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Prosocial Behavior of Children in Video Games:
Gender, Personality, Sibling Relationships, and Media Exposure

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Introduction

In recent years, the growing popularity of video games among children has garnered widespread attention. According to recent statistics, an estimated 37% of Swedish children between the ages of 5 and 8 engage in gaming activities daily (Swedish Media Council, 2019). As a result, children spend increasingly more time in digital environments, and significant research has been conducted to investigate the impact of video games on childhood development. Concerns regarding the effects of violent video games have resulted in numerous studies demonstrating the link between increased exposure to such games and heightened aggressive behavior (Ferguson, 2015). On the other hand, however, research has also suggested that playing "prosocial" video games can have beneficial behavioral consequences (Harrington et al., 2016).

A prosocial video game is one in which the player must cooperate, collaborate, or help in order to succeed (Harrington et al., 2016). The description for this kind of game is based on the definition of prosocial behavior: cost for self to provide benefit for others (Wittek & Bekkers, 2015). Previous research on prosocial games suggests that engagement may enhance players' sympathy, empathy, and overall prosocial behaviors (Harrington et al., 2016). Additionally, it has been demonstrated that brief exposure to prosocial video games can increase a child's accessibility to increased prosocial thoughts and behaviors (Li et al., 2022). These studies investigated the specific prosocial sub-behavior mutualism. Described as helping others at a cost to oneself but resulting in net benefits for both (Wittek & Bekkers, 2015), games where prosocial behavior is necessary for success fall under this description. While relevant, our study was concerned with a different prosocial sub-behavior: altruism. Unlike other forms of prosocial behavior, altruism encompasses acts that solely benefit others at a cost to oneself. Many believe

that altruism is one fundamental aspect of human sociality and contributes to a more compassionate, cooperative, and inclusive society.

Previous research links factors like gender, personality, family makeup, and media consumption to altruistic behaviors. Studies in the area of gender and altruism have been complex and sometimes contradictory. Some suggest that girls are more likely to engage in sharing behaviors compared to boys, with the explanation that girls prioritize group harmony, whereas boys are more inclined towards personal gain (Burford et al., 1996). Conversely, other studies indicate that male and female individuals may exhibit different levels of altruistic behavior depending on the specific situational context (Andreoni et al., 2001). For instance, females may display greater altruism when the act is costly, whereas males may exhibit more altruism when the price is relatively lower. Additionally, personality traits have been identified as potential predictors of altruistic behavior. Adults with higher levels of agreeableness, conscientiousness, and inquisitiveness have been associated with a greater inclination toward altruism (Furnham et al., 2016). There is, however, very little research between personality traits and altruism in children. Another factor that has been investigated is family makeup. Previous research suggests that children with older brothers tend to exhibit less sharing behaviors (Angerer et al., 2015). Studies conducted on the subject of altruistic behavior and childhood media consumption have resulted in findings varied by medium. It was reported that children who spent more time on the internet or playing games demonstrated less prosocial behavior than those who spent more time watching television (Fitzpatrick & Boers, 2022). However, these findings do not account for the content in any of the mediums examined.

While the aforementioned research laid the foundation for the present study, very little is known about the discussed factors and altruistic behavior in a digital environment. There are

significant gaps in the literature that we hoped to address in our study. Studies pertaining to gender can be limited by binary data. In response to this constraint, we deployed a task that allowed participants to self-identify their gender on a spectrum. Additionally, research that has been conducted regarding personality traits and altruism has been confined to adults. Our study contributes to this field of research by providing data about the relationship between altruism and personality in children. Keeping in mind that the majority of studies address altruism in real-life scenarios, we included a task that engaged real-life sharing in addition to digital sharing so as to provide depth to our collected data and anchor our analysis in previous research.

This research aims to investigate the relationship between self-identified gender, personality, siblings, media exposure, and digital and real-life altruistic behaviors. Prior to this study, there was a predicted correlation between gender self-identification and personality. Additionally, it was expected that there would be a negative correlation between number of siblings, and media-exposure. Finally, it was hypothesized that there would be a positive correlation between resources donated within the digital game context and the real-life context. By addressing these research objectives, a more comprehensive understanding of the individual factors influencing childhood altruism can be achieved.

Method

Participants

The final sample included 8 year old children (N=46; mean age 8.48, SD=0.27). Families were recruited from the Uppsala, Sweden area via telephone and email. Both guardians, and the child, provided consent for participation in the study. All participants were given a 100 kr bookstore gift card. The methods and protocols of the study were conducted in accordance with

the standards specified in the 1964 Declaration of Helsinki and approved by the local ethics committee, the Swedish Ethical Review Authority.

Design

The aim of this study was to examine the relationship between multiple sharing behaviors and various factors. Our independent variables were self-identified gender and personality, and our dependent variables were the number of resources shared in the digital environment of the "Ludum Detector" game and the real-life scenario of the "Dictator Game."

Materials

Gender Task. Participants self-identified their gender through the completion of a digital task built on the Scratch interface developed by the Media Lab at the Massachusetts Institute of Technology. The digital task guided the participant through a series of exercises via audio instructions in Swedish. The task began by explaining that while all people have similarities, they also have differences; everyone is a unique individual. It was then explained that like people, birds also have similarities and differences. The participant was then presented with a spectrum as seen in Figure 1. On one side is a yellow circle that represents "other birds."

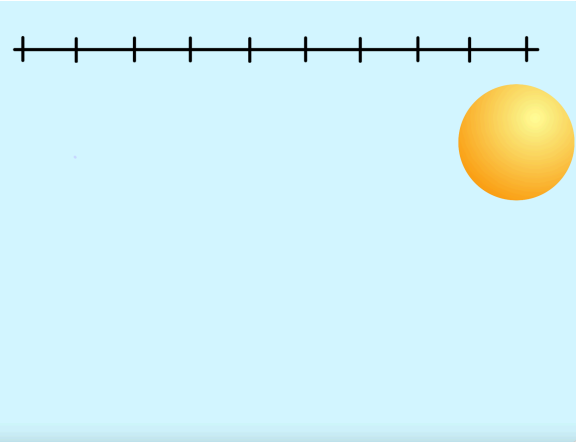

Figure 1. The scale consistently used during the Gender Task.

The participant was then told information about three kinds of birds (crow, peacock, penguin). One at a time, the task's animation placed these birds on the spectrum according to how similar they are to "other birds." After observing the mechanic of placing the birds on the spectrum, the participant was presented with three more birds (pigeon, flamingo, owl) which they were asked to place on the spectrum themselves.

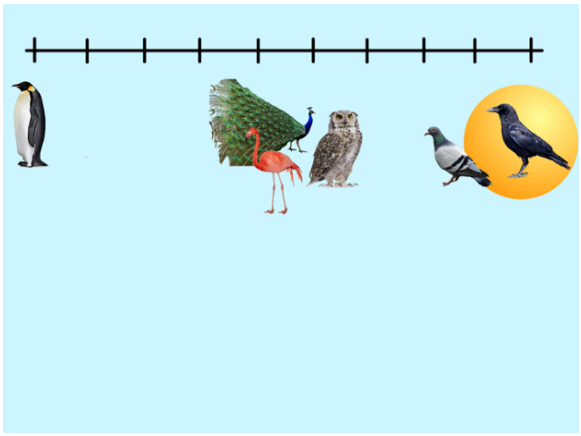

Figure 2. How the spectrum appeared after the task animation placed the first three birds, and the participant placed the other three birds.

This familiarized the participant with the function of the scale and the placement of items on it. The birds were then cleared from the spectrum, but the yellow circle remained. Next, a green circle appeared on the screen, as seen in Figure 3, and it was explained to the participant that this circle represented them.

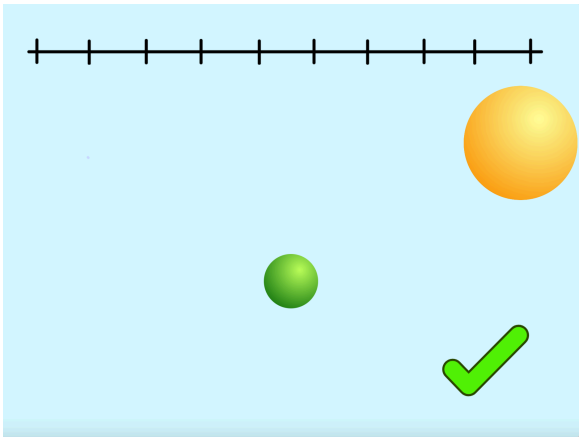

Figure 3. The green circle was a moveable object, and the green check mark allowed the participant to indicate when they were satisfied with their placement and ready to proceed.

Using the mechanics learned during the bird portion of the task, the participant was asked to place the green circle on the spectrum with the yellow circle representing, first, "other children," then, "other girls," and finally, "other boys." The interface remained identical across all three prompts, and participants had unlimited time to make their placements and proceed when they were ready. By using a scale system and asking participants to identify how similar they feel to other children, other girls, and other boys, we collected more nuanced gender identity data that provides an alternative to binary classification.

Ludum Detector Game. The "Ludum Detector" is a video game that was specifically designed for this study using the Unity Engine. The game began on an introduction screen: the participant was "Player 1" and they were playing with "Player 2," however, this other player was fictitious. The object of the game was to earn 100 coins by progressing through a series of 5 rooms. In each room, the participant was instructed to collect an amount of gold rings that corresponded to the level they were on. They were informed that the faster they cleared the rooms, the more coins they would earn; however, the number of coins earned after each level remained consistent across participants and was not impacted by player performance.

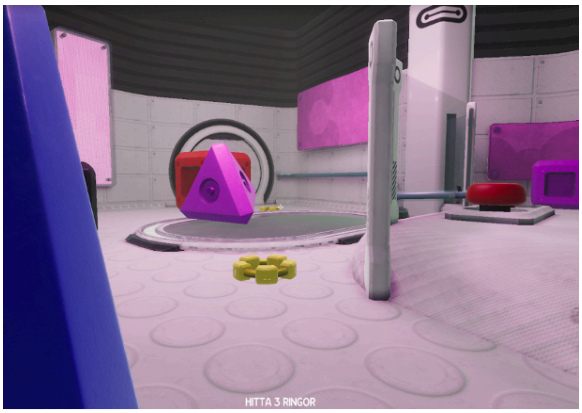

Figure 4. Ludum Detector level 3 room. Image displays the sensor (oblong gray mat), gold rings, red completion button, and randomly generated geometric obstacles.

After completing each room, a "waiting for player 2" message appeared, implying that the invented second player was taking longer to complete the level and would subsequently earn fewer coins. When both players' coins were displayed, "Player 2" consistently scored behind the participant. After completing the second, third, and fourth rooms, participants were presented with a donation prompt. They were told that Player 2 was facing difficulty earning coins, and they were given an opportunity to share 0, 10, or 20 of their coins with Player 2.

Figure 5. The donation prompt, posed to the participant in Swedish.

Each prompt created a scenario with a different donation risk. The high-risk prompt occurred after the second level when the participant's score was 67 and Player 2's score was 42. The participant had three more levels to clear and no guarantee they would reach 100 coins. The medium-risk prompt occurred after the third level when the participant's score was 98 and Player 2's score was 66. The participant was close to their goal of 100 and had two rooms remaining. The low-risk prompt occurred after the fourth level when the participant's score was 124 and Player 2's score was 87. The participant was not at risk of losing the game and still had one level to earn points. The game mechanics and in-game environment are carefully controlled by researchers throughout the study. The game is conducted on a desktop computer equipped with a

22-inch monitor, mouse, and joystick for control. The joystick was used for movement, and the mouse was used to pick up objects and manage the first-person view.

Dictator Game. The "Dictator Game" is a behavioral task developed to examine altruistic behavior in a real-life scenario (Benenson, 2007). The participant unknowingly engaged in this task during the session. As a reward for winning the video game, the participant was presented with 6 Oreo Cookies as a prize. The researcher then pretended to look around for a moment before feigning consternation and informing the participant that those were the last cookies, but that there was another participant coming in to play after them. They were given the opportunity to donate some of their prizes to the next participant. They were provided with two bags, one for themselves and one for the fictitious subsequent participant. The researcher and the guardian then left the room, allowing the participant to distribute the prizes in privacy. When they were ready, participants exited the room with the bag for themselves and left behind the bag for the other participant.

Questionnaire. The research questionnaire consisted of three parts: sibling information, media exposure, and an abbreviated version of the Hierarchical Personality Inventory for Children. The questionnaire was designed and implemented using the Qualtrics platform and was completed by the guardians of the participants on either a tablet or a laptop device.

The sibling information section of the questionnaire was comprised of two questions. Participants' guardians were asked to provide the number of siblings the participant has in their household, as well as the age and gender of each sibling.

The media exposure section of the questionnaire consisted of two scaled questions. Participants' guardians were asked to estimate the amount of time the participant spent on different forms of media during normal weekdays and weekends.

On a **normal weekday**, select the time that your child spends using the following devices:

	None	1-59 min	1-2 hours	2-3 hours	3-4 hours	more than 4 hours
Television	○	○	○	○	○	○
Laptop/Computer	○	○	○	○	○	○
Mobile Phone/Tablet	○	○	○	○	○	○
Game Consoles	○	○	○	○	○	○

Figure 6. Sample question about daily media exposure.

The participants' personality traits were assessed using an adapted version of the Hierarchical Personality Inventory for Children (HiPIC) known as the HiPIC-30. The HiPIC-30 was developed in a 2016 study as a 30-question alternative to the otherwise 144-question HiPIC (Vollrath, 2016). This questionnaire consists of questions that evaluate the five personality traits: extraversion, benevolence, conscientiousness, neuroticism, and imagination and guardians were asked to respond on a five-point Likert scale.

Please respond to the following statement.

	Disagree	Slightly Disagree	Neutral	Slightly Agree	Strongly Agree
My child talks about own feelings	○	○	○	○	○

Figure 7. Sample question on HiPIC-30 personality assessment.

Procedure

Prior to the session, the guardians of the participants received an email explaining the purpose and procedure of the study. They were required to sign a consent form prior to arrival or upon arrival. Upon entering the room, the participant sat in front of the monitor on one side of the table as seen in Figure 8. The guardian was asked to sit on the other side of the table and not interfere with their child's behavior or decision-making during any task. The researcher sat

opposite from the participant but was able to view the monitor via a mirror placed behind the participant. Consent was obtained to film the monitor during the session.

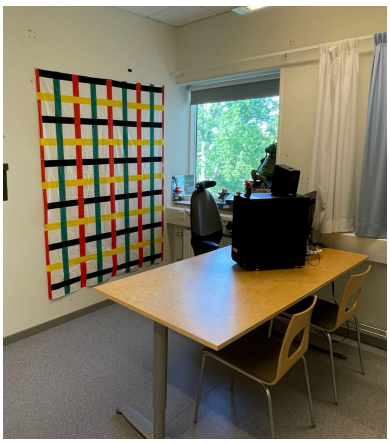

Figure 8. The room used to conduct this study was decorated thematically to indicate to participants that it was a "game room."

First, participants were asked to complete the gender task. While they were doing so, we requested that guardians complete the research questionnaire. Next, participants began the Ludum Detector game. Guardians had a hard copy of the game instructions and donation prompt so that, when indicated by the researcher, they could read the instructions and prompt aloud from the other side of the table. This ensured understanding for participants who were not strong readers while maintaining privacy when making decisions. Finally, once participants had completed the Ludum Detector game, the researcher instigated the Dictator Game.

Data Analysis

The data analysis for the gender self-identification task involved manual coding of responses on a 1-10 scale. Each question's response was assigned a numerical value, where 1 represented participants who indicated not identifying themselves as similar to other children/boys/girls at all, while 10 represented participants who identified themselves as very similar to other children/boys/girls.

For each participant, the number of coins shared at each risk level was recorded. The total number of shared coins was calculated as the sum of coins shared across all risk levels. The range of shared coins varied from 0 to 60, with a higher score representing sharing more coins in the game.

The participants' sibling information, media exposure, and personality scores are gathered by a survey conducted using Qualtrics, which was completed by the guardians of the participants. The sibling information was coded to capture the number of younger sisters, older sisters, younger brothers, older brothers, and the total number of siblings.

To assess media exposure, participants' responses regarding media usage on weekdays and weekends were aggregated to calculate a media exposure score. The media exposure score ranged from 8 to 48, with a lower score indicating low exposure to media and a higher score indicating high exposure to media.

Personality scores were calculated by summing the scores of questions related to each of the five personality categories: extraversion, benevolence, conscientiousness, neuroticism, and imagination. The scores for each personality category ranged from 6 to 30, A score of 6 indicated that the personality category was not a typical description of the participant, whereas a score of 30 indicated that the personality category was a typical description of the participant.

The number of Oreos shared in the Dictator Game is recorded by calculating the number of Oreos left in the envelope, ranging from 0 to 6, with 0 representing the participant who did not share any Oreos in the Dictator game, and 6 representing the participants who shared all 6 Oreos.

Results

Across all 46 participants, 45 (97.83%) participants completed the gender self-identification task, and 46 completed the Ludum detector game and the Dictator Game. All 46 guardians completed the questionnaire. See Table 1-4 for results of descriptive statistics.

The primary object of the study is to investigate the relationship between individual factors and altruistic behaviors observed in the Ludum Detector game and in the Dictator Game. Furthermore, we aim to examine the relationship between personal characteristics and altruistic behavior specifically in the high-risk sharing situation of the Ludum Detector game, where participants demonstrate typical altruistic behavior by assisting others despite the potential risk of failure in the game for themselves. We conducted Pearson's correlation coefficient to examine the statistical relationships.

	N	Min	Max	M	SD
Oreos Shared in Dictator Game	46	0	6	2.652	0.822
Media Exposure	46	12	33	16.87	4.014
Number of Siblings	45	0	4	1.356	0.83

Table 1. Descriptive statistics for information gathered in Dictator Game and questionnaire.

Sharing Condition	N	Min	Max	M	SD
High-risk Level	46	0	20	8.478	5.15
Medium-risk Level	46	0	20	7.391	6.81
Low-risk Level	46	0	20	10.65	7.718
Total	46	0	50	26.52	15.234

Table 2. Descriptive statistics of shared coins in the video game.

Personality Traits	N	Min	Max	M	SD
Extraversion	46	16	29	24.07	3.193
Benevolence	46	10	27	19.39	3.744

Conscientiousness	46	13	29	21.33	3.17
Neuroticism	46	6	29	15.74	5.946
Imagination	46	19	30	25.89	2.742

Table 3. Descriptive statistics for result of HiPIC-30 personality test.

Prompt	Gender at Birth	N	Min	Max	M	SD
Similarity to other Children		45	1	10	7.644	2.685
Similarity to Other Girls	Female	22	1	10	7.864	2.601
	Male	23	1	9	3	2.378
Similarity to Other Boys	Female	22	1	8	2.568	2.02
	Male	23	1	10	7.522	2.695

Table 4. Descriptive statistics for the result of gender self-identification task.

Gender Self-identification

A slightly positive trend was observed between participants' scores on the identification with girls scale and the total amount of coins shared in the Ludum Detector game, $t(43) = 1.992$, $p = 0.052$. Although the trend did not reach statistical significance at the conventional threshold ($p < 0.05$), the observed pattern implies a potential relationship between gender identification and altruistic behavior in the study setting. Participants who identified more closely with girls tended to share a greater number of coins in the Ludum Detector game.

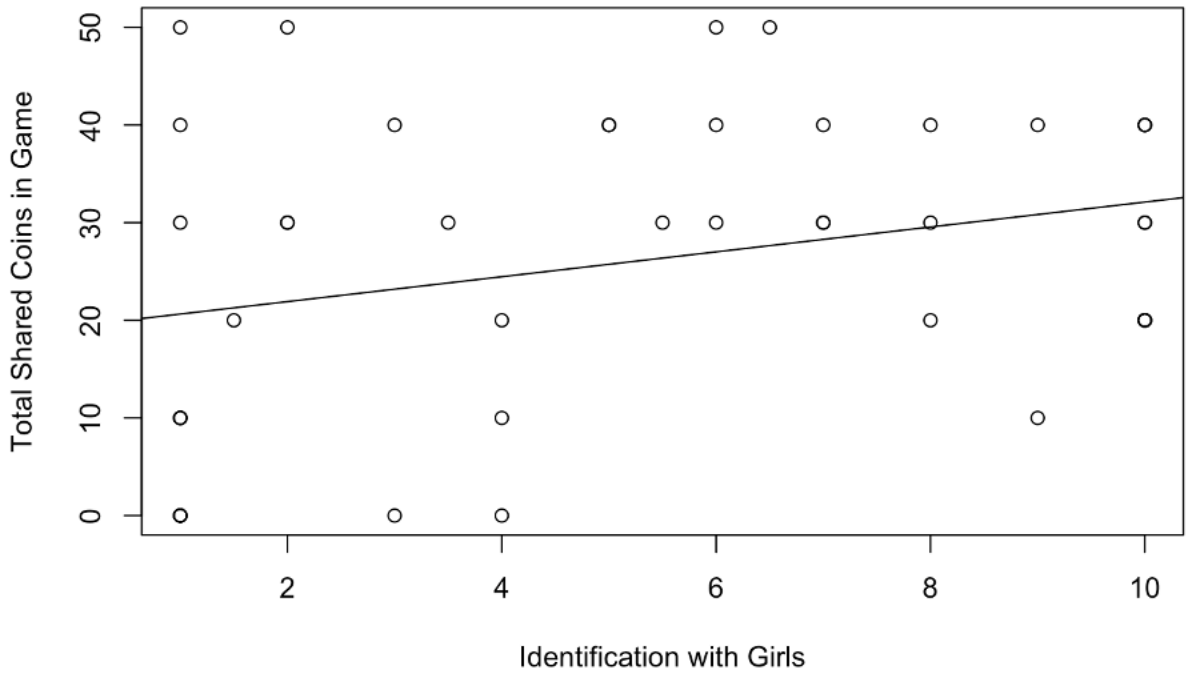

Figure 8. Linear relationship between levels of identifying with girls and coins shared in the video game.

Personality

We examined the correlation between the 5 personality categories and the observed altruistic behavior observed in Ludum game and Dictator Game. See Table 5 for a summary of results. In the high-risk sharing situation, we found a significant correlation between the score of Extraversion and the number of shared coins, $t(43) = -2.724$, $p = 0.009$. Participants with higher extraversion scores on the personality test tended to share fewer coins in the high-risk situation. Additionally, in the Ludum Detector game, we observed a slightly negative trend between extraversion and the total number of shared coins, $t(43) = -1.935$, $p = 0.059$. Although not statistically significant at the conventional threshold, this trend suggests that higher extraversion scores may be associated with sharing fewer total amount of coins in the Ludum Detector game.

Furthermore, we found that participants with higher imagination scores in the personality inventory shared fewer coins in the Ludum Detector game, $t(43) = -2.250$, $p = 0.029$.

Table 5

Personality Traits	Shared Coins in High-risk Level	Total Shared Coins in Game	Shared Oreos in Dictator game
Extraversion	-0.384**	-0.283.	-0.206
Benevolence	0.154	0.045	0.248
Conscientiousness	-0.095	-0.117	0.185
Neuroticism	0.062	0.007	-0.086
Imagination	-0.118	-0.324*	0.168

Table 5. Pearson's r between personality traits and shared resources in the video game and Dictator Game.

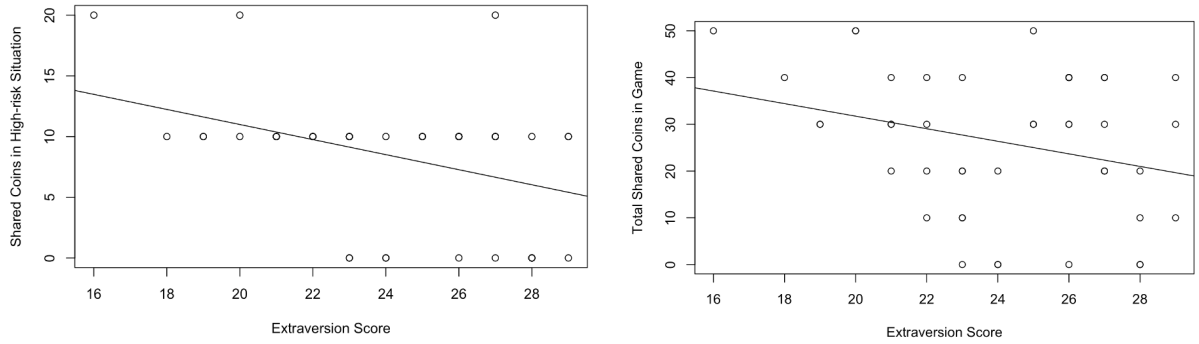

Figure 9. Linear relationship between Extraversion score and shared coins in the video game.

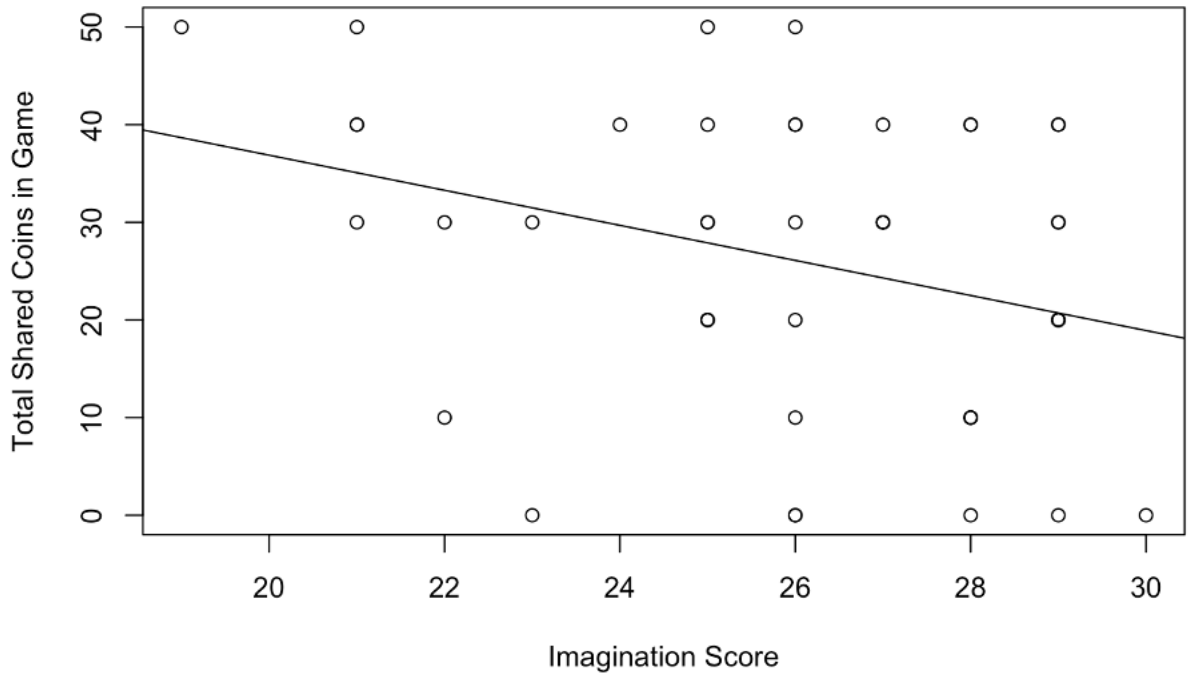

Figure 10. Linear relationship between Imagination score and shared coins in the video game.

Siblings

We examined the correlation between the number of siblings in the household and the total number of shared coins in the Ludum Detector game. The results revealed a significant negative correlation, indicating that participants with a greater number of siblings shared fewer coins in the Ludum Detector game, $t(43) = -2.513$, $p = 0.015$.

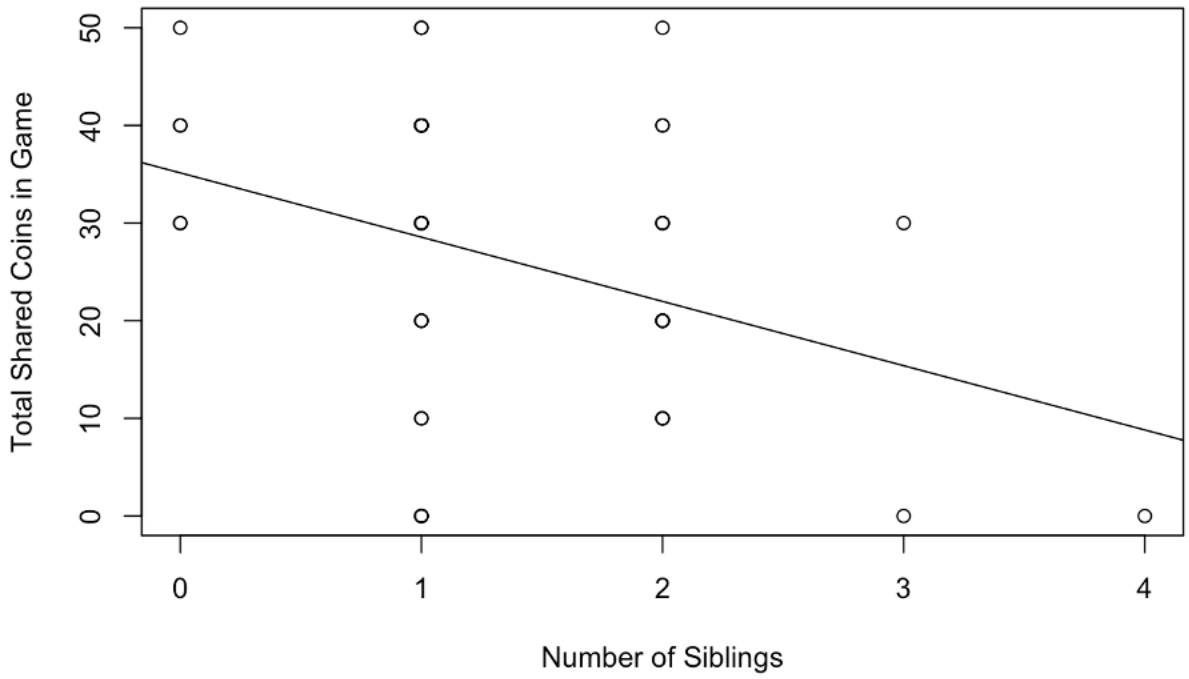

Figure 11. Linear relationship between number of siblings and shared coins in the video game.

Media Exposure

In examining the relationship between media exposure and altruistic behavior in the Ludum game, we discovered a significant positive correlation between the amount of time participants spent on media and the total number of shared coins, $t(43) = 2.06$, $p = 0.045$. The findings indicate that there is an association between media consumption and sharing behavior in the Ludum Detector game. Specifically, participants who spent more time engaged with various forms of media on both weekdays and weekends tended to share a greater number of coins during the game.

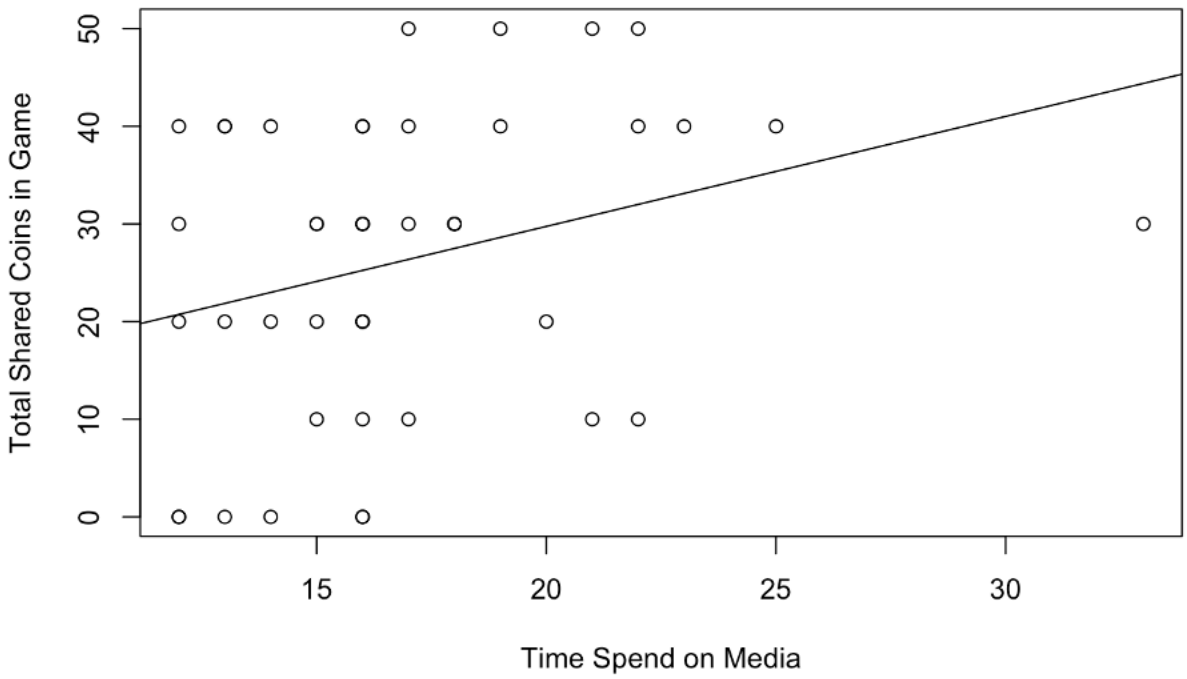

Figure 12. Linear relationship between time spent on media and shared coins in the video game.

Discussion

Building upon previous findings, various factors were associated with prosocial behaviors in digital contexts as well as in daily lives. Our study examined the link between altruistic behaviors exhibited in video games and in the Dictator Game with various individual factors. Specifically, we investigate the influence of gender self-identification, the big five personalities, siblings, and media exposure.

We examined the relationship between the big five personalities with the altruistic behaviors in both the video game and Dictator Game. Our findings revealed a significant correlation between extraversion and sharing behavior in the video game. Specifically, participants with higher extraversion scores demonstrated a tendency to share less in the video

game, supporting our hypothesis that individuals with higher extraversion scores may exhibit lower levels of altruism.

We also found a correlation between the imaginative personality trait with the altruistic behavior in the video game. Participants who scored higher in imagination on the personality test tended to share more in the video game. This finding aligns with previous research, which has shown that individuals with high levels of inquisitiveness, characterized by a curiosity about the world, often exhibit more altruistic tendencies.

In addition to examining the link between personality traits and altruistic behaviors, this study aimed to explore the relationship between the presence of siblings and altruistic behaviors in both video games and daily life. Our study revealed a negative relationship between the number of siblings and the number of coins shared in the video game. Specifically, participants from larger households with more siblings tended to share fewer coins in the video game. Although our study didn't reveal a negative relationship between the number of older brothers and altruistic behavior that has been demonstrated by a previous study, our study contributes to the field by extending this investigation to consider the overall number of siblings in the household and its impact on altruistic behaviors.

We also sought to investigate the relationship between media exposure and altruistic behaviors. Previous findings were varied by medium (internet and video games, and television), but we found that increased media exposure led to increased sharing in a digital capacity.

Through our data analysis, we discovered a notable relationship between self-identification with other girls and prosocial behavior in the video game. Specifically, our findings indicate that the more participants responded that they felt "similar to other girls," the more coins were shared during the video game. This result aligns with previous literature that has

demonstrated girls' tendency to share resources when prompted to maintain group harmony. Furthermore, our findings support our initial hypothesis that girls are more likely to engage in sharing behavior compared to boys. By highlighting the connection between identification with other girls and sharing behavior in video games, our study provides additional evidence for the existing understanding of gender differences in altruistic tendencies. These findings underscore the importance of considering gender-related factors when examining and interpreting sharing behaviors in gaming contexts.

Despite our study's exploration of the relationships between personal characteristics and altruistic behavior in the video game, we did not find any significant association between the relevant individual factors and the altruistic behavior in Dictator Game. Additionally, we did not observe a relationship between prosocial behavior in the Ludum Detector game and the Dictator Game. It is important to note that there is limited existing research investigating the specific link between altruistic behaviors in video games and daily life. Therefore, our study makes a valuable contribution to this area of research by differentiating these behavioral environments, exploring these associations, and highlighting their complexities. While our findings did not uncover substantial connections in the context of the Dictator Game, they provide a foundation to further explore the nuanced relationships between various factors and altruistic behaviors across different experimental settings.

Our study not only contributes to the understanding of the relationship between various individual factors and altruistic behavior in video games and real life, but also provides insights to the gaming industry. Our study contributes to this industry by providing valuable information that can be utilized in the creation of engaging experiences for players. Understanding how individual traits influence player behavior allows game developers and designers to tailor their

games to better align with players' characteristics, preferences, and motivations. By recognizing and leveraging the influence of personal traits, game developers and designers can create more immersive and captivating gameplay experiences that resonate with players on a deeper level. In summary, our study's insights offer a meaningful contribution to both the academic understanding of altruistic behaviors and the practical applications within the game industry, ultimately paving the way for more inclusive and socially conscious gaming experiences.

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