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Video games from the perspective of adults with autism spectrum disorder

Micah O. Mazurek [a,*], Christopher R. Engelhardt [a], Kelsey E. Clark [b]

[a] University of Missouri – Columbia, Department of Health Psychology and Thompson Center for Autism and Neurodevelopmental Disorders, 205 Portland Street, Columbia, MO 65211, United States
[b] University of Missouri – Columbia, Department of Psychological Sciences, 210 McAlester Hall, Columbia, MO 65211-2500, United States

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ABSTRACT

Individuals with autism spectrum disorder (ASD) experience significant challenges in community engagement and social activities, yet they have strong interests in video games. Thus, there has been increasing interest in understanding potentially positive and negative effects of video games in this population. However, research has not yet examined the perspectives of individuals with ASD themselves on this topic. The purpose of this study was to use qualitative methods to examine the preferences and motivations for video game play among adults with ASD. Individual interviews were conducted with 58 adults with ASD, and responses were coded through an iterative and collaborative process. Several themes were identified, including perceived benefits of video game use (e.g., social connection, stress reduction) as well as perceived negative effects (e.g., time use, addictive potential). Participants also noted both positive and negative aspects of game design that affect their overall enjoyment. The most frequent all-time favorite video game genres were Role-Playing (31%) and Action-Adventure (19%). These qualitative findings enhance our understanding of video game use from the direct perspectives of individuals with ASD, and suggest a need for incorporating these perspectives in future quantitative studies on positive and negative aspects of game use in this population.

1. Introduction

Individuals with autism spectrum disorder (ASD) experience primary difficulties with social impairment and repetitive or restricted behaviors (American Psychiatric Association, 2013), leading to ongoing functional difficulties across the lifespan (Howlin, Goode, Hutton, & Rutter, 2004). For example, adults with ASD are at risk for poor social and occupational outcomes (Billstedt, Gillberg, & Gillberg, 2005, 2011; Eaves & Ho, 2008; Engstrom, Ekstrom, & Emilsson, 2003; Henninger & Taylor, 2013; Howlin et al., 2004; Levy & Perry, 2011), experience high rates of anxiety and depression (Gillott & Standen, 2007; Joshi et al., 2013; Mazefsky, Folstein, & Lainhart, 2008; Moseley, Tonge, Brereton, & Einfeld, 2011), and have difficulties engaging in day-to-day community and social activities (Muller, Schuler, & Yates, 2008). Many adults with ASD also find social interactions to be over-stimulating and anxiety-provoking (Bellini, 2006; Dalton et al., 2005; Joseph, Ehrman, McNally, & Keehn, 2008), and may experience loneliness and a sense of isolation as a result of these difficulties (Bauminger, Shulman, & Agam, 2003; Mazurek, 2014; Muller et al., 2008).

Despite their limited engagement in social and community activities, many individuals with ASD seem to have strong interests in video games (Mazurek, Shattuck, Wagner, & Cooper, 2012; Mazurek & Wenstrup, 2013; Mineo, Ziegler, Gill, & Salkin, 2009; Orsmond & Kuo, 2011). Previous studies found that children and adolescents with ASD spent more than two hours playing video games per day (Mazurek & Engelhardt, 2013b; Mazurek & Wenstrup, 2013). Moreover, children with ASD spent more time playing video games per day than typically developing (TD) children (Mazurek & Engelhardt, 2013b), TD siblings (Mazurek & Wenstrup, 2013), and those with other disabilities (Mazurek et al., 2012).

Because individuals with ASD have strong interests in video games, autism researchers have been increasingly interested in examining the effects of video game use. With regard to potential

Abbreviations: ASD, autism spectrum disorder; TD, typically developing; *M*, mean; SD, standard deviation.

* Corresponding author. Tel.: +1 573 884 5451; fax: +1 573 884 6421.
E-mail addresses: mazurekm@missouri.edu (M.O. Mazurek), EngelhardtC@health.missouri.edu (C.R. Engelhardt), kecnz2@mail.missouri.edu (K.E. Clark).

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benefits, many researchers have focused on developing applications of game technology for improving social and behavioral outcomes in individuals with ASD (Durkin, 2010; Ferguson, Anderson-Hanley, Mazurek, Parsons, & Warren, 2012; Grynszpan, Weiss, Perez-Diaz, & Gal, 2014; Moore & Taylor, 2000). In contrast, others have focused on understanding potentially negative consequences of video game play in individuals with ASD, including pathological game play (Mazurek & Engelhardt, 2013b; Mazurek & Wenstrup, 2013), problem behaviors (Engelhardt & Mazurek, 2014; Mazurek & Engelhardt, 2013a), and sleep problems (Engelhardt, Mazurek, & Sohl, 2013). Despite this increased interest in understanding both positive and negative video game effects, many unanswered questions remain. For example, motivations for game play in this population are virtually unknown. A better understanding of these motives could directly inform targeted interventions and could elucidate the mechanisms underlying problematic game play in individuals with ASD.

One potential reason why individuals with ASD may have pronounced interests in video games is that such games offer visually stimulating virtual environments, which may provide individuals with ASD opportunities to utilize their visual processing skills and preferences. Consistent with this idea, many individuals with ASD have strengths in visual-spatial reasoning skills (Shah & Frith, 1993), attention to visual detail (Jolliffe & Baron-Cohen, 1997; Pellicano, Maybery, Durkin, & Maley, 2006), and visual pattern recognition skills (Stevenson & Gernsbacher, 2013). Individuals with ASD also respond positively to (and show preference for) visually-based information (Charlop-Christy, Le, & Freeman, 2000; Mineo et al., 2009; Nally, Houlton, & Ralph, 2000; Shane & Albert, 2008). Because video game play often requires visual-spatial skills and immediate attention to visual cues, video games may be inherently rewarding for individuals with visual strengths.

Other aspects of game design may also be especially attractive for individuals with ASD. For example, most video games provide a well-defined structure and framework, while simultaneously offering players imaginative experiences. Thus, they may appeal to the desire for fantasy, while not requiring self-generative imaginative play skills (an area of difficulty for many individuals with ASD (Jarrold, Boucher, & Smith, 1993)). Additionally, video games provide the player with opportunities for mastery, achievement, and in-game rewards (Olson, 2010). Video games are often designed to provide clear visual and/or auditory cues, clearly defined expectations, and immediate and frequent reinforcement for in-game behaviors. Because individuals with ASD often experience executive functioning difficulties (Rosenthal et al., 2013), these game features may provide in-game structures and supports that offset those weaknesses. Finally, video games are also much more predictable and controllable than real-world interactions and activities, which may appeal to individuals with ASD who have strong preferences for routine, predictability, and repetition.

Although researchers have long speculated about the motivations for game play among individuals with ASD, studies have not yet sought to solicit perspectives of individuals with ASD themselves. Whereas a few studies have focused on the perspectives of individuals with ASD in general (e.g., see Carrington & Graham, 2001; Howard, Cohn, & Orsmond, 2006; Hurlbutt & Chalmers, 2002; Jennes-Coussens, Magill-Evans, & Koning, 2006; Muller et al., 2008; Trembath, Germano, Johanson, & Dissanayake, 2012), none have focused on video games specifically. Researchers have not yet examined what individuals with ASD like about video games, what they dislike, or their gaming motivations. There is increasing interest in designing new game-based tools for supporting individuals with ASD (Grynszpan et al., 2014), and knowledge gained from individuals with ASD themselves may help guide those efforts. It is critically important for researchers to solicit and understand the perspectives of individuals with disabilities themselves, and to incorporate those perspectives into ongoing research (Kramer, Kramer, García-Iriarte, & Hammel, 2011; Meyer, Park, Grenot-Scheyer, Schwartz, & Harry, 1998; Ward & Trigler, 2001).

1.1. Current study

The goal of the current study was to examine the preferences and motivations for game play among adults with ASD. Qualitative methods were chosen due to their advantages in providing direct insight into the thoughts and feelings of participants. Because previous qualitative research among individuals with ASD has found that the focus group format may be problematic for individuals with ASD due to their social and communication challenges (see Hedges et al., 2014), individual interviews and structured questions were used (for a review of this issue, see Cheak-Zamora & Teti, 2014). This approach was chosen to provide a rich understanding of the motives for game play and of both positive and negative aspects of game use in the lives of adults with ASD.

2. Methods

2.1. Participants

Participants included 58 adults with ASD participating in a larger study focused on video game effects (details described in Engelhardt, Mazurek, Hilgard, Rouder, & Bartholow, in press). Two individuals with ASD participated in the larger study but did not participate in this qualitative sub-study. One of these participants elected to terminate the larger study prior to qualitative data collection, and the other did not complete the sub-study because the experimenter inadvertently ended the study visit before conducting the qualitative interview. Recruitment was conducted through an academic medical center in the midwestern United States specializing in diagnosis and treatment of ASD. Participants had been previously diagnosed with ASD based on the center's clinical care model, which includes a diagnostic battery conducted by a physician and/or psychologist and the use of standardized diagnostic tools, such as the Autism Diagnostic Observation Schedule (Lord, DiLavorne, & Risi, 2002) and/or the Autism Diagnostic Interview – Revised (Lord & Rutter, 1994).

Participants ranged in age from 17 to 25 ($M = 20.5$, SD = 2.0), and Full Scale IQ scores ranged from 82 to 127 ($M = 103.0$, SD = 10.9). The majority of the sample was male (86.2%) and Caucasian (86.2%). Most participants reported living with parents (81%), with remaining participants living with other people (e.g., partner, roommates, etc.). Most participants (89.8%) were not currently in a romantic relationship. The majority of participants had completed at least a high school education (41.4%) or greater (34.5%). However, a substantial percentage (25.9%) was neither employed nor currently attending school. Participants reported playing video games for an average of 2.4 h (SD = 2.1) per typical weekday and 3.5 h (SD = 2.3) per typical weekend day.

2.2. Procedures

Following completion of the laboratory visit (described in Engelhardt et al., in press), participants were interviewed using a standard set of four questions about video game use: *"Why do you play video games?" "What is your all-time favorite video game?" "What did you like about your all-time favorite game?"* and *"What do you dislike about video games?"* Verbal responses were immediately recorded in writing by the interviewer, and these responses were analyzed by all members of the research team.

2.3. Qualitative data analysis

An iterative and collaborative process was used to analyze data through multiple phases of discussion, coding, categorizing, theme development, and review. First, all three team members independently reviewed the responses and formulated initial impressions of the data and initial codes. Then, the team met to discuss and to compare and contrast initial impressions of thematic categories. The team then came to consensus on a preliminary structure of primary themes. Each team member then independently coded all responses according to this structure. Finally, the team met two more times to review discrepancies and to come to a consensus on the final coding scheme.

Each game title was categorized into mutually exclusive game genres. Genres were obtained from the Entertainment Software Rating Board website, and were cross-referenced with descriptions from two popular gaming websites (*Gamespot* and *IGN*). Although each game was categorized into a single best-fitting genre category, some games contain elements from multiple genres. Resulting genre categories included: (1) Action-Adventure, (2) Action-Role-Playing/Role-Playing, (3) Fighting, (4) Music, (5) Platform/Party, (6) Puzzle, (7) Racing, (8) Sandbox, (9) First-Person Shooter, (10) Simulation, (11) Sports Simulation, and (12) Strategy

3. Results

3.1. Reasons for video game play

Analysis of the responses to the question "*Why do you play video games?*" yielded 11 separate themes, each of which is described in detail below.

3.1.1. Stress relief

Stress relief was reported to be an important reason for video game play by many participants (22 men). Several observed that playing games helped distract them from the worries and concerns associated with everyday life. For example, one participant noted that he plays games because "life is stressful," while another noted that games allow him to "escape the stresses of life." This theme was echoed by several other participants, with nine individuals specifically using the term "stress" in describing their reasons for play.

Several other respondents described mood and anxiety management as being a primary motivator for game play. For example, one participant noted that he plays video games to "try to get [his] mind off stuff or when [he is] flustered [by] work, friends, home, or stuff that upsets [him]." Another participant noted that playing video games "distracts from negative emotions that [he has]," and another participant expressed a similar feeling, noting that games "help [him] cope." Similarly, another young man reported when he is "upset or anxious," playing video games "helps take [his] mind off problems and helps [him] calm down and avoid thinking of stressful things."

3.1.2. Fantasy/Immersion

A closely related theme for many participants (16 men, 4 women) was the idea that video games allow the user to escape reality and become immersed in a different world. Although this idea may be closely tied to the need to escape daily stressors, many individuals also expressed that the fantasy or immersion element of video game play is particularly compelling. For example, one young man noted that he enjoys video games because they allow him to "do things [he] can't do in real life," with several others reporting nearly identical reasons. Another participant reported feeling that he is "in a different world" when playing games. Others expressed similar feelings about "escap[ing] from reality" and the ability to "see new worlds" or be "transport[ed] to different places." For some participants, the opportunity to play the role of a character in the game was important. For example, one participant noted the he does not "stand out much in real life, so that's why [he] enjoy[s] playing the hero." Another individual noted that he enjoys playing "as a character in a movie."

3.1.3. Filling time

For a number of individuals (19 men, 1 woman), video games appear to serve the purpose of filling time. Participants noted that games help "kill time," "pass a boring day," and can be a "good time waster." In expanding on this theme, there appeared to be an underlying sense of lack of productivity for some participants. For example, one participant described games as "an activity [I] can do," while another noted that "efforts into [other] endeavors [are] non-productive." Several participants (8) noted that video games give them "something to do" and several other participants (4) used the phrase "pass the time" to describe reasons for game play.

3.1.4. Social

A portion of participants (9 men, 3 women) cited social interaction as an important reason for video game play. For example, one woman noted that video games allow her to "play with friends [she doesn't] get to see" and another said she does not "normally get out and about and [has] no friends outside the video games." She added that she likes to "play online to interact with people other than [her] parents." Others observed that video games provide a shared activity that can be enjoyed with friends. For example, one individual said that games allow him to "play with friends and talk to them" and another noted that if he "had a friend over, [he] could actually have fun with them" while playing video games. Another indicated that video games help foster interactions with family members, noting that games are "one of the few ways [he] can socialize with [his] little brother."

3.1.5. Compulsion

Several participants (7 men) described their game play as being compulsive. One young man noted that although games are fun, his "OCD and routines keep [him] playing them" (note, we assumed that the participant used the term "OCD" to refer to obsessive–compulsive disorder). Another said he feels compelled to play because "if you spend a lot on a system you must play it to avoid feeling guilty." One man "worried that [he] is becoming addicted" to playing games, and went on to add that his parents have needed to hide his video game controls. Another expressed a similar feeling that games "can get addicting" and another young man said he "used to be addicted to them and would not go outside."

3.1.6. Themes related to enjoyment of game play and design

Not surprisingly, a majority of respondents (28 men, 7 women) indicated that they played video games because they are "fun" and entertaining. Their elaborations provided insight into the reasons they found games to be fun.

3.1.7. Achievement/Challenge

Many participants (11 men) described achievement and challenge as being enjoyable aspects of game play. One said he likes to "challenge [him]self," another reported that he "like[s] to keep [his] brain challenged," and three others specifically noted challenge or competition as motivators. Another participant reported that he enjoys achievements within the game, and that he likes to "try to get a 100% in completion," while another participant noted that he likes to "try to get all the achievements." The term "achievements"

within this context refers to specific, often optional, goals or objectives within a game that are not required for game completion, but that offer additional "badges" or in-game rewards.

3.1.8. Autonomy/Creativity

The second most commonly reported theme related to game play and design was the idea that video games provide a sense of autonomy and an outlet for creativity (6 men, 3 women). One participant noted that she "like[s] making stuff in games like *Sims* or *Minecraft*." Another observed that "video games are a creative outlet" and that she "enjoy[s] customization" within role-playing games. Interestingly, another participant reported that playing video games "increases [his] imagination."

3.1.9. Story

Several individuals (8 men, 1 woman) described the video game story as a compelling reason for play. For example, one person indicated that video games can be "like reading a book." Several others reiterated enjoyment of storytelling elements, noting that they "like the story," "enjoy a good story with commentary on certain issues," "like a good story," enjoy "adventure and fantasy" story elements, and enjoy " in-depth stories" and a series of stories.

3.1.10. Graphics

Other participants (5 men, 2 women) described the game design graphics and imagery as important reasons for play. For example, one participant noted that he "like[s] the images and graphics," and two other young men and one young woman specifically reported enjoying "graphics" within their games. Additionally, one woman noted "art design" and another found "nature scenes" to be an enjoyable game element.

3.1.11. Mental stimulation

Some participants (7 men) reported that they enjoy the mental stimulation of game play. One young man reported that he plays games because they "stimulate your mind," another noted that games "keep [him] productive" and "get [his] brain moving," while a third observed that games "allow you to think in different ways."

3.2. Dislikes

Analysis of the responses to the question *"What do you dislike about video games?"* yielded 8 separate themes (see Table 1).

3.2.1. Game features

Many participants (17 men, 2 women) reported disliking particular game features and formats. Among these features were "first-person" perspectives and motion controls. One participant noted that game controls associated with first-person perspective character movement were problematic, particularly "movement sensitivity and inversion looking." Another reported similar concerns about motion control in real-time strategy games. Several people cited "glitches" or technical problems with the games themselves, and similar dislikes included "glitches and poorly-made games," poor graphics, and games that "take too long to load." Other negative game design features included time limits and games that do not automatically save progress. One young man reported disliking video aspects of game designs, particularly when "cut scenes [are] too long" and when "voices don't match lip movements in the game." Another participant reported disliking games that "limit [him]" by not allowing open-world exploration. Similar concerns were noted by another young man who noted that he does not like it "when a storyline forces you to go one way or another."

3.2.2. Negative social

Apart from elements inherent in the games themselves, a number of participants (11 men) expressed concerns about negative social interactions that occur within the context of online video games. For example, one individual noted that "other players frustrate [him] in multiplayer games." Other people noted concerns about the actions of other players. One participant explained that "the community can be bad because of anonymity." Another player specifically reported disliking "noobs" in video game chat-rooms (a term used to describe players who are new or unskilled at a particular game). Other participants expressed concerns about the use of foul language (e.g., "online cussing" and "swearing"). A number of participants noted specific negative online interactions with other players, including "insulting messages," "people criticizing [his] game play," "arguing with other players," and players "talking trash through microphones."

3.2.3. Violence

Another frequently expressed concern related to the amount of violence that is depicted in many video games. This concern ("violence") was specifically expressed by 10 participants (7 men, 3 women). One player also added that he dislikes "violent games that go against the Bible."

3.2.4. Difficulty

Although some participants reported that they enjoy challenging aspects of games, a number of participants (7 men, 2 women) noted that excessive game difficulty can be a negative quality of games. Participants reported disliking the "stupid hardness" and "unrealistic difficulty" of some games. One young man noted that he becomes frustrated "when levels get harder and harder" and another reported finding some games "needlessly frustrating."

3.2.5. Addictive qualities

Similar to a theme previously described, several participants (8 men) noted that they dislike the "addictive" qualities of some video games. Several expressed concerns about losing track of time while playing. For example, one young man reported that video games "can become so addictive that we lose track of time" and

Table 1
Perceived positive and negative aspects of video games (Most to least frequent).

Positive aspects	% of Respondents	Negative aspects	% of Respondents
Entertainment/Thrill	60.3	Negative game features	32.8
Stress relief	37.9	Negative social	19.0
Fantasy/Immersion/Escape	34.5	Violence	17.2
Filling time	34.5	Difficulty	15.5
Positive social	20.7	Addictive qualities	13.8
Achievement/Challenge	19.0	Developer critiques	13.8
Autonomy/Creativity	15.5	Sexual content	8.6
Story	15.5	Physiological response	5.2
Graphics	12.1		
Mental stimulation	12.1		

another reported that he does not like "getting sucked in and losing track of time." Others expressed different aspects of addiction, noting that "you have to sit and play them and they keep you from doing things you need to do" or that you "waste time playing video games that could be spent with family or doing other things."

3.2.6. Developer critique

Interestingly, a number of participants (7 men, 1 woman) expressed specific criticisms of game developers. One young man observed that he feels that video games are now "business more than art" and another expressed a similar sentiment, noting that he dislikes "companies trying to cash in." Another participant expressed the belief that the "creators disregard users in sequels." One man noted that he dislikes when the developers "treat [him] like an idiot and repeat things" and when there is a "lack of effort put into the game."

3.2.7. Sexual content

Another content-related concern voiced by some participants (3 men, 2 women) was the amount of sexual content within video games. One young man noted that he does not like "objectifying women" in games, and a young woman noted that she dislikes "double standards in games" related to women (e.g., "women in skimpy clothing"). Another young woman noted that she specifically dislikes the amount of "nudity" in some video games.

3.2.8. Physiological response

A few participants (3 men) reported physical reactions as a negative feature of video game play. One noted that games "can give [him] headaches," and another also noted that games "can hurt [his] eyes and make [him] have headaches." Another individual observed that playing video games "can make you feel blah after a while."

3.3. Favorite game genre

Finally, participants were asked: "*What is your all-time favorite video game?*" and "*What did you like about this game?*" Genre categories and most frequent game titles by genre are presented in Table 2. In examining responses to the question, "*What did you like about this game?*" it was apparent that responses were highly idiosyncratic even within the same genre category and could not be easily grouped into coherent themes. As a result, exemplars of reasons for liking each game category are provided in Table 2 rather than grouping by thematic group.

4. Discussion

Previous research has demonstrated that individuals with ASD have strong interests in video games (Kuo, Orsmond, Coster, & Cohn, 2014; Mazurek & Wenstrup, 2012). As a result, there has been a growing interest in understanding the positive and negative aspects of game play in this population (Ferguson et al., 2012; Mazurek & Engelhardt, 2013a; Whyte, Smyth, & Scherf, 2014). This study represents the first examination of these topics among adults with ASD. Importantly, positive and negative aspects of game play were understood from the direct perspectives of adults with ASD themselves.

4.1. Positive and negative aspects of game design

Not surprisingly, *Fun/Entertainment* was the most common motivation for video game play. Related to this theme, adults with ASD reported a number of different game features that relate to their overall enjoyment. These included designs emphasizing achievement and challenge, allowing for creativity or autonomy, containing interesting story elements, and emphasizing visual graphics or artistic elements. Similarly, many individuals described these features when explaining reasons for liking their all-time favorite games, using terms such as "challenging," "graphics" and "story" to describe enjoyable game design aspects across game genres (Table 2).

These themes are not dissimilar from those reported by gamers without ASD (Hilgard, Engelhardt, & Bartholow, 2013; Przybylski, Rigby, & Ryan, 2010; Sherry, Lucas, Greenberg, & Lachlan, 2006; Yee, 2006a). In fact, many of these specific themes are highly consistent with previous theoretical models for video game motivation. For example, the *Achievement/Challenge* theme fits well within the Self-Determination Theory (SDT) approach to game motivation, particularly within the "competence" domain (Przybylski et al., 2010). The *Achievement/Challenge* and *Mental Stimulation* are also consistent with the Uses and Gratifications Theory as it has been applied to video game use, particularly within the "challenge" and "competition" categories (Sherry et al., 2006), and with the over-arching motivational category of "achievement" as described by Yee (2006b). These shared themes indicate that adults with ASD may respond to game elements in very similar ways to adults without ASD.

Although challenge and difficulty were perceived positively by some participants, others were frustrated by excessive difficulty. Other game design elements that contributed to worse user experiences included technical problems, glitches, poorly designed graphics, and movement control difficulties. Content-related issues, specifically violence and sexual content, were also perceived negatively by several participants. In fact, relatively few participants listed First-Person Shooter or Fighting games as among their favorites. In contrast, prior studies in the general population have found Shooter games to be among the most popular game genre among adolescents (Floros & Siomos, 2012) and adults (Elliott, Golub, Ream, & Dunlap, 2012), with *Call of Duty: Advanced Warfare* (a First-Person shooter) topping the NPD Group's (formerly National Purchase Diary) list of top-selling video games of 2014 (Kain, 2015).

4.2. Video games as tools for stress reduction, escape and diversion

A second major theme that emerged from the current study is that video game play provides relief from anxiety and stress for many individuals with ASD. In fact, 38% of the sample specifically expressed this stress-reduction motivation theme. Individual responses also revealed that many participants experienced a significant amount of daily stress, and that they found some degree of solace or escape through video game play. The idea of distraction from problems appeared to be closely related to this, with many individuals noting that video games provided a temporary escape. These findings are consistent with those of a previous qualitative study of anxiety in 11 young adults with ASD. Although the study focused on anxiety, computer games were specifically mentioned by at least two participants as being favorite anxiety-reduction strategies (Trembath et al., 2012). Our findings are also consistent with the fact that anxiety is highly prevalent among adults with ASD (Gillott & Standen, 2007; Joshi et al., 2013; Mazefsky et al., 2008; Moseley et al., 2011), and suggest that video games are often used to cope with that distress.

Related to the theme of temporary escape from stress, many participants also desired escape from reality. The *Fantasy/Immersion* theme was voiced by over one-third of participants, who appeared to enjoy a range of different aspects of fantasy. These included the opportunity to play the role of a character, to do things that are not possible in real life, and to be transported into new and different worlds. This theme has been identified as a primary game play motivation domain in studies

Table 2
All time favorite game.

Game genre	% of Respondents	Most frequent game title by genre (number reporting)	Example reasons for liking game
Role-playing, action-role-playing	31.0	*World of Warcraft* (3)	"Never ends…something else to do in terms of plot lines" "Never fails to give [me] something to do and help"
		Tales of series (2)	"Story and characters – character's personality – can relate to them"
		The Elder Scrolls V: Skyrim (2)	"Huge world that's open… can go anywhere, different paths and characters to play as, good environmental graphics" "Quests, powers, upgrades… so many things to do"
		Final Fantasy series (2)	"Could choose different characters"
		Kingdom Hearts series (2)	"Graphics, game play, storyline"
		Pokémon series (1)	"Endless game…community is getting bigger and bigger"
		RuneScape (1)	"Interact with other people…gave [me] something simple to do"
		Super Mario RPG: Legend of the Seven Stars (1)	"Atmosphere, ambience, music, graphics… turn-based system"
		Paper Mario (1)	"Challenges, humor, and gags…nice blend of action and adventure"
		Dark Souls (1)	"Enemies…environments and background are cool; game is linear but never feels linear"
		Persona 3(1)	"Gripping story"
		Legend of the Dragon (1)	"Level-ups"
Action-adventure	19.0	*Zelda series* (5)	"Great story and good game play" "Music, graphics… game environment"
		The Last of Us (1)	"Game play with innovative and the story was beautifully done… easily to relate to characters"
		Harry Potter series (1)	"Engaging and has really cool graphics"
		Grand Theft Auto series (1)	"Could take vehicles… make cars fly"
		Zombies Ate my Neighbors (1)	"No particular reason"
		Metroid Prime (1)	"Really cool… open world adventure game… liked being alone in the game and exploring"
		Batman: Arkham City (1)	"Can fight a lot of bad guys whenever you want"
Platform/Party	8.6	*Sonic the Hedgehog series* (2)	"Love the hero of the game… he has friends who help him face challenges"
		Super Mario 64 (1)	"Challenging…enjoyed skill and challenge it took"
		Mario Party series (1)	"Multiplayer and play with friends in same room"
		Crash Bandicoot series (1)	"Challenge and nostalgia of the game"
Shooter	6.9	*Call of Duty series* (2)	"Challenging…like the in-game weapons"
		Star Wars: Battlefront (1)	"Fun to play…challenging with friends"
		BioShock series (1)	"Can have four different guns and special powers
Simulation	6.9	*Sims series* (2)	"Making families"
		Zoo Tycoon (1)	"Like the animals – over 40 species to choose from"
		Littlest Pet Shop (1)	"Make your own pet shop"
Racing	5.2	*Gran Turismo series* (1)	"Racing simulators based on real life"
		rFactor (1)	"Simulates vehicle dynamics well"
		Star Wars Episode I: Racer (1)	"Graphics…could fly a pod from the… movie"
Strategy	5.2	*StarCraft* (1)	"You can choose 'races' in the game"
		League of Legends (1)	"Lots of different characters to play… can do cool things with teammates"
		Alpha Centauri (1)	"Visuals, audio, extensive art assets and extended quotes"
Puzzle	3.4	*Dig Dug* (1)	"Challenging puzzle game"
		Portal 2 (1)	"Puzzle complexity"
Music	3.4	*Rock Band series* (1)	"Can download 3,000 songs"
		Smule Piano (1)	"Teaches you how to play piano"
Sandbox	3.4	*Minecraft* (2)	"Designed to be modified through code… customizable" "Can build anything – things not possible in real life"
Sports	3.4	*Mario Tennis* (1)	"Enjoyed as a child"
		MLB 2006 (1)	"Like the favorite players from all the different years"
Fighting	1.7	*Super Smash Bros.* (1)	"Graphics and stages look cool… fantasy-like and fast-paced"

of adults in the general population (Sherry et al., 2006; Yee, 2006a, 2006b). The preference for fantasy was also borne out in the types of games preferred by most participants. In fact, participants most frequently reported Role-Playing games (31%) as their all-time favorite games, followed by Action-Adventure (19%); genres typically having prominent fantasy elements.

A number of individuals with ASD reported playing video games in order to fill time, and that they often sense a lack of productivity in their daily lives. This theme is consistent with previous findings that individuals with ASD are often not engaged in productive, community-based activities, and spend less time in such activities than individuals with other disabilities (Mazurek et al., 2012; Orsmond, Shattuck, Cooper, Sterzing, & Anderson, 2013; Shattuck, Orsmond, Wagner, & Cooper, 2011). Because video games involve achievements, tasks, and monitoring of progress, this may provide a sense of competence for individuals who may otherwise struggle with self-directed or self-initiated activities.

4.3. Social aspects of gaming

Given that social impairment is a central feature of ASD (American Psychiatric Association, 2013), it is interesting that twenty percent of participants described *Social Relatedness* as a reason for playing video games. Many reported that games provide a way for them to interact and share enjoyment with both friends and family, offer a shared activity and topic of discussion that is

both socially acceptable and widely enjoyed, and provide a more comfortable venue for interacting with others than other activities. This finding is similar to the findings of a previous study on social media use among adults with ASD, in which many adults noted that social media allowed them to achieve social connection while compensating for their social difficulties (Mazurek, 2013). Because many games offer online multi-player options, this may allow individuals to connect and share enjoyment with others without the difficulties associated with face-to-face social interaction.

This social motivation is shared by video game players without ASD (Przybylski et al., 2010). Previous research in the general population has found that video games also provide a context for social interaction, both directly and through online multi-player options (Griffiths, Davies, & Chappell, 2003; Kolo & Baur, 2004). In fact, many individuals in the general population find online social interaction to be more comfortable and less threatening than offline interactions (Caplan, 2003; Walther, 1996). Online or game-based social contexts offer greater element of control over the social interaction (Walther, 1993; Walther & Burgoon, 1992) and do not require nonverbal social cues such as eye contact, facial expression, and gestures (Walther, 2007). This may be especially appealing to individuals with ASD.

Despite perceived social benefits, a number of participants also expressed concerns about in-game negative social interactions. Examples of such interactions included foul language, insults, and arguments between players. Individuals with ASD may also be at greater risk for online aggression as evidenced by the emerging body of research on cyber bullying among individuals with ASD (Kloosterman, Kelley, Craig, Parker, & Javier, 2013; Kowalski & Fedina, 2011). However, the frequency of such problems in multi-player online game environments is not known.

4.4. Compulsive and addictive aspects of game use

The issue of game addiction emerged both when discussing reasons for game play and negative features of video games. Several participants noted that their game play can be compulsive, that they feel the need to continue playing, and that they feel "addicted." Participants reported a common experience of "losing track of time" and feeling compelled to continue playing to the exclusion of other activities. These observations are consistent with the general construct of behavioral addiction, as well the more specific construct of pathological video game use (Gentile, 2009; Griffiths, 2005, 2008). They also resonate with previous findings that youth with ASD experience greater difficulties with addictive or problematic game play than typically developing youth (Mazurek & Engelhardt, 2013b; Mazurek & Wenstrup, 2013).

Game use for the purpose of stress-reduction and immersion/escape may also relate directly to potential game addiction. For example, game use for the purpose of mood regulation has been linked to pathological game patterns in previous general population research (Mehroof & Griffiths, 2010; Wölfling, Thalemann, & Grüsser-Sinopoli, 2008). There is also evidence of an association between the Role-Playing game genre and pathological game play, both in the general population (Elliott et al., 2012; Lee et al., 2007; Rehbein, Kleimann, & Mössle, 2010; Smyth, 2007) and among individuals with ASD (Mazurek & Engelhardt, 2013a, 2013b). Thus, player characteristics, game genre, and reasons for use may each contribute to the likelihood of addictive patterns of play among individuals with ASD.

4.5. Limitations

The current study had several limitations that should be noted. First, this qualitative sub-study did not include a comparison group of adults without ASD. As such, we cannot directly compare the perspectives of individuals in the current study with perspectives of typically developing adults. Secondly, participants in the study had relatively strong cognitive skills (Full Scale IQ scores ranging from 82 to 127) and verbal abilities, and were able to express their thoughts and perspectives during one-on-one interviews. Thus, we cannot determine the extent to which our findings may or may not generalize to the larger population of adults with ASD, including those with limited cognitive and/or verbal abilities.

4.6. Conclusions and future directions

The current study provided valuable first-person accounts of video game preferences, and revealed preliminary themes regarding motivations for game play. We hope that these qualitative findings will help inform future quantitative research exploring both positive and negative aspects of game use among adults with ASD. These methods were chosen as a way of gaining greater insight into participants' direct experiences and thoughts, and mirror the efforts of other technology-based intervention researchers (Parsons & Cobb, 2013, 2014). Several themes emerged that point to important areas for future consideration. These include the perceived benefits of video game use (e.g., social connection, stress reduction) as well as the perceived negative effects (e.g., time use, addictive potential). These findings are important to consider as the field continues to move forward in developing new game-based interventions for individuals with ASD.

Developers of game-based interventions for ASD are encouraged to take gamer perspectives into account throughout the design and creation process. Technological glitches and inadequate movement controls appear to be particularly unpleasant for individuals with ASD, and may distract players from content or central game features. First-person perspective motion controls also appear to be undesirable for many individuals with ASD. In contrast, game features that may enhance player experiences include a greater emphasis on visual graphics, fantasy or story-based elements, or in-game rewards and achievements. Many participants enjoyed challenge in video games, but were easily frustrated by overly difficult game play. Adaptive game technologies that automatically adjust and tailor game difficulty for each individual player based on their in-game performance would be ideal. These designs could foster competence and mastery, while minimizing frustration. Finally, multi-player or cooperative game play may be helpful in promoting social engagement for individuals with ASD. However, many individuals experienced negative social interactions through existing online multiplayer formats. Developers should consider ways of ensuring safe and positive game communities for individuals with ASD. Options may include access-granting/blocking based on player feedback or other types of game-behavior monitoring.

A second important consideration for the field is that video games may have unintended negative effects for many individuals with ASD. Participants in this study voiced specific concerns about their tendencies to become "addicted" to games, similar to findings of prior research on children and adolescents with ASD (Mazurek & Engelhardt, 2013b; Mazurek & Wenstrup, 2013). This concern should also be taken into account in future game-development research. It is likely that the very same game features that make games attractive and motivating may also contribute to preoccupation (Mazurek & Engelhardt, 2013b; Mazurek & Wenstrup, 2013). Overuse of such media may contribute to health-related effects such as poor sleep (Engelhardt et al., 2013) or reduced engagement in productive or community-based activities (Mazurek et al., 2012). Overall, more research is needed to determine how to leverage the potential benefits of such technology while preventing potential negative effects for individuals with ASD.

Future studies would benefit from both longitudinal and experimental designs in order to better understand these effects within both naturalistic and well-controlled contexts. An additional area for future investigation is the degree to which themes identified in the current study can be useful in informing quantitative research. For example, the current video game preference themes could be used to develop and test a survey intended to measure hypothesized motivational constructs. Parallel analysis and exploratory and confirmatory factor analyses could then be used to determine the number of latent factors supported by the data and number of factors that might be due to noise (e.g., see Hilgard et al., 2013). In addition, it would be helpful to include comparison groups of individuals without ASD to determine the extent to which video game motives and preferences differ across groups.

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