play have been reported in other published studies as well. Winter-Messiers (2007) reported that children with ASD used their interest in video gaming to talk to peers. Further, when talking about this interest, children with ASD showed improved communication skills. Improvements in fine motor skills were also associated with video game play.

Perceived positive social support (i.e., subjective norms) for video game play by children with ASD also did not vary based on reported severity of ASD characteristics. Parents of children with ASD felt that other parents (e.g., people they know or parents with children with ASD symptoms similar to their child's) would be supportive of their child's engagement with video games regardless of the level of severity of their child's ASD symptoms. This is consistent with previous research that has reported that parents are supportive of their child's interests when they are socially acceptable and are activities that are universally preferred (Winter-Messiers, 2007), as is the case with video games, based on the number of individuals with and without ASD who play video games for leisure (Electronic Software Association, 2013).

Data from the current investigation demonstrated the applicability of the theory of planned behavior to assess parental support of video game play. The three constructs predicting intention (subjective norm, attitude, and perceived behavioral control) explained 45.6% of the variance in parents' intention to support their child's engagement with video games. Attitude was the greatest predictor of intention, which is consistent with previous research (e.g., Ajzen, 1991; Ajzen & Driver, 1992; Armitage & Conner, 2001; Conner & Sparks, 2005; Godin & Kok, 1996). In the current study, behavioral beliefs about video gaming (e.g., the belief that video game play improves social skills) were correlated with parental attitude. This suggests behavioral beliefs have a strong influence on parent attitudes about video gaming (Ajzen, 1991). Perception of social support (i.e., subjective norm) was the second greatest predictor of parental intent to support engagement with video games. This is consistent with previously published research indicating that the subjective norm is an important factor in predicting parental intentions (Bourgonjon, Valcke, Soertaert, Wever, & Schellens, 2011). Perceived behavioral control was not significant, indicating that parents have little to no concern that they would have difficulty controlling their child's video game play.

Clinical Implications

Video gaming is a motivating activity for children with ASD and one that parents appear to support. Parental support is critical to service provision in the school setting. Parents and professionals must collaborate to establish the intervention goals outlined in the child's Individualized Education Plan (34 C.F.R. § 300.300). Many of the factors that affect parental support of intervention practices have been identified (Carlson et al., 2013). Several of these factors are directly related to parental attitudes and perceptions about the intervention practice in combination with their assessment of the unique needs of their child with ASD. Therefore, understanding the preferences and perspectives of parents will facilitate the decision-making process about clinical practices in the school environment.

Based on the data from the current project, parents would likely support the use of video games as a context for teaching new skills to children with ASD in intervention. Published literature, however, indicates that video games are not currently being used for this purpose (Williamson, 2009). It is possible that the climate regarding the use of video games and novel technology in education intervention has evolved more quickly than new research has been published. The accessibility of a variety of new technologies and video games in the form of smartphone and tablet applications is rapidly changing. As a result, more educators and SLPs may use this type of tool in one form or another than the published literature suggests.

The data from the current project indicate children with mild and moderate forms of ASD play video games regularly. The majority of the children for whom information was reported in the current project had diagnoses of autistic disorder, Asperger's syndrome, and PDD-NOS (see Table 3). However, these diagnostic categories have been removed from the current classification system (DSM-5; American Psychiatric Association, 2013), and children with an ASD diagnosis are now classified by severity (i.e., Level 1, 2, or 3). This change should not immediately affect the clinical utility of the data presented in this article. Clinicians should consider, however, how changes in the diagnostic classification of ASD affect their ability to apply research evidence reported for individuals diagnosed using other criteria. As children with ASD diagnosed using the DSM-5 begin to become a larger part of school-based clinical caseloads, the children in the current study classified as having "mild" ASD (or Asperger's syndrome) may no longer have ASD diagnoses. These children may have diagnoses such as social communication disorder or may not be identified as having a disability at all. It would be interesting to consider the use of video games clinically with a broader range of children, particularly considering the dynamic nature with which diagnosis and subsequent labels are provided.

Regardless, incorporation of video games into intervention for children with ASD is worth consideration. Access to a variety of technologies is more prevalent than at any other period in history. According to the Electronic Software Association (2013), the average U.S. household owns at least one dedicated video game console, personal computer, or smartphone. Therefore, many children with and without ASD in the school context will have some background knowledge of video games to bring to the therapeutic learning environment.

Limitations

The results of this study should be interpreted with the consideration of several limitations. This study is not representative of all parents of 8- to 12-year-old children with ASD. First, the individuals who participated were self-selected; therefore, parents of children who play video games may have been more likely to take the survey than parents of children who do not play video games. Second, boys and Caucasian individuals are overrepresented in the sample of participants. As a result, the findings from the current investigation may be more applicable to boys. Traditionally, more boys than girls have played video games (Lucas & Sherry, 2004); however, more recent statistics suggest that the number of girls playing video games is increasing (Electronic Software Association, 2013). More investigation of the perceptions of parents of girls with ASD is warranted to better determine if differences exist based on the gender of the child with ASD. Third, the children with ASD had predominately autistic disorder,

PDDNOS, and Asperger syndrome diagnoses. Individuals with these diagnoses tend to experience milder ASD symptom involvement, and therefore, the data are not representative of the experiences and attitudes of parents with children with ASD across the spectrum. Fourth, information gathered about ASD diagnosis and severity of ASD symptoms was based on parental report and was not externally validated. Parents were not required to provide official documentation of the child's ASD diagnosis to participate and were not asked to provide information regarding the specific procedures or criteria (e.g., DSM-IV-TR or educational definitions) used to determine their child's ASD eligibility and severity. This is an inherent limitation of the online survey methodology used in this study. Hence, it should be considered in interpreting the results because it may be difficult to compare the results from the current investigation to the results of others studying individuals with mild and moderate forms of ASD. Finally, the questions contained in the survey were constructed based on recommendations regarding questionnaire development published by Fishbein and Ajzen (2010), who originally proposed and confirmed the theory of planned behavior. Despite this, the way the questions were written may have introduced bias in the direction of favorable ratings for video games as the questions were stated positively, and negative and neutral questions were not included.

Directions for Future Research

The most salient direction for future research is to evaluate whether video games are an effective intervention for ASD symptoms such as social skill development or other positive educational and therapeutic outcomes for children with ASD. Future research should assess parental intent to support video game play in these contexts specifically, although there is no reason to believe that parents who support engagement with video games at home would not be supportive of engagement with video games in the classroom or therapy settings. This work should also extend to teachers and SLPs to determine the factors that influence their decision to incorporate video games into the classroom and therapeutic settings. Future research could extend the results of the current study by comparing parental support as measured using the theory of planned behavior to other models. Future studies could also potentially use a more comprehensive theory of planned behavior questionnaire to increase the value of R^2 .

Conclusions In conclusion, children with ASD play video games in a similar manner to their typically developing peers. Further, this application of the theory of planned behavior confirmed that parents of children with mild and moderate forms of ASD appear to support engagement with video games. The parent respondents in this study indicated that video game play was positive for their children with ASD and contributed to their skill development in several areas (e.g., social skills, fine motor skills, language skills, reading and writing, and critical thinking). Parents of children with ASD indicated that they intended to continue supporting the video game play of their child with ASD in the future and perceive social support for their child's engagement with video games.

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