

Influence of adaptive video gaming on quality of life and social relationships

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Introduction

In recent years, the field of adaptive gaming has been growing rapidly. The accessibility of video games has now become a focus for companies and organizations to allow individuals with disabilities to participate more actively in the gaming community. Current adaptive gaming technology not only allows individuals to participate in gaming, but also to play competitively with individuals not using adaptive gaming equipment. Many adaptive video game controllers are now available to individuals with disabilities who are unable to access a standard controller, and range from head-controlled pneumatic joysticks to customizable gaming rigs that enable users to connect external joysticks and accessibility switches. Despite the rising popularity of adaptive gaming, its acceptance as an integral service within the rehabilitation field has been slow to develop.

Research analyzing the benefits of gaming within the rehabilitation field has primarily been focused on its applications in physical therapy [1]. Multiple studies have shown increased functional recovery and motor function following use of off-the-shelf gaming systems for stroke rehabilitation [2]. However, the possible benefits of gaming within the rehabilitation field may range beyond physical benefits alone. Some studies have shown that participation in video gaming has quality of life and social benefits in the general population [3]. Though there has historically been a negative stigma surrounding video gaming [4], there is emerging evidence that it has positive effects on mental health and well-being when used appropriately [5].

In order to progress the acceptance of adaptive gaming as an essential person-centered service in the rehabilitation environment, studies need to demonstrate that it has a significant positive impact on participants. The purpose of this study was to determine the effects of participation in adaptive gaming on quality of life, satisfaction with life, social relationships, and its translation to functional tasks other than gaming. A secondary focus of this study was to analyze how variations in gaming habits influence outcomes among those who participate in adaptive gaming. Overall, this data may show the positive therapeutic benefits of providing adaptive gaming services for individuals in the rehabilitation environment and help increase its acceptance as a rehabilitation service. The secondary analysis may aid in understanding how adaptive gaming should be best implemented in the rehabilitation environment to maximize quality of life and social relationship benefits of individuals participating in those services.

Methods

Participants

Individuals eligible to take part in this study were recruited directly via email, social media, or online adaptive gaming forums. Participants were individuals between 18 to 65 years of age that met the following criteria: (1) must have a physical or neurologic condition limiting them from using a standard game controller; (2) must be currently using adaptive gaming equipment or modifications for video gaming; (3) must have no less than six months of experience using adaptive gaming equipment or modifications.

Survey

Participants were asked to complete a self-administered questionnaire consisting of four parts: (1) General Information and Gaming Habits, (2) Quality of Life, (3) Social Relationships and Social Isolation, and (4) Influence of Gaming on Quality of Life, Satisfaction with Life, and Social Relationships.

General Information and Gaming Habits

The General Information and Gaming Habits section was used to collect demographic data of participants, along with information on gaming behaviors. Age, sex, and primary diagnosis were obtained from the General Information subsection. The Gaming Habits subsection includes questions regarding how long participants have been involved in adaptive gaming, how often participants game each week, what type of gaming they most often take part in, and if they use their adaptive gaming equipment for tasks other than gaming.

Quality of Life Section

The Quality of Life section of the survey contains four questions and is adapted from the Spinal Cord Injury Quality of Life Basic Dataset [6]. The Spinal Cord Injury Quality of Life Basic Dataset is a standardized self-

assessment survey containing three questions asking participants to subjectively rate their general satisfaction with life, physical health, and psychological health in the past four weeks. In addition to these questions, the Quality of Life section includes a question asking participants to rate how satisfied they are with their ability to perform daily activities independently in the past four weeks. Responses were recorded on a 0-10 scale, where 0=Completely Dissatisfied and 10=Completely Satisfied.

Social Relationships and Social Isolation Section

The Social Relationship and Social Isolation section contains four questions, two assessing personal relationships and two assessing social isolation. This section was developed specifically for this study by referencing standardized quality of life questionnaires containing questions related to social relationships and isolation. The Social Relationship subsection consists of two questions asking participants to subjectively rate their satisfaction with personal relationships and ability to participate in activities with friends and family in the past four weeks. Responses were recorded on a 0-10 scale, where 0=Completely Dissatisfied and 10=Completely Satisfied. The Social Isolation subsection consists of two questions asking participants to subjectively rate how often they have felt socially isolated and socially excluded in the past four weeks. Responses were recorded on a 0-10 scale, where 0=Never and 10=All of the Time. Scores for the Social Isolation subsection were inverted during data analysis. Therefore, higher scores reported for the Social Isolation subsection indicate a lower level of social isolation.

Influence of Adaptive Gaming Section

The Influence of Adaptive Gaming section contains three questions and was developed for this study by referencing a previously used survey for adaptive sports [7]. This section asks participants to subjectively rate whether adaptive gaming has had a significant positive influence on their overall quality of life, satisfaction with life, and social relationships. Responses were recorded using a 7-point Likert scale ranging from Strongly Disagree to Strongly Agree, with higher scores indicating a greater influence. This section was used to specifically assess the contribution adaptive gaming has had on participants' quality of life, satisfaction with life, and social relationships.

Data Analysis

In order to identify any significant differences between composite Quality of Life, Social Relationship, or Social Isolation scores among participants of different ages or gaming habits, sample t-tests were used to compare the composite scores between groups. A one-tailed homoscedastic t-test was used to test against the null hypothesis that scores are not significantly greater for those who game more frequently, have gamed for a longer duration of time, participate in gaming with family and friends, use their adaptive gaming equipment for activities other than gaming, and who are younger in age. To determine if there were any significant relationships between gaming habits or age and the overall influence of adaptive gaming on quality of life, satisfaction with life, and social relationships, a Spearman's Rank correlation analysis was performed among variables. The independent variables in the analysis included the length of time participants have been involved in adaptive gaming, how often participants game each week, whether they game with friends and family, whether they use their adaptive gaming equipment for activities other than gaming, and age. P-values were calculated based on a one-tailed distribution to test against the null hypothesis that there is not a significant positive correlation for those who game more frequently, have gamed for a longer duration of time, participate in gaming with family and friends, use their adaptive gaming equipment for activities other than gaming, and are younger in age.

Results

There was a total of 110 respondents who participated in the survey. The average composite

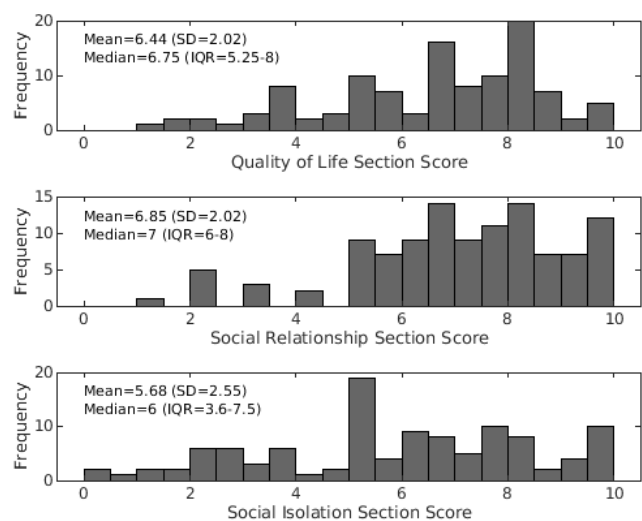


Figure 1. Histograms showing the distribution of composite scores for the Quality of Life Section (Top), Social Relationship Section (Middle), and Social Isolation Section (Bottom). The mean, standard deviation (SD), median, and the interquartile range (IQR) for each section are shown in the upper left corner of each histogram.

score for the Quality of Life section (**Figure 1**) was 6.44 (SD=2.02). The Social Relationship subsection score was the highest of the three composite scores (6.85; SD=2.02), and the Social Isolation subsection score was the lowest of the scores (5.68; SD=2.55). Over ninety percent (90.9%) of participants either Agreed or Strongly Agreed that adaptive gaming has had a strong positive influence on their quality of life, with 71.8% Strongly Agreeing to the statement (**Table 1**). A majority of participants also either Agreed or Strongly Agreed that adaptive gaming has had a significant positive influence on their satisfaction with life (87.3%), and 67.2% of participants either Agreed or Strongly Agreed that it has had a significant positive influence on their social relationships. Two thirds of participants reported using their adaptive gaming equipment for activities other than just gaming (67.3%). This includes using it for computer access (61.8%), phone access or communication (23.6%), TV access (20.0%), and other activities (6.4%). Some of the activities that respondents included in the “Other” category included school, programming, and work.

Table 1. Participant 7-point Likert scale responses rating whether gaming has had a significant positive influence on their Quality of Life (IQoL), Satisfaction with Life (ISWL), and Social Relationships (ISR).

	Strongly Disagree	Disagree	Somewhat Disagree	Neither agree nor disagree	Somewhat Agree	Agree	Strongly Agree
IQoL	1.8%	0%	0%	0%	7.3%	19.1%	71.8%
ISWL	0.9%	0%	0%	1.8%	10.0%	27.3%	60.0%
ISR	1.8%	0%	2.7%	4.6%	23.6%	32.7%	34.6%

There was no statistical difference between any groups for the composite Quality of Life score. For the Social Relationship subsection, individuals who game four or more days per week reported significantly higher scores than those who game three or less days per week ($p=0.007$ (95% CI)), and also reported a significantly lower level of social isolation ($p=0.038$ (95% CI)). Those who reported gaming more frequently with friends and family had significantly higher Social Relationship scores than those who game primarily alone ($p=0.029$ (95% CI)), and individuals who reported using their adaptive gaming equipment for activities other than gaming also had significantly higher Social Relationship scores compared to those who only use it for gaming ($p=0.044$ (95% CI)).

Those who game more frequently were more likely to Agree or Strongly Agree that adaptive gaming has had significant positive influence on their quality of life (+17.0%), satisfaction with life (+18.2%), and social relationships (+10.2%). Furthermore, there was a significant positive correlation between how often participants game and the overall influence of adaptive gaming ($r_s=0.27$; $p=0.002$ (95% CI)). Similarly, those who use their adaptive gaming equipment for activities other than gaming were more likely to Agree or Strongly Agree that it has had a significant positive influence on their quality of life (+11.3%), satisfaction with life (14.1%), and social relationships (+21.5%) compared to those who use it for gaming alone. There was also a significant positive correlation between use of adaptive gaming equipment for additional activities and the composite Influence of Adaptive Gaming score ($r_s=0.21$; $p=0.013$ (95% CI)). For those who game more frequently with family and friends, there was a higher percentage of participants that felt adaptive gaming has had a significant positive influence on their quality of life (+19.8%) and social relationships (+25.4%) compared to those who game primarily alone.

Discussion

Past studies demonstrating quality of life benefits of gaming within the rehabilitation field have had a primary focus on its use as a tool for physical rehabilitation [2]. However, the results from this study illustrate that the use of adaptive gaming in the rehabilitation field spans beyond the physical benefits alone. This is supported by the finding that a majority of participants in this study either Agreed or Strongly Agreed that adaptive gaming has had a significant positive influence on their quality of life, satisfaction with life, and social relationships (**Table 1**).

Beyond providing a means for participation and social interaction, adaptive gaming can also be translational to many functional tasks for daily independence. This is reinforced by the finding that over two thirds of participants in this study use their adaptive gaming equipment for activities other than gaming. Many participants reported using their equipment for computer access, communication, and even vocational or educational purposes. Therefore, adaptive gaming may introduce adaptive equipment in a form that is more motivational to users. This is significant, as a lack of motivation has been shown to lead to an abandonment of assistive technology devices [8]. Users may be more likely to accept and be motivated to use the adaptive equipment if it is introduced for gaming

first. Since adaptive equipment has been shown to be a positive predictor for return-to-work success for individuals with disabilities [9], this may have long term vocational and educational benefits.

Based on the results from this study, there are possible quality of life and social benefits of adaptive gaming services, as well as translation to functional tasks. However, there are important considerations for how to best implement adaptive gaming services, and results from the secondary analysis may yield important information on how to introduce adaptive gaming to participants to maximize the potential benefits and outcomes.

How participants game and use their adaptive equipment seem to be the largest contributors to the potential positive outcomes seen with adaptive gaming. Participants' responses for the Influence of Adaptive Gaming section were found to be highly dependent on the frequency that they game each week. Increased frequency of gaming had a significant positive correlation with the overall influence of adaptive gaming on their quality of life, satisfaction with life, and social relationships ($p=0.002$). Furthermore, those who game more often reported significantly greater Social Relationship scores ($p=0.007$) and a significantly lower level of social isolation ($p=0.038$). Those who tend to game more frequently with family and friends also had significantly higher Social Relationship scores ($p=0.044$). They were also more likely to report that gaming had a significant positive contribution to their quality of life (+19.8%) and social relationships (+25.4%). Therefore, gaming more frequently, and with others, seems to correlate with greater benefits from adaptive gaming. This finding emphasizes the importance of not only introducing adaptive gaming through rehabilitation services, but also providing methods for facilitating more frequent participation in gaming in a group setting. Coordinating community game nights or online gaming competitions are some examples of how this may be effectively implemented in the therapy setting.

The other factor that contributed to the positive effects seen with adaptive gaming is how participants use their adaptive gaming equipment. Use of equipment for activities other than gaming had a significant positive relationship with the overall influence of adaptive gaming ($p=0.013$). These individuals also reported significantly higher Social Relationship scores compared to those who used their equipment for gaming alone ($p=0.029$). Therefore, use of adaptive gaming equipment for tasks other than gaming not only has possible translational benefits, which were discussed previously, but may also correlate with better overall outcomes. This should be taken into consideration when providing adaptive gaming services. Equipment for adaptive gaming should be introduced for other tasks that will increase access and independence, not just be limited to gaming alone. Integration of adaptive gaming into occupational therapy or assistive technology services may be beneficial for this purpose, as gaming may serve as a gateway into other areas for daily independence.

Conclusions

Overall, the results from this study show that there are possible quality of life and social benefits from participation in adaptive gaming, as well as translation to functional tasks. This supports the need for an increase in the availability of adaptive gaming services within the rehabilitation field, as there are clear benefits to providing these services for individuals with disabilities. Secondary analysis from this study also indicates that gaming more frequently, gaming with others, and using adaptive gaming equipment for activities other than gaming seem to correlate with greater overall benefits from adaptive gaming. This provides important implications for the provision of adaptive gaming services to ensure the greatest overall benefit to participants.

References

- [1] Ravenek KE, Wolfe DL, Hitzig SL. A scoping review of video gaming in rehabilitation. *Disabil Rehabil Assist Technol*. 2016;11(6):445-453. doi:10.3109/17483107.2015.1029538
- [2] Primack BA, Carroll MV, McNamara M, et al. Role of Video Games in Improving Health-Related Outcomes: A Systematic Review. *Am J Prev Med*. 2012;42(6):630-638. doi:10.1016/j.amepre.2012.02.023
- [3] Dolatabadi NK, Eslami AA, Mostafavi F, Hassanzade A, Moradi A. The relationship between computer games and quality of life in adolescents. *J Educ Health Promot*. 2013;2. doi:10.4103/2277-9531.112691
- [4] Porter G, Starcevic V, Berle D, Fenech P. Recognizing Problem Video Game Use. *Aust N Z J Psychiatry*. 2010;44(2):120-128. doi:10.3109/00048670903279812
- [5] Halbrook YJ, O'Donnell AT, Msetfi RM. When and How Video Games Can Be Good: A Review of the Positive Effects of Video Games on Well-Being. *Perspect Psychol Sci*. 2019;14(6):1096-1104. doi:10.1177/1745691619863807

- [6] Charlifue S, Post MW, Biering-Sørensen F, et al. International Spinal Cord Injury Quality of Life Basic Data Set. *Spinal Cord*. 2012;50(9):672-675. doi:10.1038/sc.2012.27
- [7] Groff DDG, Lundberg NR, Zabriskie RB. Influence of adapted sport on quality of life: Perceptions of athletes with cerebral palsy. *Disabil Rehabil*. 2009;31(4):318-326. doi:10.1080/09638280801976233
- [8] Phillips B, Zhao H. Predictors of Assistive Technology Abandonment. *Assist Technol*. 1993;5(1):36-45. doi:10.1080/10400435.1993.10132205
- [9] Marini I, Lee GK, Chan F, Chapin MH, Romero MG. Vocational rehabilitation service patterns related to successful competitive employment outcomes of persons with spinal cord injury. *J Vocat Rehabil*. 2008;28(1):1-13