Effects of a local multiplayer cooperative game club for the development of children's social skills

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ABSTRACT

Digital games have become a popular form of entertainment, especially for primary school children. While most gaming is social, the nature and quality of it can vary, sometimes including exclusionary behavior. Studies show that online cooperative games can develop social skills, but local multiplayer games with strangers are rarely studied, particularly with younger children. This preliminary study examines a local co-op multiplayer game for up to 8 players, played weekly in a game club by 7-12-year-olds over four weeks. To measure the club's aptitude to support children's social skills, three quantitative surveys (measuring social experience, peer relationship problems and social problems) were completed by game club instructors and approximately 50 children at the beginning and after the period. The paired samples t-test showed a high social experience as well as a significant decrease in peer relationship problems, however, changes in social problems were not significant, suggesting the need for further investigations.

Keywords

multiplayer, local co-op, social skills, children, games

INTRODUCTION

Playing digital games both alone and with others is one of the most popular hobbies of children today (Kinnunen, Tuomela, and Mäyrä 2022). Simultaneously, social problems, exclusionary behavior towards peers and sense of loneliness are alarmingly on the increase (Helakorpi and Kivimäki 2021), raising concerns over youth's overall well-being. Research has shown how gaming can facilitate social connectedness and sense of belonging (Vella et al. 2019; Pietersen et al. 2018), however, these studies are often conducted with adult participants and within online realms (e.g., Raith et al. 2021; Cole and Griffiths 2007; McEwan et al. 2012; Zhang and Kaufman 2017). Additionally, games designed to promote children's socioemotional development are

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rare (Koivula et al. 2017; Zheng et al. 2021), as are the studies evaluating their effects, though much potential is expected especially from multiplayer cooperative games on children's social skills (Zheng et al. 2021; Wendel and Konert 2016).

In this study, we investigated a local co-op multiplayer (up to 8 players) digital game intended for 7-12-year-olds. The game aims to teach collaborative behavior and teamwork skills through minigames that require cooperation and communication in order to succeed. To measure the children's skill development, we employ questionnaires for both club instructors (adults) and club participants (children). In order to guide the findings, we aim to answer the research question of: *How does weekly playing of local co-operative multiplayer games affect the social and peer relationship skills of 7-to-12-year-olds?* Paired samples t-test was utilized to compare the means at the beginning and after the children's participation in the game club. Through such research setting, we aim to contribute to the limited knowledge there is on children's local co-op gaming and its effects on children's prosocial behavior, peer relations as well as social experiences.

BACKGROUND

Gaming for children is not a solitary activity (Björk-Willén and Aronsson 2014; Danby et al. 2018; Marsh et al. 2015). Most commonly, young children play (or watch others play) with their parents or other members of the family, but as children grow older, gaming partners are more likely to be friends and peers (Suoninen 2014). A friend to play with can also be a stranger found online, which is often the case with many popular mobile games, further emphasizing the social aspects of the modern gaming field (Chaudron, Di Gioia, and Gemo 2018; Hamari et al. 2019). In online gaming, collective goals, social activities and interpersonal communication have shown beneficial outcomes in terms of children learning (Garzotto 2007). However, locally played co-op games facilitate an environment that is shared by all players, enabling intuitive social interaction without, for example, technical hurdles or time lag. This synchronous social experience allows the ability to utilize gestures, physical proximity and the use of shared space, which online environments do not usually allow (De Kort and Ijsselsteijn 2008; Scott, Mandryk, and Inkpen 2002). Such interaction is versatile and crucial especially for younger children's learning opportunities, who explore their surroundings through physical and other multisensory activities.

Prior literature shows that digital multiplayer games have educational potential both in terms of academic as well as social success (Chaudron, Di Gioia, and Gemo 2018; Arnott 2016). Noteworthily, the concept of social skills may include various abilities, ranging from ability to work with others, managing relationships to communication and collaboration skills. Children themselves consider gaming as a social activity (Danby et al. 2018), and value the importance of cooperation and instructing others, in order to succeed and achieve better results in a game (Kahila et al. 2020). Studies show that children can learn valuable social skills while playing together: they learn to make compromises (Lipponen et al. 2018), vary their social status (e.g., from leader to observer) (Arnott 2016), instruct each other (Danby et al. 2018), and experience different forms of leadership and teamwork (Zhao and Linaza 2015). Additionally, children are more likely to play a game with a longer attention span when playing with someone (Danby et al. 2018; Inal and Cagiltay 2007).

While games have a strong ability to bring people together, they do not necessarily have to be cooperative or interdependent to facilitate social experience, since

competitive games can still facilitate a sense of connection between two players (Gonçalves et al. 2023; Depping and Mandryk 2017). Increasingly, games, gaming and other digital media functions as "social fuel" (Ylönen 2012) for children to, for example, increase their credibility among friends (Aarsand 2010) or raise their status in peer groups (Zhao and Linaza 2015), which may also take antisocial forms. Consalvo (2007) associates such social aspects with the theory of gaming capital, which describes good gaming competence, ownership of certain games, or gaming knowledge being beneficial for a player's social capital. For example, Aarsand (2010) argues that gaming capital can be important for a child to sort their peers into different categories on the basis of their awareness of digital games. Similarly, Kahila et al. (2020) found that digital games and related activities can be beneficial for children when finding new friendships and strengthening existing ones, since shared goals and group identification can help players form communal bonds (Depping and Mandryk 2017).

Some studies have explored the potential of gaming in promoting social skill development beyond gameplay. In their study, Koivula et al. (2017) assessed how a game designed to promote young children's socioemotional skills facilitated qualities of emotional understanding and prosocial interactions. The study showed how humorous features, creative opportunities and possibilities to make progress in the game fascinated the children and allowed them to learn socioemotional skills with the support of the present adult (Koivula et al. 2017). Consequently, Koivula et al. (2017) highlight the importance of the presence of an adult, as the gameplay situations may not always appear to be purely positive learning scenes, as they may involve arguments or conflicts that require intervening but pose as important learning opportunities as well. Additionally, in a study by Nasir et al., (2015) workgroups that had played a collaborative video game showed increased collaboration in the subsequent work task compared to a group that did not play the game. Then again Trepte et al. (2012) investigated whether online social capital can increase offline social support, revealing that online gaming can create strong social bonds, if online activities are extended with offline activities. Following the prior literature, in this study we measure the change in children's social skills during their attendance on weekly game clubs, as well as examine their own perceptions whether attending the game clubs is a social experience for them.

METHODS

Description of Materials

The examined digital game, developed by a Finnish game company Wondershop Oy, is a multiplayer game played on a shared TV or tablet screen through a standalone console and a handheld control, PlayTag, designed by the company (see Figure 1). The PlayTag works with a touchpad to control the direction of the character (up, down, left or right) and only has one button to perform actions. The controller is portable and unique to each player: the player can join the game with their personal controller, which stores the player's profile and progress and represents the players' chosen customizations on the screen. The controller works with a coin cell battery.

Figure 1: Wondershop console and PlayTag (on top) used in the game clubs.

The game consists of a collection of minigames, emphasizing collaboration, co-operation and other social aspects of gameplay. Most of the minigames are designed in a way that all eight players need to play together against the game (see Figure 2). To win, the players are required to strategize, divide and assume roles (e.g., being a "captain", "striker" or "healer"), as well as communicate with one another. The available minigames varied across the data collection phase.

The product has been built with the intention for it to serve as a Tier 2 intervention, based on Multi-Tiered System of Support (MTSS) framework (see e.g., Kouvonen et al. 2022) for 7-12-year-olds experiencing mild or moderate peer difficulties and socioemotional challenges. Whereas Tier 1 interventions address universal levels and Tier 3 individuals, Tier 2 is intended for small groups. The developers have followed The Fast Track Project Friendship Group (Bierman 2020) as a framework, which is originally a small group intervention for primary school aged children experiencing social difficulties. The Friendship Group program is designed to address children's socioemotional skill deficits, improve social behavior and peer responding, and thereby foster improved peer relationships (Bierman 2020). Within the game, the Friendship Group is applied through the game lobby, pre-game environment, the minigames, and the post-game environment. While in the Friendship Group program the session starts with a "Friendship Circle", where the attendees greet each other and discuss the objectives of the day, in the game players gather in the lobby to interact with each other. Next, the players are taken into the pre-game environment, which resembles Friendship Group's "Construction Station" that leads children into the activity and provides opportunities to prepare and practice skills needed in the game (i.e. tutorial). The different minigames introduce different team activities that in the Friendship Group are labeled as "Collaborative Challenges". These challenges encourage problem solving, teamwork and communication. Finally, the post-game environment acts as the "Closing Circle" that ends the session. Here, the players are able to share recognition, highlight skill performance and reflect on groups' strengths and weaknesses.

Figure 2: Screenshot of gameplay in one of the minigames, where players have to collect items while avoiding zombies and protecting each other.

Participants

The participants in this study were all 7-12-year-olds, and the majority of them were boys. The exact percentages and means of age and gender were not tracked to gather as little personal data as possible. The majority of the children attended game clubs within the capital area of Finland, with the exception of one game club taking place in India. The clubs were free and advertised as an after-school activity for primary school students and filled in the order of registration. In locations including 16 participants, two groups of eight were formed so that the youngest players (7-9-year-olds) and the oldest players (10-12-year-olds) played together. The total number of participants in the clubs was 79. See detailed information in Table 1.

Groups	***n***	**%**
Group 1 (two groups)	16	20
Group 2 (two groups)	16	20
Group 3	5	6
Group 4	8	10
Group 5	8	10
Group 6 (two groups)	17	21
Group 7	9	11
Total	**79**	**100**

Table 1: Participants

Participation for both the study and the game club was voluntary and anonymous. Withdrawing from the study did not affect children's game club participation. In line with the children's understanding and development stage, the children were informed about the study, what it requires from them and how to participate. Written consent was collected from the children's guardians upon game club registration, in which a Privacy Notice was also disclosed.

Data Collection and Analysis

All data was gathered during game clubs: pre-data was collected after the club's first meeting (week 1) and post-data after the club's last meeting (week 4). Depending on the location, the clubs usually lasted for 90 minutes and took place once a week.

To collect information about children's experiences in the game club, children were asked to fill in a four-item scale of Social Experience drawn from the Gameful Experience Questionnaire (GAMEFULQUEST) (Högberg, Hamari, and Wästlund 2019) (see Table 2). In order to simplify the questionnaire completion for younger children, a shortened version was used (Rantala et al. 2022) with a reduced scale of 0-2. The scale was illustrated as emojis and simplified expressions to assist with answering (0 labeled as 'no' and with a disappointed emoji, 1 labeled as 'maybe' with a thinking emoji, 2 labeled as 'yes' with star-struck smiling emoji).

Children's socioemotional problems were assessed with the Strengths and Difficulties Questionnaire's (SDQ) five-item subscale for peer relationship problems (Goodman 2001) as well as Child Behavior Checklist (CBCL) six-item subscale for social problems (see Table 2). The club instructors (one per group) filled in the surveys of each child separately. Both SDQ and CBCL are widely used in psychology, education and childcare, and generally accepted tools for measuring children's socioemotional issues (Achenbach and Rescorla 2000; Goodman 2001). All items were translated into Finnish and answered on a scale from 0 to 2. In SDQ, the scale was from 0 = 'doesn't apply, 1 = 'applies somewhat' and 2 = 'strongly applies'. In CBCL, 0 meant 'not true', 1 meant 'sometimes or somewhat true', and 2 meant 'often or very often true'.

Scale	**Items**
Social Experience (GAMEFULQUEST) (Högberg, Hamari, and Wästlund 2019)	1. When I played today, I felt like I was not alone. (omitted) 2. When I played today, I felt like I was part of the group. 3. When I played today, I felt like I was playing together with others. 4. When I played today, I felt like I belonged to the group.
Peer relationship problems (SDQ) (Goodman 2001)	1. Solitary, tends to play alone. 2. Has at least one good friend in the group 3. Generally liked by other children. 4. Picked or bullied among other children. 5. Gets on better with adults than other children.
Social problems (Achenbach and Rescorla 2000)	1. Has trouble concentrating or paying attention. 2. Clings to adults or too dependent. 3. Doesn't get along with other kids 4. Gets teased a lot.

	5. Not liked by other kids. 6. Likes to help others.

Table 2: Measurements

In the SDQ and CBCL assessments, 0 is the ideal outcome concerning the social and peer relationship problems (Achenbach and Rescorla 2000; Goodman 2001). Thus, for SDQ the values for items 2 and 3 were reversed, as well as in CBCL the item 6 was reversed. In the Social Experience scale, the first item was omitted from the analysis, as it lowered the reliability values considerably due to the ambiguous nature of the item. Eventually, the reliability thresholds were met (Cronbach's alpha >0.7). Sums of variables were computed for each of the three constructs, thus, for Social Experience 6 is the maximum value, for SDQ 10 is the maximum and for CBCL 12 is the maximum value.

A paired-samples t-test was utilized to compare the means between two time points (pre and post). The procedure computes the differences between values and tests whether the average differs from 0, as well as automates the *t*-test effect size computation (Ross and Willson 2017). All assumptions were met: two continuous variables were compared, the subjects in each sample were the same, and variables were approximately normally distributed. Missing values were excluded analysis by analysis, which means that all cases that have valid data for the tested pair were used. The subjects with missing data points were removed, which decreased the total number of individuals. No outliers were removed, as they represented natural variation in the sample. To measure the strength and direction of the linear correlation between the variables, Pearson's correlation coefficient was calculated (Mukaka 2012). Effect sizes were calculated with Cohen's *d*, which is a standardized effect size measure that quantifies the difference between means. The resulting values represent the difference between the two groups regarding standard deviations (Sullivan and Feinn 2012). All quantitative analyses were performed on IBM SPSS Statistics program's version 29.0.1.0 (171).

RESULTS

Pre scores of SDQ and CBCL were highly correlated, and the relationship was statistically significant $r(61) = .54$, $p < .001$. SDQ and Social Experience had a weak negative correlation and was not statistically significant $r(49) = -.13$, $p = .364$. CBCL and Social Experience also had a weak negative correlation and was not statistically significant $r(49) = -.27$, $p = .057$.

Post scores of SDQ and CBCL were highly correlated, and the relationship was statistically significant $r(62) = .55$, $p < .001$. SDQ and Social Experience had a weak negative correlation and was not statistically significant $r(56) = -.06$, $p = .669$. CBCL and Social Experience also had a weak negative correlation and was not statistically significant $r(57) = -.19$, $p = .156$.

		Mean	**N**	**Std. Deviation**	**Std. Error Mean**
Pair 1	Social experience (pre)	5.1915	47	1.42399	.20771

	Social experience (post)	5.5532	47	.90430	.13191
Pair 2	SDQ (pre)	1.8654	52	1.52147	.21099
	SDQ (post)	1.0192	52	1.51451	.21002
Pair 3	CBCL (pre)	1.7308	52	1.57325	.21817
	CBCL (post)	1.3269	52	1.55578	.21575

Table 3: Paired Samples Statistics

		Paired Differences							**Significance**	
		Mean	**Std. Deviation**	**Std. Error Mean**	**95% Confidence Interval of the Difference**					
					Lower	**Upper**	**t**	**df**	**One-Sided p**	**Two-Sided p**
Pair 1	Social experience (pre) – Social experience (post)	-.36170	1.74985	.25524	-.87548	.15207	-1.417	46	.082	.163
Pair 2	SDQ (pre) – SDQ (post)	.84615	1.80831	.25077	.34272	1.34959	3.374	51	<.001	.001
Pair 3	CBCL (pre) – CBCL (post)	.40385	1.78512	.24755	-.09313	.90083	1.631	51	.054	.109

Table 4: Paired Samples Test

The paired-samples t-test (see Tables 3 and 4) revealed a not significant difference in test scores between Social Experience's pre (M = 5.19, SD = 1.42) and post (M = 5.55, SD = 0.90) scores, t(46) = -1.42, *p* = .163. The effect size *d* = -.21 indicates a negative small effect. Between SDQ's pre (M = 1.87, SD = 1.52) and post (M = 1.02, SD = 1.52) scores, the test revealed a highly significant difference t(51) = 3.37, *p* = .001. The effect size *d* = .47 indicates a small effect. In CBCL's pre (M = 1.73, SD = 1.57) and post (M = 1.33, SD = 1.56) scores, the test revealed a not significant difference t(51) = 1.631, *p* = .109. The effect size *d* = .23 indicates a small effect.

DISCUSSION

With this study, the aim was to tentatively explore the social impact of a multiplayer cooperative game club, in which 7-12-year-olds attended on a weekly basis. To answer the research question of *how does weekly playing of local co-operative multiplayer games affect the social and peer relationship skills of 7-to-12-year-olds*, a four-week intervention with comparison between pre- and post-scores was examined. Overall, the results suggest that the clubs facilitated a highly social experience for children, creating an ideal environment for learning social skills in a meaningful and relevant

way through the multiplayer game that acted as the mediator of the social experience. The paired-samples t-test revealed a statistically significant difference in the SDQ scores, suggesting that the intervention had an impact on children's peer relationship problems by decreasing them, however, the change was not shown through the CBCL instrument, which tried to capture children's potential social problems.

While the quantitative analysis shows only small effects, the overall changes in means indicate positive results in all measured constructs. The results also show that the SDQ and CBCL scores positively correlate both in pre and post scores, which means that they both measured children's social and peer relation problems sufficiently, as the relationships were highly statistically significant. The negative correlation between SDQ and Social Experience, as well as between CBCL and Social Experience was expected, since their ideal outcomes are opposite.

Although our tentative results show some positive indications, it is not yet clear whether the changes were due to the game, the game club or their combined effect. As prior studies have noted, while games can create immersive environments to facilitate skill development, guidance by trained adults may be needed for learners to understand the skills comprehensively (Koivula et al. 2017; Mercer and Howe 2012). In this study setting, an adult was present in each club meeting, however, their role differed largely in terms of how much they guided, intervened or interacted with the children. These sorts of practical variables could be tracked in a different setting, whereas now the clubs were intended to be free and locally available for as many children as possible, hence, for example, controlled lab experiments were not executed. Furthermore, it is worth considering whether the specific joint activity mattered and how, and if the data would show similar outcomes for any type of weekly social gathering.

Additionally, we did not measure whether the game environment actually facilitates the intended background theory of Friendship Group (Bierman 2020), thus, the results are not directly comparative to, for example, studies made on Friendship Group interventions. Scaling such results and game effects is part of a wider challenge that is persistent in research, and especially studies on educational games' impact on social skills, which are still largely limited (Zheng et al. 2021). In future work we aim to contribute to this issue, which will be discussed in the next section.

Limitations and Further Agenda

Several limitations should be considered when interpreting the results. One of the main limitations of the data is the various settings of the game clubs in terms of instructors and the quality of completing the questionnaires. The range of differences between club leaders created some knowledge gaps to the data, however, the majority of the club instructors stayed the same throughout the data gathering period, which should enhance the unification of data. The research period was also relatively short due to the game clubs' practical arrangements, which makes it difficult to assess any potential long-term effects. Additionally, as the game clubs were not carried out in an isolated setting, we cannot fully disclose that the measured changes were due to the game or game club, or some other variables taking place in children's lives.

In terms of the investigated product, the game was constantly developed and updated throughout the data collection. Hence, some participants may have played a slightly

different version of the game than others, or some could have experienced, for example, technical difficulties and bugs that others did not, which were not tracked in the data. Additionally, as is common with longitudinal data, missing data caused some difficulties with data analysis. For the analysis method employed in this paper, the subjects with missing data points were removed, which decreased the total number of subjects.

Simultaneously with this study, we conducted qualitative data collection to investigate children's experiences, thoughts and perceptions more in-depth through observations and interviews. This line of research is at this moment being analyzed and will contain thematic analysis of observations done during game clubs and individual interviews with the participants. Some of the preliminary results point towards turning negative social relationships into neutral or more positive ones, and the cooldown periods between and after the games being especially meaningful for bonding, allowing children time to share and discuss their personal experiences. Other than that, the qualitative data could give grounds for examining the different group dynamics children develop within the game clubs, from the theoretical perspectives of, for example, groupthink and other group phenomena (see e.g., Van Mechelen et al. 2014). Additionally, we plan to utilize a control/treatment group research setting, which should produce information solely on the game's impact compared to other multiplayer games as well as other group activities, whereas the results presented in this paper consider the game clubs as a whole. In the coming works, we are also looking to incorporate in-game data to the analysis in order to reveal interconnections between children's experiences within and outside of the game.

CONCLUSIONS

The aim of this paper was to investigate the social impact of local multiplayer game clubs for 7-12-year-olds. The research question of *how does weekly playing of local co-operative multiplayer games affect the social and peer relationship skills of 7-to-12-year-olds* guided the data collection in which both club instructors (adults) and club participants (children) completed three questionnaires at the first game club meeting and four weeks later. Pre- and post-data was analyzed with a paired samples t-test. The results show a statistically significant decrease in children's peer relationship problems and a high social experience during game clubs (pre M: 5.2, post M: 5.6 with the maximum being 6), though the difference was not significant. Children's social problems also slightly decreased (pre M: 1.7, post M 1.3, with the ideal being 0), but the relation was not statistically significant. Overall, the examined game and the game clubs do show some potential in developing primary school aged children's social skills, however, more systematic research is needed in order to track the exact effects and relations between the gaming activity and children's social interactions.

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