EFFECT OF COOPERATIVE GAMES AND IDENTIFICATION WITH THE GAME PARTNER ON PROSOCIAL BEHAVIOR AMONG PRESCHOOLERS

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DECLARATION OF ORIGINALITY

I hereby declare that I am the sole author of this thesis and that this is the true copy of my thesis, including the final revisions, approved by my thesis committee. All data and information have been obtained, produced, and presented in accordance with the rules of research ethics and principles of academic honesty. As required by these rules, to the best of my knowledge I have acknowledged ideas, thoughts, and any copyrighted material in accordance with the standard referencing rules. I certify that any part of this thesis has not been submitted for a degree or diploma in another educational institution.

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ABSTRACT

Digital games have become one of the most frequently used digital media tools among young children today. The increasing frequency and duration of digital game use have made it an important area of research to examine the potential effects of these games in early childhood. Previous literature suggests that digital games with positive themes, educational content, and realistic features can support children's social behavior, cognitive development, and learning. The present study explored whether prosocial behavior can be promoted by having children play a cooperative game, and whether identifying with characters in the game affects children's prosocial behavior. To test this, a new digital game incorporating cooperative behavior was designed, and game type (cooperative vs. non-cooperative) and identification levels through character type (human vs. anthropomorphic animal) were varied among versions of this game. A total of 171 Turkish-speaking preschool children were randomly assigned to one of four digital game versions. Prosocial behavior was measured through a pizza-sharing task within the game and a sticker-sharing task afterward. Playing the cooperative version did not increase prosocial behavior compared to the non-cooperative version. However, children in the human character condition shared fewer pizza slices but more stickers than those in the anthropomorphic character condition, suggesting that the effect of identification varies across contexts and reward types. These findings highlight the complexity of children's responses to digital game components and underscore the importance of considering character-related perceptions when examining prosocial behavior.

Keywords: Digital game, cooperation, anthropomorphism, prosocial behavior, preschoolers

ÖZET

Dijital oyunlar, günümüzde küçük çocukların en sık etkileşimde bulunduğu dijital medya araçlarından biridir. Dijital oyun kullanımındaki artış, bu oyunların erken çocukluk dönemindeki etkilerini önemli bir araştırma konusu haline getirmiştir. Mevcut bulgular, olumlu temalara sahip, eğitsel ve gerçekçi içerikli dijital oyunların çocukların sosyal davranışlarını, bilişsel gelişimlerini ve öğrenme süreçlerini destekleyebileceğini göstermektedir. Bu araştırma, çocukların işbirlikçi bir oyun oynamasının prososyal davranışı teşvik edip etmeyeceğini ve karakterlerle özdeşleşmenin prososyal davranış üzerindeki etkisini incelemiştir. Bu amaçla, işbirliği unsurlarını içeren yeni bir dijital oyun tasarlanmış; oyun türü (işbirlikçi veya işbirliği içermeyen) ile karakter türüne bağlı özdeşleşme düzeyi (insan veya antropomorfik hayvan) oyunun farklı versiyonlarında değiştirilmiştir. Araştırmaya, okul öncesi dönemdeki 171 Türkçe konuşan çocuk katılmış ve her biri oyunun dört versiyonundan birine rastgele atanmıştır. Prososyal davranış, oyun içindeki pizza paylaşma görevi ve oyun sonrasındaki çıkartma paylaşma görevi ile ölçülmüştür. İşbirlikçi versiyonu oynamak, işbirliği içermeyen versiyona kıyasla prososyal davranışı artırmamıştır. Hayvan karakterle oynayanlara kıyasla, insan karakterle oynayan çocuklar pizza dilimlerini daha az paylaşırken, çıkartma görevinde daha fazla paylaşım yapmıştır. Bu bulgu, özdeşleşmenin etkisinin bağlama ve ödül türüne göre değişebileceğini göstermektedir. Bulgular, çocukların dijital oyun unsurlarına verdikleri tepkilerin karmaşıklığını ortaya koymakta ve prososyal davranışın incelenmesinde karakter algılarının dikkate alınmasının önemini vurgulamaktadır.

Anahtar Kelimeler: Dijital oyun**,** işbirliği, antropomorfizm, paylaşma, okul öncesi çocuklar

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1. INTRODUCTION

Games, in their different forms, stand out as an important tool in developing a diverse set of social skills (Endedijk, 2020; Kollbrunner & Seifert, 2013; Van Oers, 2013). The widespread access of children to digital games, one of these forms of play (Yalçın et al., 2022), combined with findings showing that digital media can affect the social and cognitive development of young children (Baydar et al., 2008; Wilson, 2008; Yang et al., 2020), suggests the idea that digital games can be used as a tool that supports children's development.

Digital media can promote academic success, problem-solving skills, motivation, and social-emotional development (Aslan & Turgut, 2023; Nikolayev, 2015). Digital games in particular are notable for their capacity to foster prosocial behavior and peer interaction, particularly when children are given the chance to explore and play together (Iplikci et al.,2022; Ramani & Brownell, 2013; Sohrabi, 2021). Similar to traditional games, well-constructed digital games can encourage sharing and helping, by embedding cooperative challenges and social goals into game (Gentile et al., 2009; Iplikci et al., 2022), meaning that in addition to being enjoyable, digital games can provide valuable settings for fostering good social skills and cooperation.

Moreover, the media content and how information is presented can be just as influential as what is conveyed (Cohen, 2012; Nikolayev, 2015). To increase engagement, media often features non-human characters, particularly anthropomorphic animals, which are widely used in children's content (Goldstein & Alperson, 2020; Kara, 2023Larsen et al., 2018; Oranç, 2019; Richert et al., 2009). However, children’s level of identification with the character can influence the learning process. While some studies support the use of human characters for promoting learning and prosocial behavior, the effect of

anthropomorphic characters on young children's social responses remains unclear.

In this context, the study examines whether the theme of the digital game—cooperative vs. non-cooperative—affects the prosocial behaviors of preschool children during and after game; and whether the character type in the digital game— human vs. non-human—has an effect on prosocial behaviors. To this end, a novel digital game was created especially for preschoolers. The findings of this study aim to contribute to the development of digital games that effectively support preschool children's prosocial behavior in a controlled and engaging context, providing empirical foundation for content and design decisions in such games.

1.1 Games: A Pathway for Social Skill Development

Prosocial behaviors include a broad range of voluntary actions intended to benefit others, such as helping, sharing, comforting, and cooperating (Eisenberg & Mussen, 1989). Among these, cooperative behavior is considered one of the earliest emerging forms of prosociality, rooted in children's innate sensitivity to others' emotional states. Empathic and sympathetic responses and feelings have been proposed as one of the key elements that initiate this innate drive to cooperate in children (Jordan et al., 2015). The capacity to comprehend and experience other people's mental states is intimately linked to these responses and emotions (Tomasello, 2009). Babies that comprehend that someone else is in difficulty, for instance, feeling concern for that person and offering assistance (Jordan et al., 2015; Tomasello, 2009; Warneken, 2018). Research also indicates that infants between the ages of fourteen and eighteen months, irrespective of their cultural background, help a stranger in need (Clements, 2022; Tomasello, 2009; Warneken, 2018).

Cooperative behaviors are observed in the first years of life, both in humans and chimpanzees (Tomasello, 2009), suggesting that these behaviors can be universal, emerge and evolve as natural tendencies rather than being solely acquired from the environment.. This is evident before language acquisition as well, including in the exchange of information, such as pointing to the necessary material (Tomasello, 2009; Warneken, 2018). Moreover, children engage in this action without receiving rewards, and they even leave enjoyable activities to engage in this behavior, perhaps due to an intrinsic drive (Tomasello, 2009; Warneken, 2018).

From their earliest years, children typically engage in activities that provide opportunities for social interactions with peers (Endedijk et al., 2020). In this way, they develop their current skills while also gaining new social skills (Clements, 2022; Ramani & Brownell, 2013). These abilities enable an individual to successfully socialize by responding to the other person in a suitable manner (Clements, 2022). Playing games facilitate peer connection, cooperation, and the development of these abilities (Kollbrunner & Seifert, 2013; Ramani & Brownell, 2013; Sohrabi, 2021; Van Oers, 2013). In other words, children who engage in games with their peers are likely to acquire the abilities required for social interaction and cooperation (Endedijk et al., 2020; Ramani & Brownell, 2013; Sohrabi, 2021).

Cooperation is a fundamental component of social interaction from an early age. It is characterized by actions taken by people to accomplish common goals, obtain benefits, or strengthen social bonds (Jordan et al., 2015; Sohrabi, 2021). While playing a game, children engage in a variety of cognitive and social skills that promote cooperation and joint problem-solving. Games necessitate children to decide on a shared objective and set of rules, devise a strategy to reach the aim of the game, and use effective

communication to resolve any issues that come up while they carry out this plan (Ramani & Brownell, 2013). To effectively complete their own character's tasks in the game, children also need to comprehend the intentions of others and coordinate with them (Endedijk et al., 2020; Ramani, 2005; Ramani & Brownell, 2013; Sohrabi, 2021). Therefore, the social and cognitive abilities acquired during the game enable the children to effectively collaborate with others (Clements, 2022). For example, in a sand castle building task, both children need to know and understand that the other person's intention is to build a castle and that this is their common desire. They should also follow each other to adjust the size of the castle and determine where the walls can be placed. During the game, children should sometimes support the other person so that the castle does not collapse, sometimes bring water to the other person when necessary, or hold the castle to prevent it from collapsing. In other words, they should socialize and cooperate in the game, which, in turn, help them develop social-emotional skills such as emotion regulation, cooperation, and responsibility (Clements, 2022; Endedijk et al., 2020; Kollbrunner & Seifert, 2013; Ramani, 2005; Ramani & Brownell, 2013; Van Oers, 2013). Interpersonal nature of the games provides a more engaging, inspiring and fulfilling learning experience, often making them more effective and educational tool than passive observation of others (Sohrabi, 2021).

While the impact of games on cooperation and helping has been studied, most of these studies have involved participants with developmental delay or autistic spectrum disorder (Jin et al., 2016; Mpella et al., 2019; Sohrabi, 2021). In addition, in literature, games and their role on socio-cognitive development have generally been addressed on the games that involve one-on-one face-to-face interaction with peers (Sohrabi, 2021). However, in today's world, children also find opportunities to play with others through

digital media tools, and in this way, they interact with their peers in a way similar to traditional play.

1.2 Digital Media During Childhood

Digital media should not be viewed as a substitute for natural social interaction, but rather as a distinct context characterized by its own features, structures, and modalities. It can present complementary opportunities for the development of children's social competencies that extend beyond those available in face-to-face settings. Children begin to use digital tools and media, including mobile games, the internet, and television from a young age (Gottschalk, 2019; Jefferson, 2023; Şenol et al., 2023). Ninety-eight percent of children under the age of eight have access to mobile technology (Kalati & Kim, 2022), and nearly three-quarters own a smartphone or other mobile device and use it on a regular basis (Jefferson, 2023; Nikolayev, 2015). Similar statistics are observed in various countries such as Australia (Rhodes, 2017), Southeast Asia (Unantenne, 2014) and Europe (Chaudron, 2015). Furthermore, a study Turkish Statistical Institute (TURKSTAT, 2021) showed that internet usage among children aged six to 15, increased from 50% in 2013 to 82% in 2021, with 90% of children saying they used the internet every day – an increase which might have been also influenced by the COVID-19 pandemic (Güzel et al., 2021), which brought about remote learning and extended time at home.

The American Academy of Pediatrics (2020) recommends that children from two to six should not exceed one hour of screen time daily. Studies show that longer screen usage might result in social-emotional delays, sleep issues, and developmental issues (UNICEF, 2017). In addition to the impacts of media use, media content also matters. Exposure to violent and unpleasant games has been linked to psychosocial issues, low

academic performance, aggressive behaviors, and attention issues (Ferguson, 2015; Lieberman et al., 2009; Yalçın et al., 2021). Since young children's brains develop and adapt more quickly, they may be more susceptible to environmental inputs, including negative media effects (Christakis, 2009; Yang et al., 2020). Therefore, it is becoming more and more crucial to know how to use digital technology responsibly and to give young children access to age-appropriate, instructive, and trustworthy media content because of the problems that can arise from potential issues linked to overuse and lack of guidance. Such age-appropriate digital media can improve academic performance, social-emotional growth, and cognitive abilities (Aslan & Turgut, 2023; Nikolayev, 2015) as well as children's motivation to solve problems (Clarke & Abbott, 2016), gain reading skills (Neumann, 2014), and improve the learning process (Snell & Snell-Siddle, 2013).

Digital games stand out due to their capacity to foster interaction and collaboration, much like traditional play (Ramani & Brownell, 2013; Sohrabi, 2021). However, the unique context of digital games—with their distinct features, structures, and modalities—has received limited attention in relation to its influence on children's socialization and cooperation.

1.3 Learning Prosocial Behavior in Games by Preschool Children

General Learning Model (Buckley & Anderson, 2006), which explains how exposure to various environmental stimuli—including digital media tools—can influence individuals' learning and behavioral processes. This model suggests that environmental inputs (e.g., digital media content) influence cognition, affect, and arousal, which in turn influence behavior (Buckley & Anderson, 2006). Therefore, playing video games can influence behavior through arousal, emotions, and cognition. Digital content incorporating cooperative behavior influences people's mood and attention (Buckley &

Anderson, 2006; Gentile et al., 2009) and activates cognitive schemas with the relevant behaviors, allowing people to display positive thoughts, attitudes, and behaviors over the short and long term (Greitemeyer & Osswald, 2010). Cooperative activities have the potential to trigger prosocial motivations, which may then extend to foster prosocial behaviors, manifesting as early sharing (Hay, 1979) or as instrumental helping (Hamann et al., 2011) with social partners (Buckley & Anderson, 2006; Hamann et al., 2011; Hay, 1979; Tomasello, 2009). Therefore, cooperative digital games may stimulate prosocial tendencies and encourage sharing behaviors, as compared to non-cooperative games.

Research demonstrates that digital games with positive content can support the development of social skills and prosocial behaviors (Buckley & Anderson, 2006; Gentile et al., 2009). According to a study by Greitemeyer and Osswald (2010), compared to those who played neutral or violent versions, adults aged between 19 and 43 who played cooperative-themed video games-working alongside virtual characters to overcome challenges-exhibited more positive social behaviors, such as offering assistance, being willing to invest more time to help with a subsequent experiment, and intervening more frequently in a harassment situation. Iplikci and colleagues (2022) also examined real-time peer cooperation in a mobile cooking game in Turkish designed for children aged 10 to 12. The study showed that children who played the cooperative version of the digital cooking game demonstrated greater levels of positive affect (e.g., laughing, smiling), more frequent social engagement during play (e.g., helping, asking questions, positive conversation), and reported a higher preference for the cooperative game afterward compared to those who played solitary version. These findings demonstrate that, although the nature of interaction may differ -virtual or real- digital games are useful tools that promote constructive social connections and cooperative behaviors in addition to being

forms of entertainment.

These two studies, which involved adults (Greitemeyer and Osswald, 2010) and children aged 10 to 12 (Iplikci et al., 2022), collectively suggest that digital games may influence behavior and the learning process. However, their focus on how digital games affect learning and behavior is limited to adult samples or school-aged children (Iplikci et al., 2022; Konrath et al., 2023; Leiberg et al., 2011; Narvaez et al., 2008). Game-based interactions may be experienced and processed differently by preschool-aged children, who are at a more foundational stage of social-emotional development (Brownell et al., 2009). As compared to preschoolers, children between the ages of 10 and 12 have already more developed social and cognitive abilities. They are better able to consider social dynamics, autonomously obey game rules, and control their conduct at this developmental stage (Eccles, 1999). As a result, more complex thought processes may influence how they perceive and react to the game's content.

Since the preschool age group is still developing the fundamental skills of sharing and helping, the impacts game content might be even more noticeable (Brownell et al., 2009). Understanding the perspectives of others, managing one's emotions, comprehending moral issues, and responding with concern to individuals in need are some examples of these abilities (Carlo, 2014; Eisenberg et al., 2015; Gülseven et al., 2022). Studying how digital media influences early mentioned prosocial behaviors is crucial for these children since they are also more perceptive of the emotional tone and structure of social interactions (Christakis, 2009).

Although preschoolers are undergoing a critical developmental period as mentioned (Christakis, 2009; Yang et al., 2020), there is limited research on how digital game content influences prosocial behaviors in this age group. The current research aimed

to systematically examine the effects of the type and mechanism of digital games on preschoolers' prosocial behaviors.

1.4 Identification with Cooperation Partners in Games

Digital games typically involve interaction not only with the game mechanics but also with characters that serve as social partners during game. Similar to how the perceived traits of a cooperation partner in real-life settings can influence social responses such as trust, empathy, or willingness to help (Tomasello, 2009), the features of characters in digital environments can shape children's in-game behaviors (Parsons et al., 2019). Previous research has shown that character-based collaborative games can promote prosocial behaviors such as helping and cooperation among young children (Parsons et al., 2019).

We suspect that children's identification with media characters might be a key factor that influences their responses during and after game. According to the Social Identity Theory, group-based identity influences social behavior (Tajfel & Turner, 1986). This theory states that people define themselves through their membership in social groups, and that belonging to these groups is a key factor in shaping self-perception (Tajfel & Turner, 1986). In other words, this theory suggests that people organize the social world by classifying themselves and other people into social groups (such as "us" vs "them"). Through perceived group memberships and norms of the group, these classifications serve to both define the self and direct behavior.

According to this theory, being part of a group not only fosters a feeling of belonging but also leads to more positive attitudes and behaviors toward members of the group than toward others (Tajfel & Turner, 1986). Children's relationships with media characters can vary according to how these characters are perceived as social identities.

A basic us versus them categorization in such media would be us, humans, versus them, animals. If so, children would feel more connected to human figures, and this identification may encourage prosocial behaviors towards them, such as sharing, helping, or cooperating (Cao et al., 2023; Schlesinger & Richert, 2017). Therefore, a child's degree of social identification with a character and the social behaviors they display in response to that identification may be directly impacted by visual or categorical cues, such as the type of the characters (human vs. animal). This expectation is in line with related findings and discussions in the literature. People interact more often with and have greater trust in others they perceive to be familiar or similar to themselves (Alves et al., 2022; DeBruine, 2002; Sofer et al., 2015; Tajfel & Turner, 1986; Woolley & Fishbach, 2016).

1.4.1 Human versus Anthropomorphic Characters in Games

Digital games designed for children frequently use anthropomorphic characters to make the display of digital content more enjoyable and engaging (Goldstein & Alperson, 2020). Anthropomorphism can be defined as attributing human-specific traits such as thinking, feeling emotions, and speaking to non-human entities like animals, objects, or fantastical creatures (Larsen et al., 2018; Oranç, 2019). Looking at the statistics, anthropomorphic animal representations are seen in 70% of children's media, including television, movies, and books (Goldstein & Alperson, 2020). However, research shows that higher realism of media content (e.g., books content) has a major positive impact on children's behavior and learning (Cao et al., 2023; Schlesinger & Richert, 2017). Larsen and colleagues (2018) investigated whether children would be more likely to behave morally in real-life scenarios if they read the same moral story with human or anthropomorphized animal characters. Children between the ages of four and six were randomly assigned to one of three conditions: the Animal condition, in which

anthropomorphized animal characters; the Human condition, in which the characters were human; or the Control condition, in which a story about seeds without any examples of human interaction or generosity was read to them. In this study, children completed the same sticker-sharing task twice: once before the story was read (pretest) and once after (posttest), in order to examine changes in their sharing behavior. Results showed that children who read stories incorporating humans demonstrated more sharing behavior compared to those who read stories with anthropomorphic ones.

Kara (2023) found similar results with Turkish children. The first study in this research investigated the impact of storybook types (fantasy, anthropomorphic, or realistic) on children's analogical problem-solving behavior. Preschoolers who took part in the study were given various problems to solve after listening to different storybooks. Children who listened to realistic stories were better at solving physical content problems than children who listened to fantasy or anthropomorphic stories. The second study looked at the relationship between children's prosocial behaviors, including sharing, helping, and honesty and the type of storybook they read—realistic, anthropomorphic, or fantastical. In the second study, prosocial behaviors were measured both before and after the storybook listening phase. The findings showed that children who listened to realistic stories had a greater difference between their pre-test and post-test sharing scores than children who listened to anthropomorphic or fantastical stories.

These findings are in line with the expectations driven by the Social Identity Theory (Tajfel & Turner, 1986). Accordingly, characters that are human characters (as compared to animals), which aligns with children's own social category, might foster prosocial responses. Despite a growing interest in how children learn from digital games,

there is still a lack of evidence in the literature regarding how the type of character (i.e., human vs. anthropomorphic) impacts children's learning and prosocial behaviors.

Building on this literature, the current study examines how character type (human vs. anthropomorphic) and game structure (cooperative vs. non-cooperative) jointly influence preschoolers' prosocial behavior in a digital game context.

1.5 The Present Study

Despite a growing interest in how children learn from digital games, there is a lack in the field systematically examining the effects of digital games on preschool children's on prosocial behavior. Digital games might offer children opportunities to enhance various cognitive and social skills (Lieberman et al., 2009), and as implied by the General Learning Theory (Buckley & Anderson, 2006; Gentile et al., 2009) repeated exposure to certain types of media content can shape cognitive, emotional, and behavioral outcomes. Besides, as implied by Social Identity Theory (Tajfel & Turner, 1986), children might be more likely to react positively to those who they believe belong to their in-group members, that is, human characters in the game, as compared to out-groups, that is, anthropomorphic characters.

Within the scope of the current thesis, we first developed a novel digital game in accordance with the appropriate game characteristics discussed in the literature for preschoolers. Then, by developing different versions of the same game, we empirically investigated i) how cooperative (as compared to non-cooperative) behavior in digital games affects preschoolers' prosocial behavior, and (ii) whether the level of prosocial behavior that follows the game varies depending on whether the social interaction partner is a human or an anthropomorphic character.

The hypotheses of the study are as follows:

Hypothesis 1: Preschool children who play cooperative digital games would be sharing with others during and after the game than those who play non-cooperative games.

Hypothesis 2: Sharing others during and after the game will be more when the other player in the digital game is a human-like character than an anthropomorphic animal character.

There are few opportunities for goal-directed or reciprocal interaction between the player and the character in a non-cooperative game setting. Therefore, whether the character is anthropomorphic or human, the player's sharing behavior might not be much influenced by the character's perceived social relevance. Cooperative games, on the other hand, necessitate social collaboration by nature, which makes the character's attributes more noticeable and socially significant. Therefore:

Hypothesis 3: The character in the game would influence the amount of sharing only in the cooperative game. When the game is non-cooperative, there would be no difference between the effects of the human character and anthropomorphic character conditions on sharing.

2. METHOD

In order to test our hypotheses, we conducted an experiment with preschool children. The experiment employed a 2 (game type: cooperative vs. non-cooperative) × 2 (character type: human vs. anthropomorphic animal) between-subjects design. Children were randomly assigned to one of four game conditions: cooperative-human, cooperative-animal, non-cooperative-human, or non-cooperative-animal. Sharing was assessed through two measures: the number of pizza slices served to the other character during the digital game and the number of stickers shared in a subsequent sharing task.

The study was approved by the Institutional Ethics Review Board of Özyeğin University (Confirmation code: 2025/01/03). To collect data in kindergartens, the permission was obtained from the Research Department of the Ministry of Education in Turkey (Application number: MEB.TT.2025.017584). The study's description, hypotheses, sample size estimation, experimental design, variables, and planned analyses were preregistered prior to data collection on AsPredicted.org (https://aspredicted.org/sqqd-dh7t.pdf). Furthermore, a pilot test with 10 preschoolers was carried out prior to the main study to evaluate whether the tasks and instructions of the digital game were age-appropriate and understandable, and to determine whether any modifications were needed. The experimenter observed the children's experiences and task involvement throughout the sessions.

2.1 Participants

Parents of preschool children received consent forms from 17 local preschools in Istanbul, Turkey that had been authorized by the provincial directorate of the Ministry of National Education. Consent forms were provided either digitally or in print, based on

the preferences of school administrators. A total sample size of 158 was required based on an a priori power analysis conducted using G*Power (Erdfelder et al., 1996), assuming an alpha level of .05, power of .80, and a medium effect size. Children refusing to take part in the experiment, inability to follow instructions, or teacher-reported delays in speech and language development were excluded from the analyses (preregistered exclusion criteria). A total of 178 parents provided consent for their children's participation. Seven children were disqualified because they refused to participate to the study (N = 4), could not follow instructions (N = 2), and had teacher-reported language problem (N = 1). As a result, 171 preschool children (M_{age} = 66.42 months, SD_{age} = 8.76, range = 45 – 85, 91 boys) were included in the final sample. Table 2.1 presents the descriptive statistics of participant age by gender for the entire sample. Table 2.2 provides the age distribution across the four experimental conditions. The mean ages and standard deviations were relatively similar across all groups, suggesting a balanced distribution of participant age across conditions (see Figure 2.1).

Table 2.1 Descriptive Statistics of Participant Age by Gender

Child's Gender	*N*	M_{age}	*SD*
Girl	80	66.30	7.88
Boy	91	66.56	9.71
Total	171	66.42	8.76

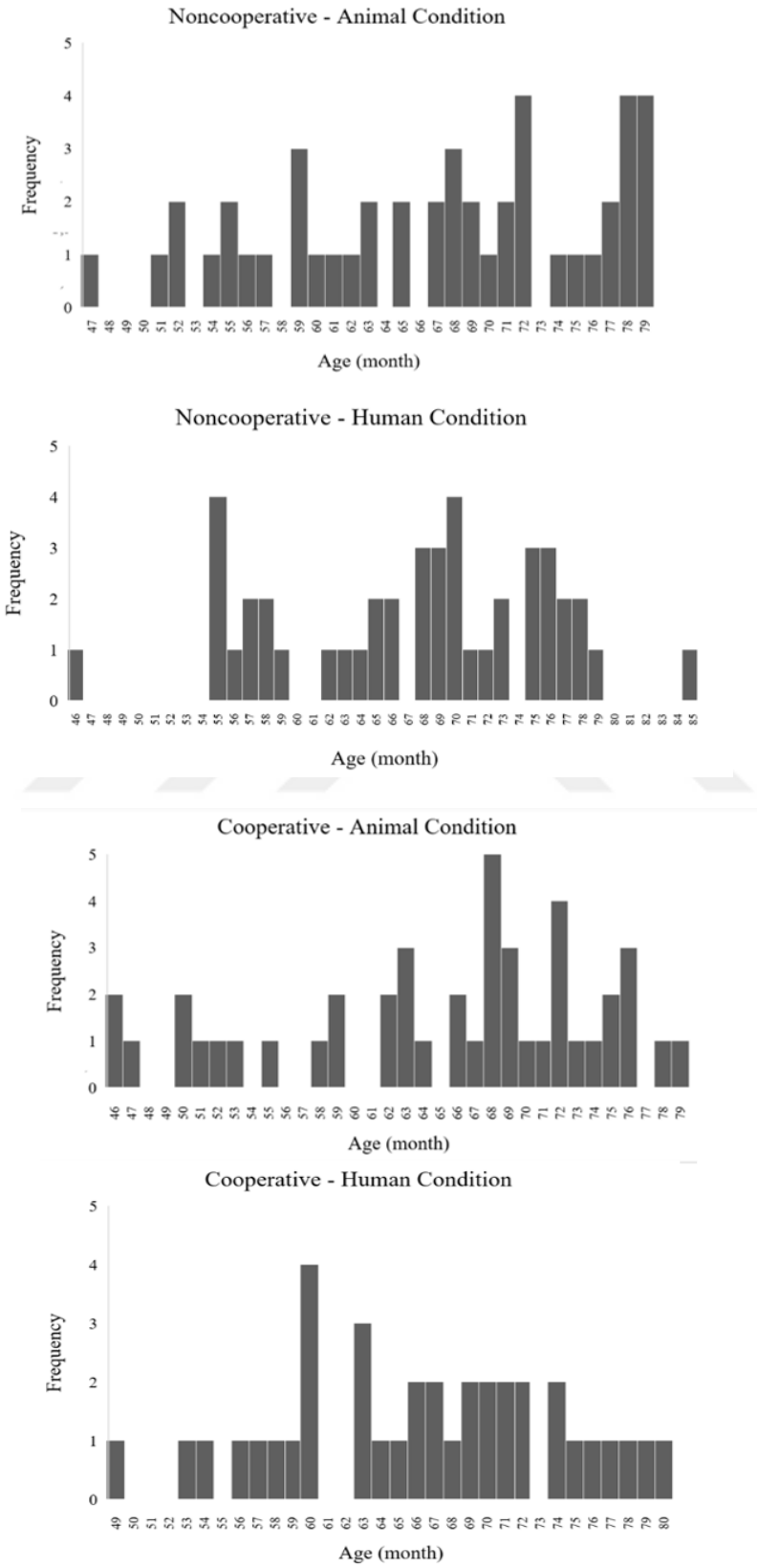
Note. N = Sample Size; M_{age} = Mean; SD = Standard Deviation. Age is reported in months.

Table 2.2 *Descriptive Statistics of Participant Age by Experimental Condition*

Game Type	Character Type	*N*	M_{age}	*SD*
Non-Cooperative	Animal	46	66.89	9.16
Non-Cooperative	Human	44	67.45	8.58
Cooperative	Animal	44	64.98	9.31
Cooperative	Human	37	66.32	7.85
Total		171	66.42	8.76

Note. N = Sample Size; M_{age} = Mean; SD = Standard Deviation. Age is reported in months.

Figure 2.1 *Age Distribution of Participants across Experimental Conditions*



Note. All figures in this thesis, including appendices, were created by the author and are copyright-free.

2.2 Procedure

Before the experimental sessions, participants' parents were requested to read and complete the informed consent form (see Appendix A). At their preschools, the children participated in the experiment individually in a quiet room. Each child was randomly assigned to four versions of the game: (1) a cooperative game with a human character, (2) a cooperative game with an anthropomorphized animal character, (3) a non-cooperative game with a human character, (4) a non-cooperative game with an anthropomorphized animal character.

Children were verbally informed of the processes and their consent was obtained before gaming sessions began. Firstly, demographic information was completed by the experimenter. After that, the Anthropomorphism of Animals subscale of Individual Differences in Anthropomorphism Questionnaire – Child Form (IDAQ-CF; Severson & Lemm, 2016) and then the digital game 'Pizza Star' were administered on a tablet. In this game, children completed a pizza-making task and then were asked to share the slices of pizza between themselves and the other character in the game. Following this sharing decision, the game was over, and the tablets were taken away. After the game, we presented children with 10 stickers and asked them to share these stickers between themselves and another classmate. Throughout the session, the experimenter observed the children to ensure if they needed any help. The children who interrupted to ask questions or make comments received neutral responses, and were gently redirected to the digital game. The children received the stickers they had chosen to keep for themselves after completing all tasks. Sticker-sharing behaviors and responses to manipulation check questions were coded in a separate notebook by the researcher. The whole session lasted approximately 15-20 minutes. All of the data about the participants was anonymized and

stored separately in a secure file that only researchers can access. Children's names or any identifying information were not recorded in the data file, ensuring that the dataset remained fully anonymous. A total of six experimenters (five female, one male) conducted the sessions, each followed a standardized set of instructions during the study to ensure procedural consistency (see Appendix D).

2.3 Pilot Study

A pilot study was conducted with 10 children (M_{age} = 57.9 months, SD_{age} = 7.78, range = 47 – 76, 6 boys) to see if the digital game's design was appropriate for the study's objectives and suitable for preschool-aged children. The pilot also aimed to test whether they understood the instructions and the tasks of the digital game. Participants were randomly assigned to one of the versions of the digital game and asked to play the full game. Additionally, manipulation check questions were also assessed in the pilot test.

Similar to the procedures followed in previous studies (Laranjeiro, 2021), we noted our observations about the clarity of the game instructions, the time required to complete all of the tasks, and the questions asked by the children while playing the game. Some updates were made to the digital game, which are covered in depth in the Materials session below, based on the findings of the pilot testing. Likewise, changes were made to the way the manipulation check questions were presented, which is also discussed in detail in the materials section. It is important to note that these modifications did not change the core content of the game, but only added technical and procedural clarity to the game, such as positioning the time icons closer to the working area, modifying the instructions to reduce priming, and making the screen touchable only after feedback was complete.

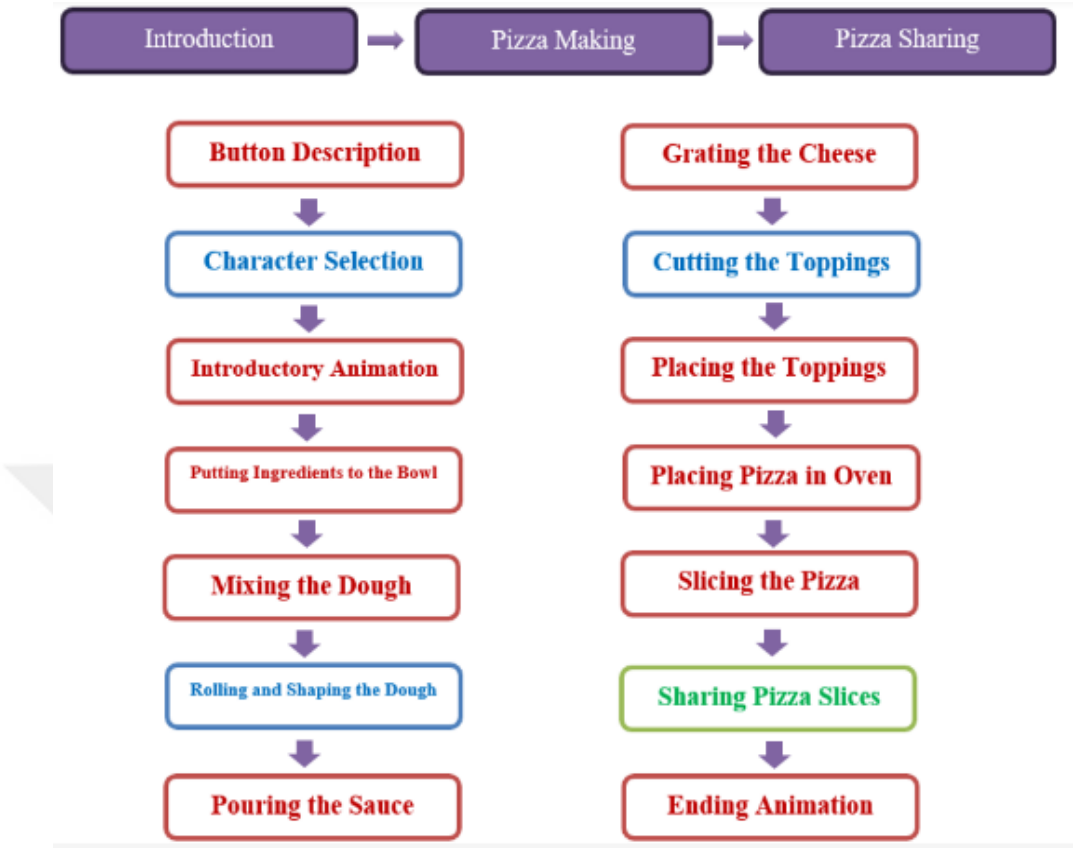
2.4 Materials

2.4.1 Digital Game: Pizza Star

As part of this thesis project, a completely new digital game named as Pizza Star was developed for the current study in accordance with the research objectives and structure of the experimental design (see Figures B1 through B16 and Table B1 in Appendix B). Cooking was chosen as the game's primary mission because of its natural structure, which suggests collaboration, cultural familiarity, and previous usage in related studies (e.g., Iplikci et al., 2022). The development process of the game lasted approximately five months, starting in January, 2025 and ending in May, 2025. The game was designed including its components such as visual layout, characters, sound, structure, design, and flow, to engage the target preschoolers. A professional game developer helped with coding and the technical structure. The digital game was custom-developed by using the Dart programming language and the Flutter Flame (Flame, n.d.) game framework. Player interactions and game-related data were managed through Firebase (Google, n.d.), a cloud-based NoSQL document database platform.

The game was structured in sequential stages: button orientation, character selection, introductory animation, 10 pizza-making subtasks (e.g., ingredient mixing, dough shaping, pizza decoration), the pizza-sharing task, and the closing animation. Each stage was visualized in a process flowchart (see Figure 2.2).

Figure 2.2 *Process Flowchart of Digital 'Pizza' Game*



Note. This figure shows the digital game's flow with three main phases (purple: Introduction, Pizza Making, Pizza Sharing). Steps below each phase depict in-game activities. Blue boxes mark choice points where children selected a character, shaped dough, or chose ingredient order. The green box highlights the sharing phase, where the child distributes pizza slices—capturing the study's measure of prosocial behavior.

Four versions of the game were created based on two independent variables. Two of these versions involve a child making the pizza by themselves, while the other versions involve a child working with the other character to prepare the pizza ingredients. The cooperative versions included alternating tasks between the child and the other character. In contrast, the non-cooperative versions had the child complete all tasks alone. Although the other character was in the setting, they only read a book and did not actively take part in the 'pizza making' process. Both cooperative and non-cooperative game types were developed in two versions, which were played with an anthropomorphic animal character or a human (see Figure 2.3).

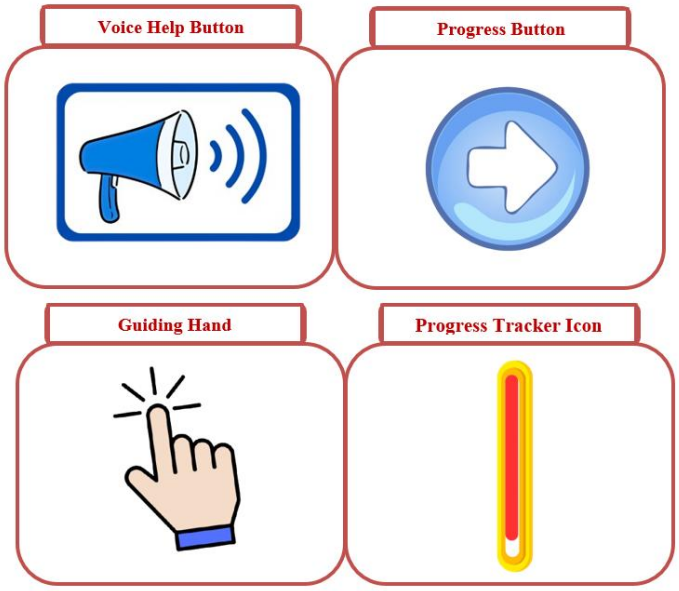
Figure 2.3 *Versions of the Digital Game 'Pizza Star'*

In order to maximize identification and minimize distractibility, the characters were developed to be selected by the participant (Lieberman et al., 2009). Six customizable characters—three girls and three boys—were created to represent a range of skin tones and hairstyles (see Figure 2.4). To guarantee age appropriateness, the researcher also used AI-generated images to construct the characters and then modified them using Canva. To lessen external variability, each character wore neutral outfits and had facial features that were similar. In terms of posture, facial expressions, clothing, and stayed visually consistent across versions. In order to prevent gender bias, an attempt was made to create the 'other' character that did not represent a specific gender. All characters used the same neutral voice, recorded by the researcher using modified vocal tone.

Figure 2.4 *Characters Designed for Digital Game 'Pizza Star'*

Cutting and arranging materials, spreading sauce and grating cheese, preparing and shaping dough, setting the pizza in the oven, and slicing are the four fundamental work processes that make up the foundation of the digital pizza game. The tasks are designed to be completed through touch interaction, taking into account the children's age and motor ability (Kolak et al., 2021). Each task had visual and auditory instructions to ensure comprehension (Callaghan & Reich, 2021), a guiding hand appeared after three seconds of inactivity, and pressing a "next" button was necessary to proceed (see Figure 2.4). The child could alone choose how quickly they engaged, and there was no time limit on any of the tasks (Papadakis et al., 2020; Kolak et al., 2021). A progress tracker icon was also placed on the screen in some tasks to visually indicate how much of the current task had been completed. The icon gradually filled up as the child progressed through each step, helping maintain motivation (see Figure 2.5).

Figure 2.5 *Visual and Interactive Support Elements in the Game Interface*



The game was played on tablets. Using empirical research on early childhood game design, the game was purposefully created for preschool-aged children (Callaghan & Reich, 2021; Kolak et al., 2021; Lieberman et al., 2009; Papadakis et al., 2020). Based on earlier research, it was made sure that the game lasted roughly 15 minutes (Kolak et al., 2021), that the tasks could be completed with basic touch or drag movements (Kolak et al., 2021) and that each step included brief but understandable audible and visual instructions (Callaghan & Reich, 2021; Papadakis et al., 2020). For instance, in all versions, each task was preceded by a short task-sequence animation indicating what the task was and who would perform it. Moreover, throughout the game, feedback was also consistently expressed. Each feedback was intended to be developmentally appropriate and process-oriented (Papadakis et al., 2017; Meyer et al., 2021). Additionally, all visual and auditory feedback across conditions was standardized to prevent feedback-driven variability in behavior.

Children were offered significant choices at various times in the game to reinforce their sense of agency, even though the game was designed with an experimental design (Meyer et al., 2021). Specifically, they were allowed to choose their character at the beginning, select the shape of the pizza dough, and decide the order in which to cut the pizza ingredients. These choices were purposefully included to achieve a balance between experimental control and free will opportunities as highlighted in the research on child-centered digital design (Papadakis et al., 2020; Meyer et al., 2021). This strategy intended to increase participation while preserving the methodological quality of the study.

The literature reviewed on early childhood development, digital media design, and educational app criteria informed each design decision in the Pizza Star game. A summary of abovementioned sources and their influence on the game's features is presented in Table 2.3.

Table 2.3 *Literature-Based Design Criteria for Digital Game*

Design Criterion	Design Feature Implemented	Developmental Justification	Reference
Attention span suitability	Game duration was nearly 15 minutes	Preschoolers have limited sustained attention; shorter playtimes enhance focus	Callaghan & Reich (2021)
Support for identification and engagement	Character selection, visual diversity, same voices	Identification increases engagement and motivation	Lieberman et al. (2009)
Motor skill alignment	One-finger tap, drag-and-drop tasks	Tasks tailored to fine motor skills of preschoolers	Kolak et al. (2021)
Multimodal instruction	Voice-over, icons, hand animations, progress indicators	Non-readers benefit from visual + audio cues	Papadakis et al. (2020); Walker (2012)
Process-oriented feedback	Verbal encouragement after each task	Encouraging effort rather than outcome supports persistence and motivation	Meyer et al. (2021)
Thematic familiarity and realism	Pizza making as culturally neutral, universal theme	Familiar themes support comprehension	Iplikci et al. (2022); Cao et al. (2023)
Avoiding social desirability bias in prosocial tasks	Neutral phrasing: “Serve however you want” during sharing	Prevents suggestive priming; supports spontaneous behavior	Shoshani et al. (2022)
Child agency and free will support	Opportunities to choose character, dough shape, and ingredient order	Structured choices enhance children's sense of control and engagement, even within experimental constraints	Papadakis et al. (2020); Meyer et al. (2021)

Note. All design features were planned and implemented in alignment with empirical findings and evaluation rubrics developed for early childhood digital games (e.g., ETEA, ACE, REVEAC).

The database recorded non-identifiable information including the participant's gender, anonymized identification code, version of the game played, character selection, the number of pizza shared. Although the game could be played offline, in order to automatically send data to a secure database, it needed an active internet connection.

A pilot study was carried out to improve the usability and functionality of the game. Revisions following this phase helped make the game more applicable and engaging for children. The time icons were positioned nearer to the children's work areas. The audio feedback was diminished since the game was too frequently interrupted at some points. To ensure that everyone progressed in the same manner, the screen was made touchable once the instructions and feedback were complete. To avoid extending the time, just the progress button remained active after the task was completed. The instruction 'you can share' was replaced with 'you can serve however you want' to avoid suggestive priming. Furthermore, during the pizza-sharing task, the researcher verbally informed the participant: "There are eight pizza slices here. You can serve them however you like. I won't be watching; let me know when you are done." The researcher then turned away to reduce evaluation pressure and ensure authentic behavior.

Participants' motivation and engagement levels increased as a result of all these adjustments. More significantly, each measure was taken in order to ensure that none of the feedback or instructions unintentionally affected the dependent variable being tested (sharing behavior).

2.4.2 Pizza Sharing Task

Right before the game ended, participants were asked to divide eight pizza slices between the plates of their selected character and the 'other' character. This task was identical across all conditions and served as the primary behavioral dependent variable

for prosociality. The aim was to assess how the perceived collaboration in the game might affect sharing strategies. To ensure experimental control, the pizza was always divided into 8 same slices after cutting, regardless of the dough shape (see Figure 2.5). This prevented children from being influenced by the pizza's shape, toppings, or crust when sharing. In addition, during the pizza slice sharing process, care was taken to ensure that the participant did not think that the other character was watching him/her. Since the characters normally blink, they appear alive during game. Therefore, photographs of the characters were used in this phase, not the characters themselves, to support sharing in a relaxed manner (see Figure 2.6). After the pizza service was completed, an animation was shown with the participant's chosen character wearing a chef's hat, ensuring that the ending of the game was displayed in the same way in each version.

Figure 2.6 *Interface Display During the Pizza Sharing Task*

2.4.3 Anthropomorphism Tendency

Participants were asked questions from the 'Anthropomorphism of Animals' subscale of the Individual Differences in Anthropomorphism Questionnaire-Child Form (IDAQ-CF, Severson & Lemm, 2016) in order to assess their attributions of intentions, emotions, consciousness, and mental states to animals. In the original study, the scale was

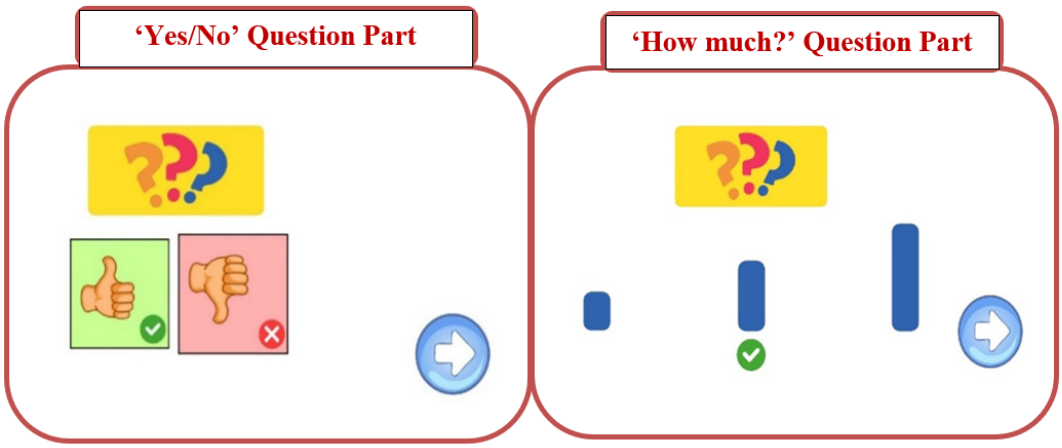
administered to children aged 5, 7, and 9 years. The full IDAQ-CF consists of 12 items and has an overall internal consistency coefficient of $\alpha = .80$. Additionally, the Anthropomorphism of Animals subscale (4 items) has been reported to have high reliability ($\alpha = 0.71$; Severson and Lemm, 2016).

First of all, during the translation process, the researchers who developed the scale were contacted and their opinions were obtained regarding cultural adaptations. The original questionnaire includes 4 items about cheetah, turtle, insect, and lizard. However, due to the fact that some of the animals in the original scale were not suitable for Turkish culture, it was decided to use tiger instead of cheetah, butterfly instead of insect, and rabbit instead of lizard with the support, suggestion, and approval of the researchers who developed the original scale.

The application process was structured according to the age characteristics of the children. First, an information page without questions was shown on the screen. On this page, the following explanation was given to the children: “We will now present some questions to you. These questions have no correct or incorrect answers. We just want to know what you think, so feel free to respond however you choose.” After that, three sets of practice questions were given (“Do you like candy (broccoli, carrots)? If yes, how much?”) prior to the four items being introduced, in order to make sure that the children comprehend how to answer the questions. At this stage, an icon (a yellow box with a question mark) was created to allow children to listen to the questions again whenever they wished (see Figure 2.7). When participants tapped this icon, the question was repeated. Since the training questions were solely meant to help children become familiar with the scale, their scores were excluded from the data analysis. After the exercises, the children were shown the same information sheet again and the following

explanation was given: “Now there will be some questions about animals. Again, there are no right or wrong answers to these questions, we just want you to say what you think.” Then, all 4 items in the anthropomorphism of animals subscale were presented. Scoring procedure was the same as in the original scale (Severson and Lemm, 2016). The child was asked to respond to two questions for each item on the anthropomorphism of animals subscale. For instance, the question about emotions ‘Does a tiger have feelings, like happy and sad?’ can be taken as an example to make clear the scoring. The child received a score of 0 if they selected the "thumb-down (no)" icon on the tablet in response to this question. The second question ("how much?") was presented to the child if they touched the tablet's "thumb-up (yes)" icon in response to the question. In the second question, "a little bit," "a medium amount," and "a lot" were indicated by visual bars of increasing height. Thus, "No" (0), "Yes, a little bit" (1), "Yes, medium amount" (2), and "Yes, a lot" (3) were the codes assigned to the 4-point scale (see Figure 2.7) (see Figures C1 and C2 in Appendix C).

Figure 2.7 *Visuals Used in the Turkish Adapted Questionnaire*



Total scores ranging from 0 to 12. During the application, some children made statements such as “I don’t know” or “How should I answer?” In such cases, the experimenter continued the process by giving the child a non-directive but encouraging response such as “I don’t know either, so I want to know what you think.”

The mean scores for the anthropomorphism of animals subscale (all 4 items) ranged from 0 to 12, and the mean was 6.70 (SD = 3.00), with higher scores indicating greater tendency to anthropomorphize. Internal consistency of the scale was relatively low (α = .49). Inter-item correlations ranged from r = .14 to .32, and all correlations were positive but modest in strength. Despite the low internal reliability, the scale was retained for exploratory analyses, and higher scores were interpreted as indicating greater anthropomorphism tendencies.

2.4.4 Demographic Information

Demographic information consisted of the participant's gender, date of birth, research participation date, game version, and identification code. The parents of the participants provided some of the information through consent forms. The game versions were assigned randomly after parental consent was received, in accordance with the experimental design. Before the experiment began, the researcher entered the assigned game version, participation date, participant’s identification code, gender, date of birth, and gender into the application interface. Identification codes were generated in order to ensure participant anonymity, and the collected data was not linked to the participants' actual names. Moreover, demographics and other gathered data were kept in different folders to maintain confidentiality. Furthermore, access to these files was restricted to the research team only.

2.4.5 Manipulation Check Questions

Participants were asked questions at the end of the digital game session check whether perceptions regarding the cooperativeness and the character type differ between the game versions. These questions were about (i) whether they made the pizza alone or with the other character in the game, (ii) whether the other character in the game was human or animal. Preschool children use visual information more dominantly than auditory input (Hayes & Birnbaum, 1980; Nelson et al., 1976). Also, in our pilot study, it had been observed that some children did not fully understand which character was meant by the phrase “other character”. Therefore, considering that children may have difficulty understanding these questions based on verbal information alone, a presentation supported by visuals was preferred for manipulation check questions.

The researcher used non-leading but thought-provoking questions, such as "Are you sure?" and "Why did you think that?" when the subject was unsure or unable to provide a response. The purpose of these follow-up questions was to gather clues on the child's thought processes. These answers were taken into account in the qualitative process evaluations but were left out of the quantitative analyses.

Studies have shown that children, starting at around the age of three, like their own gender more than others, attribute more positive characteristics to their own gender, and tend to prefer friends of the same gender in play environments (Martin & Ruble, 2004). Therefore, in addition to these two basic questions, an additional question about the gender of the other character in the game was asked to children within the scope of exploratory analyses. In order to examine if the participant’s perception of the gender of the other character could affect sharing behavior (e.g. the number of pizza slices given).

3. RESULTS

This study aimed to examine how different types of game (cooperative vs. non-cooperative) and character types (human vs. anthropomorphic) in a digital game influence preschoolers' sharing behavior. Preliminary analyses, including descriptive statistics and the distribution features of data set, are provided in the data screening section. Following the descriptive statistics, confirmatory analyses were carried out in accordance with hypotheses to assess the impact of cooperation level and character type on sharing behavior. Correlation and comparison analyses with other variables, including age, gender, anthropomorphism scores, and manipulation successes were carried out as exploratory analyses.

3.1 Data Screening

The digital game we created for the study involves four versions: non-cooperative human character, non-cooperative animal character, cooperative human character and cooperative animal character. The findings of the analysis indicate that the number of participants in each edition were comparable (see Table 3.1).

Table 3.1 *Distribution of Participants across Game Versions*

		Character Type		
		Human Character (*n*)	Animal Character (*n)*	Total
Game Type	Non-Cooperative	44 (25.7%)	46 (26.9%)	90
	Cooperative	37 (21.6%)	44 (25.7%)	81
	Total	81	90	171

Note. Percentages are based on the total sample (N = 171).

This study examined the effects of different digital game versions on children's sharing behaviors by treating in-game and post-game sharing behaviors as two separate dependent variables. How many of the eight pizza slices those participants gave to the other game character was the measure of their in-game sharing behavior. Post-game sharing behavior was evaluated through the sticker sharing task performed after the gaming process. We first checked if the normality assumption was met and the data distributions of both dependent variables.

The Shapiro-Wilk test performed for the in-game sharing variable was found to be statistically significant (W = .676, p < .001), which revealed that the distribution deviated from normality. An examination of the histogram revealed that the majority of children distributed the pizza slices equally, typically sending four slices to the other character and retaining four slices for themselves. On average, children gave 3.73 slices to the other person in the game (N = 164, SD = 1.23).

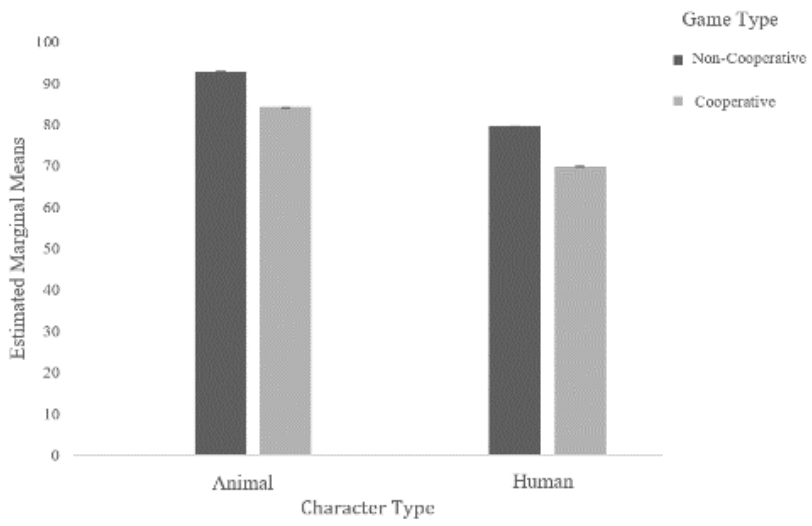
Similarly, the Shapiro-Wilk test performed for the number of shared stickers variable was also found to be significant (W = .816, p < .001). On average, children shared 2.31 stickers (N = 166, SD = 2.34). The histogram distribution also revealed that the data were mostly collected at low values (between zero stickers sent and six stickers sent out of ten) and showed positive skewness. Therefore, dependent variables did not meet the normality assumption. Scheirer-Ray-Hare test, a non-parametric equivalent of ANOVA, was used in the following confirmatory tests.

3.2 Confirmatory Analysis

3.2.1 In-Game Sharing Behavior

To test the hypothesis, nonparametric analysis was favored because the sticker and pizza sharing variables failed to meet the normality assumption. Therefore, we tested our assumption with Scheirer-Ray-Hare test. To do so, we first ranked the sharing scores during the game (i.e., the number of pizza slices given to the other person) and ran a 2 (type of game: cooperative game or non-cooperative game) X 2 (character in the game: human character or anthropomorphic character) between-subjects design ANOVA using SPSS (see Figure 3.1).

Figure 3.1 *Estimated Marginal Means of Pizza Sharing Scores by Character Type and Game Type*



The rank of pizza pieces that children donated to the other character was takes as the dependent variable for the first analysis. The results showed that the main effect of game type was not significant, $F(1,160) = 2.46$, $p = .119$. The main effect for the character type variable was found to be significant in the analysis of variance, $F(1,160) = 5.61$, $p = .019$. Children who played with human characters ($M = 74.80$, $SD = 36.10$) had lower

rank scores than those who played with animal characters (M = 88.57, SD = 37.88), indicating less pizza sharing behavior. The interaction between game type and character type was not significant, $F(1,160) = 0.01$, $p = .926$, (for descriptive statistics, see Table 3.2; for rank scores, see Table 3.3).

Table 3.2 *Descriptive Statistics for Raw Pizza Sharing Scores by Game Type and Character Type*

Game Type	Character Type	*M*	*SD*	N
Noncooperative	Animal	3.98	0.93	46
	Human	3.75	1.08	40
	Total	3.87	1.00	86
Cooperative	Animal	3.81	1.47	43
	Human	3.29	1.34	35
	Total	3.58	1.43	78
Total	Animal	3.90	1.22	89
	Human	3.53	1.22	75
	Total	3.73	1.23	164

Table 3.3 *Pizza Sharing Rank Scores by Game and Character Type*

Game Type	Character Type	Mean Rank	*SD*	N
Noncooperative	Animal	92.86	36.44	46
	Human	79.64	32.67	40
Cooperative	Animal	84.28	39.32	43
	Human	69.97	39.51	35

Age in months was used as a covariate in an exploratory ANCOVA to see if the effects of character and game type on pizza sharing remained after controlling for age differences. The analysis revealed no significant main effect of age, $F(1,159) = 2.12$, $p = .148$, $\eta^2 = .013$, indicating that children's age did not reliably predict the number of pizza slices shared. Game type showed non-significant effect, $F(1,159) = 3.00$, $p = .085$, $\eta^2 =$

.019, suggesting that there was no significant difference in pizza sharing between cooperative and non-cooperative games. Additionally, children who interacted with animal characters shared a little higher number of pizza slices than children who interacted with human characters, $F(1,159) = 3.77$, $p = .056$, $\eta^2 = .023$. The interaction effect between game type and character type was not significant, $F(1,159) = 0.52$, $p = .471$, $\eta^2 = .003$. These results imply that the cooperative structure of the game has little effect on children's pizza-sharing behavior after controlling for age, with the exception of a slight trend preferring animal characters. ANCOVA results are presented in Tables E1 through E6 in Appendix E.

Additionally, outliers were identified and removed to explore whether their exclusion would influence the results, as data removal was not specified in the preregistration. This step was undertaken solely to observe potential changes in the patterns across groups. Detailed results of these supplementary analyses are provided in Tables F4 through F6 in Appendix F.

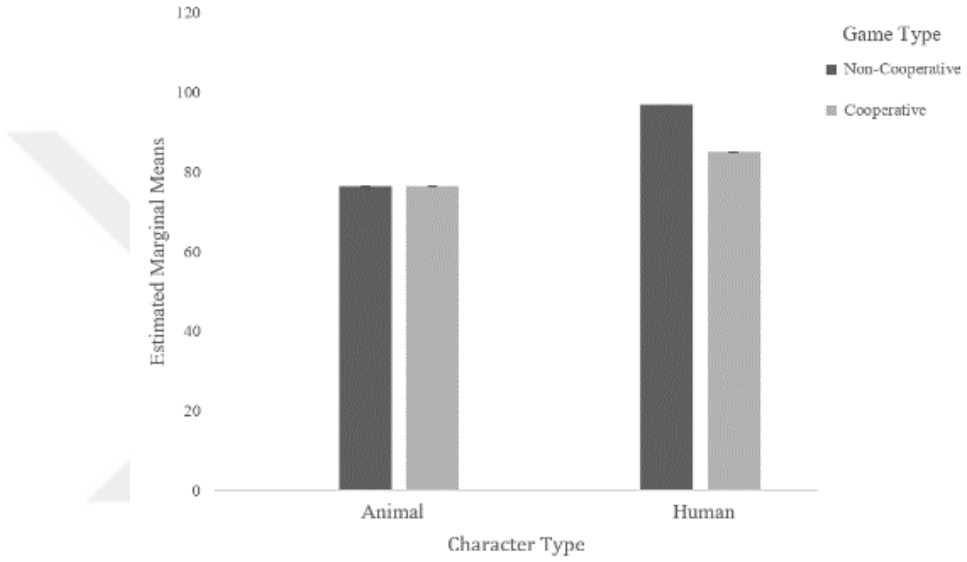
3.2.2 Post-Game Sharing Behavior

In the second analysis, sticker sharing was used as the dependent variable. The same Scheirer-Ray-Hare test, a conservative non-parametric equivalent of ANOVA, was used to test on sticker sharing behavior. We first ranked the scores on stickers shared and then ran a 2 (type of game: cooperative game or non-cooperative game) X 2 (character in the game: human character or anthropomorphic character) between-subjects design ANOVA using SPSS.

The results of the ANOVA for sticker sharing (rank scores) showed no significant main effect for game type, $F(1,162) = 0.71$, $p = .401$. The main effect of character type

was statistically significant, $F(1,162) = 4.13$, $p = .044$. Children who played with animal characters ($M = 76.53$, $SD = 45.30$) had lower sticker sharing rank scores than those who played with human characters ($M = 91.36$, $SD = 45.21$) (see Figure 3.2). The game type × character type interaction was not significant, $F(1,162) = 0.71$, $p = .402$.

Figure 3.2 *Sticker Sharing Rank Scores by Game Type and Character Type*



An exploratory ANCOVA was performed using age in months as a covariate to further investigate whether the effects of game type and character type on sticker sharing were still significant after controlling for age differences. Results indicated a significant main effect of age, $F(1,161) = 12.72$, $p < .001$, $\eta^2 = .073$, suggesting that older children tended to share more stickers. After controlling for age, no significant main effect of game type was found, $F(1,161) = 0.27$, $p = .604$, $\eta^2 = .002$, indicating that cooperative versus non-cooperative game did not impact sticker sharing behavior. However, the main effect of character type was significant, $F(1,161) = 3.33$, $p = .070$, $\eta^2 = .020$, children who engage with human characters shared slightly more stickers than those who play with animal characters. The interaction between game type and character type was not

significant, $F(1,161) = 0.95$, $p = .332$, $\eta^2 = .006$. These findings suggest that, when controlling for age, children's prosocial sharing behavior in the sticker-sharing task is influenced by the type of character rather than the game structure. Full ANCOVA results controlling for age are reported in Tables E1 through E6 in Appendix E.

Additionally, outliers were identified and removed using the same criteria applied in the in-game analyses, with the aim of examining whether their exclusion would alter the findings. As data removal was not specified in the preregistration, these analyses were conducted solely for exploratory purposes. The complete results of these supplementary analyses can be found in Tables F1 through F3 in Appendix F.

3.2.3 Manipulation Check Questions

As manipulation check, participants answered two questions. To assess whether participants correctly identified the other character in the game as either human or animal, a chi-square test of independence was conducted to examine the association between character type and identification accuracy. According to the crosstabulation, 87.8% of children playing with animal characters correctly identified the character as an animal, while 12.2% gave incorrect answers. 97.5% of children playing with human characters gave correct answers, while only 2.5% gave incorrect answers. As a result of the chi-square test, this difference was found to be statistically significant: $\chi^2(1, N = 171) = 5.77$, $p = .016$. This outcome demonstrates that the character manipulation worked effectively and that most children correctly identified the character type.

To assess whether participants correctly identified the cooperative versus non-cooperative nature of the game, a second chi-square test of independence was conducted to examine the association between game type and cooperativeness identification

accuracy. In this analysis, the children's responses of "helped" or "did not help" were compared with the experimentally defined game type. In the cooperative condition, 95.1% of children (n = 77) correctly identified the interaction as cooperative, while 4.9% (n = 4) did not. In contrast, only 58.9% of children in the non-cooperative condition (n = 53) gave accurate responses, while 41.1% (n = 37) misidentified the game type. This difference was statistically significant, $\chi^2(1, N = 171) = 30.60$, $p < .001$, indicating that children in the cooperative condition were more likely to correctly recognize the cooperative nature of the interaction.

3.3 Exploratory Analyses

3.3.1 Relationships Between Age, Sharing Behaviors and Anthropomorphism

Pearson correlation analyses were conducted to examine the relationships between age (in months), sharing behaviors, and anthropomorphism scores. As shown in Table 3.4, age was positively and significantly associated with sticker sharing, $r(166) = .280$, $p < .001$, indicating that older children tended to share more stickers with the other character. In contrast, a negative but non-significant relationship was observed between age and pizza sharing, $r(164) = –.061$, $p = .435$. The correlation between age and anthropomorphism score was also not significant, $r(164) = .031$, $p = .695$.

Table 3.4 *Pearson Correlations Between Key Study Variables*

	Age (months)	Pizza Sharing	Sticker Sharing	Anthropomorphism
Age (months)	—			
Pizza Sharing	–.061	—		
Sticker Sharing	.280**	–.091	—	
Anthropomorphism	.031	.011	–.055	—

Note. ** $p < .01$.

When the answers given to the manipulation check questions were examined in terms of accuracy, age was not significantly related to correctly remembering the type of the game (r = .061, p = .430) or identifying whether the character was human or animal (r = .067, p = .385).

In addition, no significant correlations were found between anthropomorphism scores and either manipulation check performance or sharing behaviors. Specifically, there was no significant relationship between anthropomorphism and identifying whether the character helped (r = .014, p = .855) or recognizing the character as human or animal (r = –.122, p = .120). Likewise, neither pizza sharing (r = .033, p = .674) nor sticker sharing (r = –.045, p = .573) was significantly associated with anthropomorphism scores, indicating that children's sharing behaviors were not significantly influenced by how human-like they perceived the character. These results indicate that sticker sharing was the only behavior significantly associated with age, while no meaningful associations were observed between anthropomorphism and either sharing behaviors or manipulation check success.

3.3.2 Relationships Between Gender, Sharing Behaviors and Anthropomorphism

To explore potential gender differences in sharing behaviors, Mann-Whitney U tests were conducted for both pizza slice sharing and sticker sharing. For pizza slice sharing, no significant difference was found between girls (M = 82.36, n = 76) and boys (M = 82.62, n = 88), U = 3333.50, Z = -0.04, p = .965. For sticker sharing, while boys (M = 89.09, n = 76) appeared to share more stickers than girls (M = 78.78, n = 90), this difference was not statistically significant, U = 2995.00, Z = -1.45, p = .148. These results indicate that gender was not a significant factor in predicting children's sharing behavior in either task.

To determine whether there was a difference in the anthropomorphism scores of boys and girls, a Mann–Whitney U test was conducted. The results indicated that the difference was not statistically significant, $U = 2829.50$, $z = –1.71$, $p = .088$. Although the difference was not statistically significant, girls tended to report slightly higher anthropomorphism scores ($M = 89.27$) than boys ($M = 76.65$).

3.3.3 Comparing Sharing Scores

To assess whether children's sharing behaviors in the digital game (pizza slices) and in the post-game real-life context (stickers) were related, a Pearson correlation and a paired samples *t*-test were conducted using the ranked scores.

The Pearson correlation between the two ranked scores was not statistically significant, $r(159) = –.091$, $p = .253$, indicating that higher sharing in one context did not reliably predict higher sharing in the other.

Similarly, a paired samples *t*-test revealed no significant difference between the mean ranked scores of pizza sharing ($M = 83.23$, $SD = 37.25$) and sticker sharing ($M = 83.02$, $SD = 45.86$), $t(158) = 0.042$, $p = .966$. The effect size was negligible, *Cohen's d* = .003, 95% CI [–.152, .159].

3.3.4 Perceived Gender of the Game Character

Children's answers to the post-game question to find out how they thought about the gender of the game character were examined. This investigation did not include children who misremembered the character type (human vs. animal). Table 3.5 displays the perceived gender frequencies for each character type. The majority of children who engaged with the human figure thought it was a girl, whereas a majority of children who engaged with the animal character thought it was a boy.

Table 3.5 *Frequencies of Children's Perceived Character Gender*

		Character Type	
		Human (*n*)	Animal (*n*)
Perceived Gender	Girl	49	5
	Boy	15	73
Total		64	78

3.3.5 The Effect of Gender Matching

Children display strong gender-based preferences and even early forms of gender bias, which can affect their toy choices, peer interactions, and social judgments as early as age three or four (Serbin et al., 2001; Shutts et al., 2013). They frequently choose peers of the same gender while demonstrating less engagement with peers of the opposite gender (Fabes et al., 2003; Shutts et al., 2013). Not only may these gender-based tendencies influence play preferences, but they can also influence prosocial actions. (Mulvey et al., 2017). Therefore, for exploratory purposes, the association between participant and character gender matching and pizza sharing scores was investigated using the Mann–Whitney *U* test. The matched group included children whose gender aligned with the perceived gender of the other character, while the mismatched group included children whose gender differed. The results showed that the pizza sharing scores of the matched group ($n = 65$, $M = 78.18$) and the non-matched group ($n = 83$, $M = 71.61$). did not differ, $U = 2458.00$, $Z = -1.18$, $p = .236$.

4. DISCUSSION

Numerous studies have demonstrated the role of traditional media, including television and storybooks, in influencing learning and social behavior (Baydar et al., 2008; Cohen, 2012; Kirkorian et al., 2008; Nikolayev, 2015). While these studies provide extensive evidence on how children interact and learn from older media such as movies and television, research examining the effects of newer digital platforms, including online games, on children's learning and behavior remains limited (Levine & Vaala, 2013; Nikolayev, 2015). Recent studies indicate that digital games, increasingly prevalent among children, exhibit comparable developmental potential (Aslan & Turgut, 2023; Clarke & Abbott, 2019; Snell & Snell-Siddle, 2013). Digital games that include cooperative goals have been shown to support children's prosocial behaviors such as sharing and helping (Greitemeyer and Osswald, 2010). The findings align with research conducted in Türkiye (Iplikci et al., 2022) and various cultural contexts (Ramani & Brownell, 2013; Sohrabi, 2021). Most studies examining the effects of digital games have focused on school-age children (Iplikci et al., 2022; Konrath et al., 2023; Leiberg et al., 2011; Narvaez et al., 2008). Digital games are also commonly used by preschoolers, who are among the most sensitive groups to environmental stimuli (Christakis, 2009; Yang et al., 2020). Therefore, the lack of digital game research for the preschool period is striking.

Digital games that are designed to promote children's social development can encourage positive social behaviors (Greitemeyer & Osswald, 2010; Iplikci et al., 2022). The current study aimed to examine sharing behavior exhibited by preschool children in the context of digital games. To this end, a novel game was designed in four different versions to investigate the interaction of the character type (anthropomorphic vs. human) and the game type (cooperative vs. non-cooperative), particularly in relation to children's

sharing behaviors both within and after the game. These behaviors were assessed through two complementary tasks: an in-game sharing task involving pizza slices and a post-game sticker sharing task.

4.1 The Effect of Game Type on Sharing Behavior

Hypotheses 1 predicted that children who played the cooperative version of the game would share more than those who played the non-cooperative version. The findings did not provide support for this prediction. Cooperative and non-cooperative games did not differ in terms of post-game sharing (sticker sharing) or in-game sharing (pizza slices). Descriptively speaking, the average scores were slightly higher in the non-cooperative condition in both cases.

Children only played the game once in the current study, which might have undermined the effect of cooperative structure of the game (Buckley & Anderson, 2006; Greitemeyer & Osswald, 2010). However, beyond the issue of limited exposure, the cooperative components might not have been viewed as truly collaborative or might not have been powerful enough to activate prosocial motives in young children. This necessitates more investigation into how preschoolers perceive cooperation cues in digital games. In order to shed light on cognitive processing during game, we exploratively examined the participants' reflections about the game. Experimenters' observational notes incorporated children's verbal expressions following the game. For the current discussions, notes about children's responses to the post-game question, "Did the character help you while making the pizza?" were examined. Among children who played in cooperative game conditions, 95.1% gave straightforward, accurate answers that followed the principles of the game (e.g., explicitly indicating that the character helped). However, just 58.9% of children who are playing non-cooperative games correctly

responded to the manipulation check questions. Some children who were playing non-cooperative games seemed unsure or hesitant when answering. We examined verbal responses of 32 children who played the game in non-cooperative versions and who provided further information about their own behavior following the experiment. Among those, 25 children indicated that the character helped them. For example, they mentioned that the other character "played the game," "gave milk," or "brought items", claiming that the character helped, despite no assistance being programmed in the game. Eight children misunderstood the character's role. Three were hesitant to critique the other character and provided polite or vague explanations such as, "he helped but I don't want to say how," or "I don't know." One child interpreted the character's passive presence (e.g., standing nearby) as a form of support. This perception of assistance was often justified through examples such as going to the kitchen together, playing with the ball, or receiving guidance from the character while reading the recipe. These responses suggest that children might have interpreted elements such as spending time together and physical proximity as forms of help, regardless of the structural nature of the game.

While the majority of children in the cooperative game condition correctly reported that the character helped them while playing, their reflections showed that they had different perspectives on the cooperation. For example, a few children commented on the background audio feedback provided by the game system. One child, for instance, remarked, "The voice told the other character 'you're working so carefully,' and told me the same—did you hear that?", referring to the prerecorded encouraging phrases delivered during both the peer character's and the child's turns. A couple of children expressed a preference for completing the tasks independently, making comments such as, "I wanted to do it all by myself," or "I wish I had been the one to pour the tomato sauce." The game's

turn-taking structure seemed to be difficult for some children to understand; even though the other character had a assigned role, some children tried to engage with the other character during their turn or to do other character's task, indicating that they did not fully understand the idea of switching roles. These responses, together with inaccurate evaluations of non-cooperative game as cooperative, suggest then preschoolers focused on task roles and responsibilities rather than generating an integrated sense of collaboration. Similar patterns have been reported by Ramani and Brownell (2014), who observed that preschoolers, even when participating in cooperative activities, often prefer to maintain control and closely monitor their partner's performance. In the current study, one likely issue might have been that the cooperative elements embedded in the game were perceived more as a division of labor than as a socially cohesive interaction.

4.2 The Effect of Character Type on Sharing Behavior

The second hypothesis of the study predicted that children playing with human characters would exhibit more sharing behavior compared to those playing with animal characters. The results supported this hypothesis in terms of sticker sharing; however, an opposite pattern was found for pizza sharing. These findings suggest that sharing behavior may vary not only by character type but also by the context in which it occurs. Different from what was predicted based on social identity approach, anthropomorphic characters, which are frequently encountered in digital media (Goldstein & Alperson, 2020), might have been perceived as more familiar and entertaining by children (Hopkins & Lillard, 2021; Weisberg & Richert, 2022); this familiarity might have led greater sharing in the in-game context. In contrast, in the post-game context, children might have perceived the character more as a social figure. In this context, the human character might have been perceived as a more realistic (Cao et al., 2023; Schlesinger & Richert, 2017), trustworthy,

and socially familiar figure (Tajfel & Turner, 1979), which could explain the greater amount of sharing in the post-game sharing task. These explanations are yet speculative and deserve further research.

4.3 The Interaction Between Game Type and Character Type on Sharing Behavior

The third hypothesis of the study proposed that game structure and character type would interact to influence children's sharing behavior. Specifically, it was expected that the human character would elicit greater sharing only in the cooperative game condition, whereas no difference would emerge between character types in the non-cooperative condition. However, the manipulation of game type did not produce the intended effect, and the analyses revealed no significant interaction between game type and character type for either pizza or sticker sharing. As a result, the expected pattern of findings was not observed, and no firm conclusions can be drawn regarding the combined influence of these two factors on children's sharing behavior.

4.4 Age as a Covariate in Prosocial Resource Sharing

The analyses including age as a covariate revealed that age was positively associated with sticker sharing, but no age effect was observed for in-game pizza sharing. These results suggest that developmental differences in prosocial behavior did not appear in the immediate, in-game strategic sharing context, but only in the post-game altruistic sharing assignment. The likelihood of older preschoolers donating resources to a peer who was absent increased with sticker sharing. This result is consistent with earlier studies showing that sharing behavior increases in frequency and consistency as children get closer to the later preschool years, indicating a developmental trajectory where

prosocial motivations and knowledge of resource distribution norms progressively get stronger (Paulus & Moore, 2017).

4.5 Strengths, Limitations, and Future Directions

The digital game designed for this research was developed based on a comprehensive literature review on features appropriate for preschool children. Instead of using different games, developing a game specifically for this research provided a significant advantage in terms of increasing experimental control and decreasing risks of confounding variables. Additionally, the game were carried out through direct digital interaction with the children, and options such as voice guidance and replay were provided in order to decrease experimenter effect. Furthermore, collecting data through a digital infrastructure both reduced data entry errors and enabled the creation of a system that automatically matched demographic information while preserving anonymity. Although the effects of the experimental manipulations were not strong, this digital game—designed in accordance with children's developmental levels and the relevant literature—offers a valuable initial model for the development of similar content in the future.

Although the measurement tools were administered in a fixed order for all participants to ensure procedural standardization, this procedure may have introduced order effects into the results. Both visual and verbal formats were used in the manipulation check questions. For instance, the question "Was the other character a human or an animal?" was supported by visuals, whereas the question "Did the character help you or not?" was presented only verbally. These differences in presentation might have interacted with children's individual comprehension skills, as some children may respond more effectively to visual cues while others may perform better with verbal input.

Children in this age group are frequently exposed to animals that wear clothes or talk in media content, and therefore may have developed a sense of familiarity with such characters. Accordingly, future studies may comparatively examine the effect of animal characters with more pronounced fantastical features (e.g., alien forms or unrealistic environmental settings). Additionally, in non-cooperative conditions, removing the character entirely from the game environment or positioning it farther away could be evaluated in terms of its impact on children's social perception of the character. This would help to distinguish more clearly between the effects of the character's mere presence and active cooperation.

In future studies, game design can be slightly adjusted to improve measurement capacity. For example, presenting the pizza slices as if they belong entirely to the participant (e.g., by placing all slices on the child's plate) could allow for a clearer examination of the effect of decision-making in resource allocation. Moreover, the equal arrangement of pizzas in two rows (top and bottom) on the screen may also have influenced sharing preferences. The impact of this visual layout could also be investigated in future research.

Children's understanding of the experimental manipulation and the post-game questions is another significant limitation. Despite the game's developmentally appropriate language and illustrations, it's still possible that some children didn't fully comprehend the character's role or the game's cooperative vs non-cooperative nature. Similar to this, some preschool-aged participants may find it difficult to reflect on their experience in the post-game interview questions. Children's interpretations and responses to the task may have been influenced by misunderstandings or individual variances in language and cognitive development. Namely, the age range of the participants might

limit their ability to grasp the intended structure of the game; older children might have been better able to understand the cooperative or non-cooperative nature of the interaction. Future studies should consider incorporating more direct measures of comprehension or simplified ways of checking children's understanding throughout the game.

Although the digital game used in this study was implemented in a single session, future research could test whether repeated use of the game reinforces prosocial behaviors over time. Additionally, developing multiplayer versions that allow parent-child interaction through game design may strengthen family relationships while also enhancing children's social learning processes.

In order to assess behavioral change over time, the current study did not provide pre- and post-test data, although using an experimental design with controlled variation of game and character types. It cannot be regarded as a comprehensive intervention as a result. In future studies, research might use a longitudinal intervention methodology, where children play the game repeatedly over several sessions and their prosocial behaviors might be evaluated both before and after the intervention. With this method, researchers could assess the long-term as well as the short-term impacts of game-based manipulations on prosocial behavior, enhancing the argument of the positive impacts of cooperative digital games.

Finally, although the game characters were carefully designed to be gender-neutral in terms of voice, name, and appearance, participants consistently assigned a female gender to the other character, regardless of their own gender. Given that character perception can influence children's social responses, future studies should consider explicitly matching the other character's gender to the participant's own gender. Such

matching could reduce the influence of gender-based biases and help ensure that children's prosocial behaviors are shaped more by the game context than by gendered assumptions.

4.6 Conclusion

The current study aimed to investigate how, in the setting of digital games, the type of character (human vs. anthropomorphic animal) and the game (cooperative vs. non-cooperative) influence the sharing behaviors of Turkish preschool-aged children. In order to differentiate between the effects of these variables, sharing behavior was evaluated using both in-game (pizza) and post-game (sticker) tasks.

The anticipated positive effect of human characters was only seen in the post-game sharing task, and children did not share more in the cooperative game condition, which was contrary to our initial hypotheses. Indeed, when children played with anthropomorphic animal characters, especially in the non-cooperative condition, in-game sharing was surprisingly higher. These unexpected findings suggest that preschoolers' prosocial behavior is highly context-sensitive and may not align with adult conceptions of cooperation or character realism.

The findings present a more complex picture in which children's sharing decisions might have been influenced by perceived familiarity, task framing, and personal interpretation of social cues. These patterns may reflect underlying cognitive and social processes such as identification, perceived companionship, or schematic interpretations of character roles.

By systematically manipulating character and game types and incorporating both behavioral tasks and child feedback, the present study contributes to a growing body of literature on digital media and early prosocial development. Future studies can examine

the ways in which digital environments interact with individual differences (e.g., gender, temperament, and language skills), character familiarity, and repeated exposure to shape young children's social decisions over time.

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APPENDICES

APPENDIX A. PARENTAL CONSENT FORM IN TURKISH AND ENGLISH

Parental Consent Form in the Original Turkish

Sayın Veli;

Aşağıda bilgileri yer alan araştırma T.C. Millî Eğitim Bakanlığının izni ile gerçekleşmektedir. Araştırma uygulamasına katılım tamamıyla gönüllülük esasına dayalı olmaktadır. Çocuğunuz araştırmaya katılıp katılmamakta özgürdür ve çocuğunuzun herhangi bir zamanda çekilme hakkı vardır. Araştırma çocuğunuz için herhangi bir istenmeyen etki ya da risk taşımamaktadır. Çocuğunuzun katılımı sizin onayınıza bağlıdır. Araştırmaya katılım sağlanamaması veya araştırmadan ayrılma durumunda öğrencilerin akademik başarıları, okul ve öğretmenleriyle olan ilişkileri etkilenmeyecektir. Bu çalışma, sadece bilimsel amaçla yürütülmektedir. Araştırmada öğrencilerden kimlik belirleyici hiçbir bilgi istenmemektedir. Cevaplar gizli tutulacak ve sadece araştırma ekibi tarafından toplu olarak değerlendirilecektir. Onay vermeden önce konu ile ilgili herhangi bir sorunuz varsa aşağıda iletişim bilgileri verilen araştırmacıya sorabilirsiniz.

Araştırmacının Adı Soyadı	Fatma Zülal Pireli
Araştırmacının İletişim Bilgileri	E-mail: zulal.pireli@ozu.edu.tr Özyeğin Üniversitesi, Psikoloji Bölümü
Araştırmanın Adı	Okul Öncesi Dönemdeki Çocuklarda Paylaşma ve İşbirliği Davranışlarının Dijital Oyunlar ile Geliştirilmesi
Araştırmanın Amacı	Bu araştırma, dijital oyunların okul öncesi dönemdeki çocukların paylaşma ve işbirliği davranışlarına etkisini incelemeyi amaçlamaktadır. Bu etkinin ise dijital oyunun özellikleri (dijital oyundaki karakterler, oyunun teması ve gereklilikleri gibi) üzerinden incelenerek açıklanması hedeflenmektedir. Bu çalışmanın okul öncesi dönemdeki çocukların yaşlarına uygun ve ayrıca

	çocukların sosyal ve bilişsel gelişimlerine destek olacak yeni dijital oyunların geliştirilmesine katkı sağlaması hedeflenmektedir.
Süreç	Bu çalışmada birkaç farklı aşama bulunmaktadır. Çalışma kapsamında çocuğunuza ilk önce hayvanlar hakkındaki genel görüşleri sorulacak, daha sonra çocuğunuz yaklaşık 10 dakika süren ve pedagoglar eşliğinde gelişim düzeyine uygun olarak tasarlanan bir dijital oyunu oynayacaktır. Son olarak ise çocuğunuzun tasarlanan dijital oyundan ne öğrendiğini ölçmeyi amaçlayan çok kısa sürecek basit bir ölçüm yapılacaktır. Çocuklarınıza katılımı ve araştırmaya desteği karşılığında ufak bir hediye verilecektir. Bu dijital oyun okul idaresinin uygun gördüğü saatlerde sınıf ortamında oynanacaktır. Proje için çocuğunuz ile sadece bir kere görüşülecektir ve toplam görüşmenin 15-20 dakika sürmesi beklenmektedir.

Not: Çalışmaya katılım sağlanabilmesi için arka sayfadaki bilgilerin doldurulması gereklidir.

Yukarıda sözü geçen "Okul Öncesi Dönemdeki Çocuklarda Paylaşma ve İşbirliği Davranışlarının Dijital Oyunlar ile Geliştirilmesi" isimli araştırma projesinin detaylarını okudum ve bu proje ile ilgili sorularım cevaplandı. Bu araştırmaya çocuğum "katılımcı" olarak davet edildi. Velisi bulunduğum ..... isimli öğrencinin yukarıda açıklanan araştırmaya katılmasına izin veriyorum.

(*Lütfen formu imzaladıktan sonra çocuğunuzla okula geri gönderiniz.)

Tarih: …../…../……..

İmza:

Velinin Adı-Soyadı:

Çocuk Adı-Soyadı:

English translations of the instructions

Dear Parent,

The research project described below is conducted with the permission of the Ministry of National Education of the Republic of Turkey. Participation in the study is entirely voluntary. Your child is free to participate or not, and may withdraw from the study at any time. The research does not pose any known risk or adverse effect to your child. Your child's participation depends on your consent. Choosing not to participate or to withdraw will not affect your child's academic success, or their relationship with teachers or the school. This study is conducted solely for scientific purposes. No personally identifying information will be collected from participants. All responses will be kept confidential and evaluated collectively by the research team. If you have any questions before giving your consent, please feel free to contact the researcher listed below.

Researcher's Name-Surname	Fatma Zülal Pireli
Contact Information	E-mail: zulal.pireli@ozu.edu.tr Özyeğin University, Department of Psychology
Title of the Study	Fostering Sharing and Cooperation Behaviors in Preschool Children Through Digital Games
Purpose of the Study	This study aims to examine the effects of digital games on preschool children's sharing and cooperation behaviors. It specifically investigates how game features (e.g., game characters, theme, and requirements) influence this effect. The goal is to contribute to the development of age-appropriate digital games that support children's social and cognitive development.
Procedure	This study consists of several stages. First, your child will be asked some general questions about animals. Then, your child will play a

	developmentally appropriate digital game designed in collaboration with child development specialists, lasting approximately 10 minutes. Finally, a brief task will be administered to assess what your child learned from the digital game. As a token of appreciation, participating children will receive a small gift. The game will be played in the classroom at a time approved by the school administration. There will be only one session with your child, and the entire process is expected to take about 15–20 minutes.

Note: To participate in the study, the form on the back page must be completed.

I have read the details of the research project titled "Enhancing Sharing and Cooperation Behaviors in Preschool Children Through Digital Games" mentioned above, and all of my questions regarding the project have been answered. My child has been invited to participate in this study as a "participant."
I hereby give permission for my child, ..., to take part in the research described above.
(Please sign the form and return it to the school with your child.)

Date: …../…../……..

Signature:

Parent Name – Surname:

Child's Name – Surname:

Child's Date of Birth: …../…../……..

APPENDIX B. DIGITAL GAME ‘PIZZA STAR’

Versions of the Digital Game

For this study, a pizza-making digital game named ‘Pizza Star’ was designed. In the cooperative condition, the pizza was prepared collaboratively with another character. In the non-cooperative condition, the character chosen by the participant prepared the pizza alone, while the other character looked at a book. This approach aimed to eliminate the presence of another character as an alternative explanation, thereby testing how working or not working collaboratively with another character influences subsequent sharing behaviors. Each game type also had two distinct character versions: one with a human character and another with an anthropomorphic animal character. Therefore, the game consisted of four versions (see Figure B1): cooperative–human character; cooperative–anthropomorphic character; non-cooperative–human character; and non-cooperative–anthropomorphic character. Participants were randomly assigned to one of these four game versions.

Figure B1 *Illustration of Digital Game Versions*

Phases of the Game

Start of the Game

At the beginning of the game, participants are introduced through an animation to the "audio help button," which they can use at any stage of the game, and the "next button," which allows them to proceed through the game. After this introductory phase, participants press the next button to move on to the character selection stage (see Figure B2).

Figure B2 *Game Start and Button Introduction*

Character Selection

The participant's character is human-shaped across all game versions. Because participants' identification with their characters is important for engagement and attention to the game (Lieberman et al., 2009), participants select their own character before starting the game in all four versions (see Figure B3).

Figure B3 *Character Selection Phase*

Introductory Animation

To ensure the context and objective of the game are clear for each version (Lieberman et al., 2009), an animated video is shown before participants start making pizza. In this animation, participant's character expresses hunger while playing with another character, then they move toward to the kitchen (see Figure B4). The same animations were used across all game versions, differing only in terms of the characters according to each version.

Figure B4 *Introductory Animation Created for Clarifying the Game's Objective*

Displaying Turn-Taking

As part of the game, tasks are assigned to each character, including the participant's character. At the start of each task, a short animation indicates whose turn it is (see Figure B5). This helps to clearly structure the game and makes it easier for children to understand the game, the tasks, and whose turn it is.

Figure B5 *Turn-Taking Animations*

Game Stages

In the cooperative condition, both the participant's character and the other character are assigned tasks necessary to complete the pizza (see Table B1). To successfully finish the pizza, the player must follow these instructions and collaborate with the other character. The tasks performed by the other character are consistent across all cooperative versions and are presented through animations. In the non-cooperative condition, however, the participant completes all tasks alone, and although the other character is present in the kitchen, they do not assist in making the pizza.

Table B1 *Task Distribution Table across Versions*

Tasks in the Game	Cooperative Version		Non-cooperative Version	
	Participant	*Other Character*	*Participant*	*Other Character*
Putting Ingredients to the Bowl	✓		✓	
Mixing the Dough		✓	✓	
Rolling and Shaping the Dough	✓		✓	
Pouring the Sauce		✓	✓	
Grating the Cheese	✓		✓	
Cutting the Toppings	✓	✓	✓	
Placing the Toppings	✓	✓	✓	
Placing Pizza in Oven		✓	✓	
Slicing the Pizza	✓		✓	
Sharing Pizza Slices	✓		✓	

Note. In the cooperative condition, both the participant and the other character perform the topping-cutting and topping-placing tasks. Both characters cut and place the same ingredients. In both tasks, the other character completes the action first, followed by the participant's character performing the same task.

Game Ending Animation

In this phase, an animation is shown in which the participant's character wears a chef's hat, and it is stated that they have successfully completed all the stages. This animation is the same across all versions (see Figure B6).

Figure B6 *Game Ending Animation*

Illustrations of Tasks in the Digital Game

Ingredient Addition Task

In this stage, flour, water, oil, and salt are poured into a bowl. This task is performed by the participant in all versions (see Figure B7).

Figure B7 *Illustrative Representation of the Ingredient Addition Task*

Mixing Ingredients Task

In this stage, the ingredients are mixed using a mixer or a spoon. In the cooperative versions, an animation is shown indicating that this task is performed by the other character (see Figure B8).

Figure B8 *Illustrative Representation of the Mixing Ingredients Task*

Dough Rolling and Shape Selection Task

In this stage, the shape of the dough is selected, the dough is placed on the counter, and it is rolled out with a rolling pin and cut according to the chosen shape. This task is performed by the participant in all versions (see Figure B9).

Figure B9 *Illustrative Representation of the Dough Rolling and Shape Selection Task*

Pouring Tomato Sauce on the Dough Task

In this stage, the tomato sauce, which is prepared in a bowl, is poured over the rolled-out dough. In the cooperative versions, an animation is shown indicating that this task is performed by the other character (see Figure B10).

Figure B10 *Illustrative Representation of the Pouring Tomato Sauce Task*

Grating Cheese onto the Dough Task

In this stage, cheese is grated onto the dough. This task is performed by the participant in all versions (see Figure B11).

Figure B11 *Illustrative Representation of the Grating Cheese Task*

Ingredient Cutting Task

In this stage, mushrooms, peppers, sausage, and olives are cut. In the cooperative versions, an animation is first shown in which the other character cuts half of the ingredients, and then the participant cuts the remaining ones. In the non-cooperative version, the participant performs the entire task alone. The number of ingredients cut by the participant is kept equal across both versions (see Figure B12).

Figure B12 *Illustrative Representation of the Ingredient Cutting Task*

Placing the Cut Ingredients Task

In this stage, the cut ingredients are placed on the pizza. In the cooperative versions, an animation is first shown in which the other character places half of the ingredients, and then the participant places the remaining ones. In the non-cooperative version, the participant performs the entire task alone. The number of ingredients placed by the participant is kept equal across both versions (see Figure B13).

Figure B13 *Illustrative Representation of the Placing the Ingredients Task*

Placing the Pizza in the Oven Task

In this stage, the pizza is placed in the oven, baked, and then returned to the counter. In the cooperative versions, an animation is shown indicating that this task is performed by the other character (see Figure B14).

Figure B14 *Illustrative Representation of the Placing the Pizza in the Oven Task*

Cutting the Pizza Task

In this stage, the baked pizza is cut into eight equal slices. This task is performed by the participant in all versions (see Figure B15).

Figure B15 *Illustrative Representation of the Cutting the Pizza Task*

Serving the Pizza Slices Task

In this stage, the same eight pizza slices on the tray need to be served. This task is performed by the participant in all versions. The served slices are placed in the same positions on the plates (see Figure B16).

Figure B16 *Illustrative Representation of the Serving the Pizza Slices Task*

APPENDIX C. ANTHROPOMORPHISM TENDENCY QUESTIONNAIRE

Before starting the digital game, a subscale of the 12-item Individual Differences in Anthropomorphism Questionnaire – Child Form (IDAQ-CF; Severson & Lemm, 2016) was used to assess children's anthropomorphic thinking about animals for exploratory analyses. Specifically, the 4-item "Anthropomorphism of Animals" subscale was administered. The questions were answered via tablet and read aloud to the participants. A button was provided on the screen in case a participant wants the question to be repeated.

For this thesis, the "Anthropomorphism of Animals" subscale was translated into Turkish in collaboration with developmental psychologists and academic experts to ensure linguistic and developmental appropriateness. During the translation process, the creators of original questionnaire (Dr. Rachel Severson and Dr. Kristi Lemm) were consulted to maintain content fidelity.

Questionnaire Procedure

Practice Questions

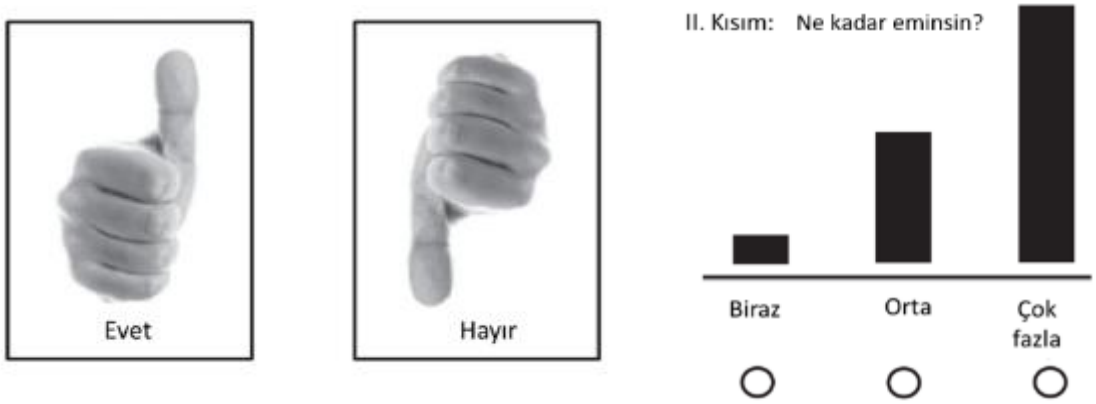
The IDAQ-CF will be administered via tablet and will begin with three practice questions, as in the original scale. Children will be asked whether they like candy, broccoli, and carrot with yes/no questions (Severson & Lemm, 2016). Children will answer using images consistent with the original visuals indicating "yes" and "no" (see Figure C1). If the child responds "yes," they will be asked how much they like it, choosing from "a little," "some," or "a lot," also using relevant visuals (see Figure A1). Following the practice items, the "Anthropomorphism of Animals" subscale items will be presented.

Main Questionnaire Items

As in the practice section, each question will begin with a yes/no prompt, followed by a question about the degree of certainty. Responses will be given via visuals. Scoring will follow the original system: "No" (0), "Yes, a little" (1), "Yes, somewhat" (2), and "Yes, a lot" (3). Each child's anthropomorphism tendency score will be calculated accordingly (Severson & Lemm, 2016). The original questionnaire items were as follows (Severson & Lemm, 2016):

- Do you like candy? If yes, how much?
- Do you like broccoli? If yes, how much
- Do you like carrot? If yes, how much?
- Does a turtle do things on purpose? If yes, how much?
- Does a cheetah have feelings, like happy and sad? If yes, how much?
- Does a lizard know what it is? If yes, how much?
- Does an insect or bug think for itself? If yes, how much?

Figure C1 *Visuals Used in the Original Study of the Questionnaire*



Note. The image on the left was used for the first question, which required a yes/no response. If the participant selected the image indicating "no," the next question was presented. If the participant chose the image indicating "yes," a follow-up question was asked, accompanied by the image on the right. In this second step, the participant selected one of the rating scale representing the amount (e.g., a little, some, a lot), and their response was scored accordingly.

Turkish Adapted Questions (Including Practice Questions)

To minimize experimenter effects, all questions were presented via tablet. Pause points were included between sections to introduce the practice items and to facilitate a smooth transition to the main questionnaire. The questions were delivered through pre-recorded audio on the tablet, and participants were able to replay the audio if needed (see Figure C2). As in the original questionnaire, participants who responded "no" to the first prompt immediately proceeded to the next question without completing the follow-up rating.

Because the study is conducted in Turkey, and animals like cheetahs, lizards, and bugs are either less familiar or often perceived negatively by children, culturally relevant and more positively viewed substitutes were used. In consultation with the scale authors (Dr. Rachel Severson and Dr. Kristi Lemm), "cheetah" was replaced with "tiger," "lizard" with "rabbit," and "bug" with "butterfly." The Turkish adapted questionnaire items are listed below:

- Do you like candy? If yes, how much? (Translation: Şeker sever misin? (Eğer evet işaretlenirse) Ne kadar seversin?).
- Do you like broccoli? If yes, how much? (Translation: Brokoli sever misin? (Eğer evet işaretlenirse) Ne kadar seversin?).
- Do you like carrot? If yes, how much? (Translation: Havuç sever misin? (Eğer evet işaretlenirse) Ne kadar seversin?).
- Does a turtle do things on purpose? If yes, how much? (Translation: Bir kaplumbağa bir şeyi bilerek ve isteyerek mi yapar? (Eğer evet işaretlenirse) Ne kadar yapabilir?).
- Does a tiger have feelings, like happy or sad? If yes, how much? (Translation: Bir kaplanın duyguları var mıdır, örneğin mutlu veya üzgün hisseder mi? (Eğer evet işaretlenirse) Ne kadar hissedebilir?).

- Does a rabbit know what it is? If yes, how much? (Translation: Bir tavşan kendisinin ne olduğunu bilir mi? (Eğer evet işaretlenirse) Ne kadar bilebilir?).
- Does a butterfly think for itself and make its own decisions? If yes, how much? (Translation: Bir kelebek kendi başına düşünür mü, kendi kararlarını alır mı? (Eğer evet işaretlenirse) Ne kadar düşünebilir?).

Figure C2 *Visuals Used in the Turkish Adapted Questionnaire*

1.

2.

3.

Note. The first image shows a pause point before practice and animal-related items, with short instructions. The second image depicts the main response phase, where questions were played aloud and could be replayed via the yellow button; selected answers shrank, and a "next" button appeared. The third image shows follow-up "is yes" items for participants who answered "yes," with responses confirmed by a checkmark before proceeding.

APPENDIX D. INSTRUCTIONS IN TURKISH AND ENGLISH

Instructions in Turkish

Araştırma için katılımcılara aşağıdaki yönerge uygulanacaktır. Araştırmayı yürütecek olan kişi (uygulayıcı), katılımcıyı sınıfından almadan önce gerekli materyalleri (tablet, zarflar, ve çıkartma) bir masanın üzerinde hazır tutacaktır. Daha sonra uygulayıcı katılımcıyı sınıfından almaya gidecek ve boş sınıfa getirecektir.
Katılımcıların her biri uygulayıcı ile görüşmeye katılmadan önce dijital oyunun dört farklı versiyonundan birine rastgele atanacak ve her katılımcı için kimliklerini belli etmeyecek şekilde yeni bir isim oluşturulacaktır.

1. **Tanışma: Katılımcı sınıfından alınıp ve sessiz bir odaya getirildikten sonra "Merhaba, hoş geldin! Benim adım *[Uygulayıcı İsmi*]! Senin adın ne? Merhaba *[çocuğun adı*]! Bugün seninle tabletten pizza yapma oyunu oynayacağız. Seninle bu oyunu oynayacağım için çok heyecanlıyım! Sen daha önce hiç tabletten, bilgisayardan veya telefondan oyun oynamış mıydın?" denilir.**

    - **[Evet derse] "**Aaaaaa, ne kadar güzel! O halde, bu oyunu kolayca oynayacak ve bence çok seveceksin, çok eğlenceli olacak!
    - **[Hayır derse]** O zaman bu senin ilk oyunun olacak ne kadar heyecanlı!

[Uygulayıcıya not: Çocuğun rahatlayabilmesi için öncelikle biraz havadan sudan sohbet etmeliyiz. Eğer bir çocuk özellikle konuşmakta zorlanıyorsa sevdiği oyunlar hakkında sorular sormak rahatlamasına yardımcı olabilir. Eğer çocuk rahat görünüyorsa bu kısım kısa tutulabilir.]

2. **Pizza oyununa başlamadan önce tabletten birkaç soruya yanıt vermeni istiyorum. Sonra pizza yapma oyununa başlayacağız. Ne dersin, soruları cevaplamak ve daha sonra pizza oyunu oynamak ister misin? (Çocuklardan alınan sözlü onam kısmı)**

    - **[Evet derse]** Harika! Hemen soruları açıyorum o halde. Soruları açmadan önce bana sormak istediğin bir şey var mı?
        - **[Evet derse ve soru sorarsa]** Sorulan sorunun cevabı verilir.
        - **[Hayır derse]** O zaman sorulara başlayabiliriz.
    - **[Hayır derse]** Pizza oyununa geçmemiz için bu soruları yanıtlaman gerekiyor. Ben de sana yardımcı olmak için burada olacağım. Ayrıca soru cevaplama kısmı çok kısa sürecek. Bence çok hızlı bitirebilirsin. Sorulara bakmak ister misin?
        - **[Evet derse]** Harika! Hemen soruları açıyorum o halde. Soruları açmadan önce bana sormak istediğin bir şey var mı?

- **[Evet derse ve soru sorarsa]** Sorulan sorunun cevabı verilir
- **[Hayır derse]** O zaman sorulara başlayabiliriz.

▪ **[Hayır derse] Çocuğun adı,** ebeveyninin/annenin bu soruları cevaplayacağından ve pizza oyununu beraber oynayacağımızdan haberi var ve izin verdi. Ayrıca eğer sorulara cevap vermek istemezsen veya oyunu oynamaya devam etmek istemezsen istediğin zaman söyleyebilirsin. Ben de sana yardımcı olmak için burada olacağım, çok eğlenceli vakit geçireceğimize eminim. Belki başlarsan fikrin değişebilir. Ne dersin başlayalım mı?

- **[Evet derse]** Mükemmel! O zaman hazırsan sorularla başlayalım.
- **[Hayır derse]** Peki sen bilirsin. Bu senin kararın, eğer istemiyorsan soruları cevaplamak veya oyunu oynamak zorunda değilsin. Ancak eğer fikrini değiştirirsen öğretmenine söylemen yeterli. Yine de tanıştığımıza çok sevindim.

3. **Katılımcı araştırmaya katılımı kabule ettikten sonra uygulamada katılımcının isim kodu, atandığı versiyon, araştırmaya katılım tarihi ve doğum tarihi kodlanacak ve daha sonra tablet katılımcıya verilecektir.**
4. **Uygulayıcı, tablette soruların açık olduğundan, sesin en yüksek şekilde olduğundan ve tabletin şarjının yeterli olduğundan emin olmalıdır.**

o "Şimdi bu tablette bazı sorular sorulacak. Bu soruların doğru veya yanlış cevabı yok. Ben sadece sen ne düşünüyorsun onu merak ediyorum. Şimdi hazırsan soruları duymak için ilerleme tuşuna basabilirsin!" denilerek sessizce egzersiz soruları bitene kadar katılımcının yanında oturulacaktır. Katılımcılara ilerlemek için hangi tuşa basması gerektiği, tabletteki yönergeleri tekrar dinlemesi için hangi tuşa basması gerektiği, soruları cevaplamak için nereye dokunması gerektiği ilk soruda gösterilir. Böylelikle IDAQ-CF sorularının nasıl cevaplanacağı katılımcı tarafından deneyimlenecektir.

▪ Katılımcı herhangi bir soru sorarsa soruya katılımcının tabletteki sorulara olan cevaplarını yönlendirmeyecek şekilde uygun cevaplar verilecektir. Katılımcı sorulara ne yanıt vermesi gerektiği hakkında sorular sorarsa egzersiz sorularının aynısı yavaşça tekrar edilir ve her seçeneğin ne demek olduğu açıklanır (Bu evet/hayır demek, Bu çok az/orta derecede/çok eminin demek). Daha sonra katılımcıya "Bu senin kararın" denilir ve katılımcı bir cevaba yönlendirilmez.

5. **Egzersiz soruları bittiğinde;**

    - "Sorularını çok iyi şekilde cevapladın. Şimdi hayvanlarla ilgili sorular gelecek. Bu soruların da doğru veya yanlış cevapları yok. Sadece ne düşünüyorsan ona uygun işaretleme yapman yeterli"." denilerek sessizce sorular bitene kadar katılımcının yanında oturulacaktır.
        - Katılımcı herhangi bir soru sorarsa soruya katılımcının tabletteki sorulara olan cevaplarını yönlendirmeyecek şekilde uygun cevaplar verilecektir. Katılımcı sorulara ne yanıt vermesi gerektiği hakkında sorular sorabilir. Böyle sorular gediğinde egzersiz soruları hatırlatılır her seçeneğin ne demek olduğu açıklanır. Daha sonra katılımcıya "Bu senin kararın veya Ben de bilmiyorum, sen ne düşünüyorsun" denilir ve katılımcı bir cevaba yönlendirilmez.

6. **Katılımcı IDAQ-CF sorularını bitirince otomatik olarak atandığı pizza versiyonunu içeren oyun gelecektir. Bu aşamada da araştırmacı katılımcının yanında olacaktır.**
    - Oyunun sesli yönlendirmeleri kendi içerisinde olduğundan araştırmacının yönlendirmesine ihtiyaç bulunmamaktadır. Eğer katılımcının dikkati dağılırsa araştırmacı onu yeniden oyuna yönlendirecek ve hangi aşamada ise ona hatırlatacaktır.
        - Katılımcı nasıl hareket edeceğini bilemezse veya görevleri yapmakta zorlanırsa katılımcıya ilk olarak sesli yardım butonu hatırlatılmalı, daha sonra görevi nasıl yapması gerektiği ilk önce sesli olarak belirtilmeli (hamur karıştırmak için elini sağa ve sola götürmelisin gibi) daha sonra katılımcı yine zorlanırsa katılımcıya nasıl yapılacağı gösterilerek destek olunmalıdır.
        - En son pizza paylaşma kısmında uygulayıcının katılımcının yakınında olması gerekir pizza paylaşımı görevi açıldıktan sonra araştırmacı katılımcıya "Şimdi bu tepside 8 dilim pizza var, sen bu pizza dilimlerini istediğin gibi servis edebilirsin. Ben şimdi uzağa gidip arkamı döneceğim. Böylelikle servisi rahat yapmış olursun. Görev bittiğinde bana haber ver" diyerek araştırmacı uzak bir köşede katılımcının görevi bitirmesini beklemelidir. katılımcı uygulayıcı onu görmediğinden istediği kadar pizza dilimi daha rahat paylaşabilecektir. Oyun bir animasyon ile bittiğinden animasyon bittikten sonra 'Yeeeyyyy!' sesi gelecektir.

- **[Katılımcı oyunun bittiğini haber verirse]** Haber verdiğin için çok teşekkür ederim. Umarım çok eğlenmişsindir. Şimdi sana oyun hakkında birkaç soru sormak istiyorum" denilerek tablet alınır.
- **[Katılımcı bittiğini haber vermezse]** (Araştırmacı tabletten soruların bittiğine yönelik çıkan sesi takip eder, ses duyulduğunda katılımcının çağırmasını bekler. Katılımcı bir süre çağırmazsa araştırmacı katılımcıya seslenir.) Sanırım oyunu bitirdin! Umarım çok eğlenmişsindir. Şimdi sana oyun hakkında birkaç soru sormak istiyorum" denilerek tablet alınır.

NOT: Oyunun aşamaları aşağıdaki gibi olacaktır. Uygulayıcı bu aşamaları bilmeli ve oyunu takip etmelidir.

1. Katılımcı oyuna başlar.
2. Katılımcı karakterini seçer.
3. Katılımcı karakterinin karnının acıktığı bir animasyon görür. (Tüm versiyonlarda diğer karakter ile beraber oyun oynarlar ve daha sonra birlikte mutfağa giderler, animasyon işbirliği içerip içermemesine bakılmaksızın aynı olacaktır, sadece diğer karakterin insan ve hayvan olduğu durumda farklılaşacaktır.
4. Hamur malzemelerini kaseye koyma görevi
5. Hamur malzemelerini karıştırma görevi
6. Hamur açma ve şeklini oluşturma görevi
7. Hamurun üstüne domates sosu dökme görevi
8. Peynir rendeleme görevi
9. Pizzanın üstüne konulacak malzemeleri kesme görevi
10. Pizza malzemelerini yerleştirme görevi
11. Pizzayı fırına verme ve dilimleme görevi
12. Pizza dilimlerini tabaklara dağıtma görevi
13. Oyun bitiş animasyonu

7. **Kavrayış Soruları: Manipülasyon kontrolü ve keşifsel analizler için çocuğa üç adet soru sorulacaktır. Cevapları not edilecek ve daha sonra çıkartma paylaşma görevine geçiş yapılacaktır.**

    - Katılımcının karşısına oturularak üç adet soru sorulacak ve cevapları not edilecektir. Uygulayıcı elinde kalem ve kağıt ile beklemeli katılımcıya verilen isim kodu ile cevapları not etmelidir. Eğer çocuğun manipülasyon sorularına verdiği cevap ile atandığı oyun versiyonu uyuşmuyorsa bu durum not edilmelidir.
        - "Oyunu çok başarılı şekilde tamamladın. Şimdi sana oyun hakkında üç tane soru soracağım, bakalım sorduğum soruların cevaplarını hatırlayabilecek misin?" denilerek aşağıda belirtilen üç soru sorulur.
            - "Oynadığın oyunda bir karakter daha vardı, o karakter insan mıydı yoksa bir hayvan mıydı? Hatırlıyor musun acaba?" denilerek çocuğun önüne 'diğer karakter' olarak anılan iki karakterin de resmi konulur ve seçmesi beklenir. Katılımcının verdiği cevap not edilir.
            - "Cevabın için çok teşekkür ederim, şimdi ikinci soruyu soruyorum. Acaba bu karakter (katılımcının seçtiği karakter gösterilir) sana pizza yapımında yardımcı oldu mu?" denilerek çocuğun cevabı not edilir.
            - "Harika! Şimdi son soruyu soruyorum, hazır mısın? Sence bu karakterin (katılımcının seçtiği karakter gösterilir) cinsiyeti ne?" denilerek çocuğun cevabı not edilir. Böylelikle çocuğun atandığı versiyon ile cevapların aynı olup olmadığı kontrol edilmiş olur.

[Uygulayıcıya not 1: Çocuk ilk iki soruyu cevaplamak zorundadır. Eğer çocuk 'Hatırlamıyorum' gibi cevaplar verirse "Biraz daha düşün lütfen, bu soruyu bence cevaplayabilirsin, hatırlama çok az kaldı gibi hissediyorum" gibi sözcükler söyleyerek çocuk desteklenilmelidir. Üçüncü soru keşifler analiz için yapılacağından, eğer çocuk 'bilmiyorum, karar veremedim, hatırlamıyorum' gibi cevaplar verirse "sen ne düşünmüştün, bir karar verecek olsan ne derdin" gibi destekleme yapılır ancak cevap vermek istemezse bu soru boş bırakılabilir.]

[Uygulayıcıya not 2: Eğer çocuklara hemen cevap vermezse veya ancak araştırmacı sözel destek sunduktan sonra cevap verirse bu durum kesinlikle not alınmalıdır ve çocuğun soruya verdiği tüm cevaplar (hatırlamıyorum vb.) de not edilmelidir.]

- Cevaplar not edildikten sonra çocuğa "Oyunu bitirip soruların hepsini cevapladın. Ben bana yardımcı olduğun için sana bir şey vermek istiyorum" denilerek çıkartmaların olduğu zarf alınılır.

8. **Çıkartma paylaşma görevi: Katılımcıya daha önceden hazırlanmış ve içerisinde 10 tane çıkartma olan bir zarf verilir. Uygulayıcı bu zarfın dışında başka renkte bir zarf daha getirir. Daha sonra katılımcıya yönergeye uygun şekilde bilgilendirme yapılır;**
    - "Bu **[zarfın rengi söylenir]** zarfı sana vermek istiyorum. İçerisinde 10 tane çıkartma var. Umarım beğenirsin. Ancak sana söylemem gereken bir şey daha var. Bugün başka biri daha buraya gelip senin gibi oyun oynayıp çıkartma alabilecekti. Bu **[diğer zarfın rengi söylenir]** zarfı ona verecektim. Ancak o, bugün hasta olduğu için gelemedi ve oyunu oynayamadı. Oyunu oynayamadığı için de çıkartma alamayacak. Ancak eğer istersen sen senin çıkartmalarından bazılarını o zarfa koyabilirsin ve ben bu zarfı ona gönderebilirim. Ben şuraya (ilerideki bir yer işaret edilir) gidip arkamı döneceğim ve zarfın içerisine ne kadar çıkartma koyduğuna bakmayacağım. Şimdi ben gidip arkamı dönüyorum. Dilediğin kadar çıkartma koyduktan ve zarfı kapattıktan sonra bana seslenebilirsin" denilerek katılımcıdan uzaklaşılır ve uygulayıcı arkasını döner. Bir süre geçtikten sonra katılımcı haber vermezse uygulayıcı "Yanına gelebilir miyim işin bitti mi" diye sorar. Çıkartma paylaşma görevi bittikten sonra uygulayıcı diğer zarfı alır ve içine bakmadan tabletin yanına koyar. Daha sonra uygulayıcı "Zarfın içine söz verdiğim gibi bakmıyorum, bu zarfın içine de bakmadan o kişiye yollayacağım" diyerek katılımcıyı bilgilendirir.
    - Çıkartmaların olduğu zarfin üstüne katılımcıya verilen isim yazılır ve tüm aşamalar bittikten ve katılımcı odadan çıktıktan sonra çıkartma sayısı katılımcıya verilen isim ile birlikte not edilir.

9. **Süreç tamamlandıktaan sonra uygulayıcı şöyle der: "Bugün benimle vakit geçirdiğin için çok teşekkür ederim. Seninle tanıştığıma çok memnun oldum. Artık her şeyi tamamladık, şimdi birlikte sınıfına geri dönelim. Geldiğin için çok sevindim!" ve katılımcıyı sınıfına geri götürür.**
10. **Başka bir katılımcı alınmadan katılımcıya atanan isim, katılımcının atandığı versiyon, araştırmanın yapıldığı gün, katılımcının verdiği tüm cevaplar, ve paylaştığı sticker sayısı kağıda not edilir.**

Instructions in English

The following instructions will be administered to participants as part of the study. Before picking up the participant from their classroom, the researcher (experimenter) will prepare the necessary materials (tablet, envelopes, and stickers) on a table. The experimenter will then go to the classroom and bring the participant to an empty room.

Each participant will be randomly assigned to one of the four versions of the digital game before the interview begins. A pseudonym will be generated for each participant to protect their identity.

1. **Once the participant is brought from their classroom to a quiet room, the experimenter will say:**
   "Hello, welcome! My name is *[Experimenter's Name]!* What's your name? Hello *[child's name]!* Today, we're going to play a pizza-making game on a tablet. I'm really excited to play this game with you! Have you ever played a game on a tablet, computer, or phone before?"

   - **[If the child says yes]** "Awww, how nice! Then I think you'll play this game very easily and enjoy it a lot—it's going to be so much fun!"
   - **[If the child says no]** "Then this will be your first game—how exciting!"

*[**Note to the experimenter**: To help the child feel at ease, start with some small talk. If the child seems shy or has difficulty talking, asking questions about their favorite games might help them relax. If the child seems comfortable, this part can be kept short]*

2. **Consent and Pre-Game Questions: Before we start the pizza game, I'd like you to answer a few questions on the tablet. Then we'll begin the pizza-making game. What do you think? Would you like to answer the questions and then play the game?**
   - **[If the child says yes]** "Great! I'll open the questions right away. Do you want to ask me anything before we begin?"
     i. **[If yes and the child asks a question]** The question is answered.
     ii. **[If no]** "Okay, let's start the questions then."
   - **[If the child says no]** "To move on to the pizza game, we first need to answer these questions. I'll be right here to help you. This part will be really short, and I think you'll finish very quickly. Would you like to take a look at the questions?"
     i. **[If the child says yes]** "Great! I'll open the questions right away. Do you want to ask me anything before we begin?"
   - **[If yes and the child asks a question]** The question is answered.
   - **[If no]** "Okay, let's start the questions then."

ii. **[If the child says no] "[Child's name]**, your parent/caregiver knows you will answer these questions and play the pizza game with me today, and they gave permission. Also, if at any time you don't want to answer the questions or continue playing the game, you can say so. I'll be right here to help you, and I'm sure we'll have a great time. Maybe once we start, you'll change your mind. What do you say, shall we start?"

- **[If the child says yes]** "Perfect! Let's begin the questions if you're ready."
- **[If the child says no]** "That's totally fine. It's your decision—if you don't want to answer the questions or play the game, you don't have to. But if you change your mind, just tell your teacher. Still, I'm really glad we got to meet."

3. **After the participant agrees to take part in the study, their participant ID, assigned game version, date of participation, and date of birth will be recorded in the system. Then, the tablet will be handed to the participant.**
4. **The experimenter must ensure that the questions are open on the tablet, the volume is at its highest, and the device has sufficient battery.**
    a. The experimenter will say: "Now, you'll hear some questions on this tablet. There are no right or wrong answers to these questions. I'm just curious about what you think. If you're ready, you can press the next button to hear the questions!" The experimenter will sit silently next to the participant until the practice questions are completed. During the first question, the child will be shown which button to press to proceed, how to replay the audio instructions, and where to touch to give their answer. In this way, the participant will experience how to respond to the IDAQ-CF questions.
        i. If the participant asks any questions, appropriate answers will be given in a way that does not guide or influence their responses. If the participant asks what they should answer, the same practice questions will be slowly repeated and each option will be explained (e.g., "This means yes/no", "This means a little/medium/very sure"). Then, the experimenter will say, "That's your decision," and will not guide the child toward a specific response.

5. **Once the practice questions are completed:**

    a. The experimenter will say: "You answered those questions really well. Now there will be some questions about animals. These also don't have right or wrong answers. Just select the option that best matches what you

think," and will sit silently next to the child until the questions are completed.

i. If the participant asks any questions, appropriate answers will again be given without influencing their responses on the tablet. If the child asks what they should answer, the practice questions will be recalled, and the meaning of each option will be explained again. Then the experimenter will say, "It's your choice," or "I don't know either—what do you think?" and will not guide the child toward a specific answer.

6. **Once the participant finishes the IDAQ-CF questions, the version of the pizza game they were randomly assigned to will automatically begin. During this stage, the researcher will remain next to the participant.**

a. Since the game includes its own voice instructions, there is no need for the researcher to provide guidance. However, if the participant becomes distracted, the researcher will gently redirect the child back to the game and remind them of the current stage.

- If the participant appears unsure of how to proceed or has difficulty completing tasks, the researcher should first remind them about the voice assistance button. Then, they should explain verbally how to perform the task (e.g., "You need to move your hand left and right to mix the dough"). If the participant still struggles, the researcher may demonstrate the required action.
- During the final pizza sharing stage, the researcher should stay close to the participant. Once the sharing task appears on the screen, the researcher should say: "Now there are 8 slices of pizza on this tray. You can serve them however you like. I'm going to step away and turn my back so you can serve comfortably. Let me know when you're done with the task." The researcher will then move to a distant corner and wait for the child to finish. Since the participant will not be observed during this task, they may feel more comfortable sharing however many slices they wish. The game ends with an animation, followed by a "Yaaay!" sound once the animation is complete.
  - **[If the participant notifies the researcher that the game is finished:]** "Thank you so much for letting me know! I hope you had a great time. Now I'd like to ask you a few questions about the game," the researcher says while taking the tablet.

- **[If the participant does not notify the researcher:]** (The researcher will listen for the sound that indicates the end of the game and wait for the participant to call them. If the child does not call after a while, the researcher may say) "I think you've finished the game! I hope it was fun. Now I'd like to ask you a few questions about it," and then takes the tablet.

NOTE: The stages of the game are as follows. The facilitator should be familiar with these stages and follow the game accordingly.

- ✓ The participant starts the game.
- ✓ The participant selects their character.
- ✓ An animation plays showing that the participant's character is hungry. (In all versions, the game starts with the participant and the other character playing together and then going to the kitchen. This animation remains the same regardless of whether the condition is cooperative or not; only the type of the second character—human or animal—varies.)
- ✓ Task: Placing dough ingredients into the bowl
- ✓ Task: Mixing the dough ingredients
- ✓ Task: Rolling and shaping the dough
- ✓ Task: Pouring tomato sauce on the dough
- ✓ Task: Grating cheese
- ✓ Task: Cutting the toppings for the pizza
- ✓ Task: Placing the toppings on the pizza
- ✓ Task: Putting the pizza in the oven and slicing it
- ✓ Task: Serving the pizza slices onto plates
- ✓ Final game animation

7. **Manipulation Check Questions: Three questions will be asked to the child to check manipulation control and for exploratory analysis. The answers will be noted down, and then the sticker-sharing task will follow.**

- The facilitator sits in front of the participant and asks three questions, taking notes of the responses. The facilitator should have a pen and paper ready and record answers using the participant's assigned ID code. If the answers do not match the assigned game version, this should be noted.
    - "You completed the game very well! Now I'm going to ask you three questions about the game—let's see if you can remember the answers."
        - "There was another character in the game you played. Was that character a human or an animal? Do you remember?" — The facilitator shows the child images of both characters referred to as "the other character" and waits for a response. The answer is recorded.
        - "Thank you for your answer! Now for the second question. Did this character (the one selected by the participant) help you make the pizza?" — The child's response is noted.
        - "Great! Now the last question—are you ready? What do you think the gender of this character is?" — The facilitator shows the same character again and records the child's answer. This helps check if the child's answers align with the assigned version.

[Facilitator Note 1:] The child must answer the first two questions. If the child says "I don't remember," the facilitator should encourage them with supportive prompts such as: "Think a little more, I think you can answer this one—you're really close to remembering!" The third question is for exploratory purposes. If the child says "I don't know," "I can't decide," or "I don't remember," supportive prompts like "What did you think at the time? If you had to guess, what would you say?" can be offered. However, if the child still does not want to answer, the question may be left blank.

[Facilitator Note 2:] If the child does not respond immediately or only responds after verbal encouragement, this should definitely be noted. All responses, including "I don't remember," must be recorded.

    - After the answers are recorded, say: "You've finished the game and answered all the questions. I want to give you something to thank you for helping me," and bring out the envelope containing the stickers.

8. **The participant is given a pre-prepared envelope containing 10 stickers. The facilitator also brings a second envelope of a different color. Then the participant is informed according to the instructions:**

    - "This [insert envelope color] envelope is for you. It has 10 stickers inside. I hope you like them. But I have something else to tell you.

Today, someone else was supposed to come here and play the game and receive stickers, just like you. I was going to give this [insert other envelope color] envelope to them. But they couldn't come because they are sick today and didn't get to play the game. That means they won't be getting any stickers. But if you want, you can put some of your stickers in this envelope, and I can send it to them. I'm going to go over there (point to a spot in the room) and turn my back. I won't look at how many stickers you put in. Once you're done and the envelope is closed, just call me." Then the facilitator walks away and turns their back. If the participant does not call after some time, the facilitator asks, "Can I come over? Are you finished?" After the sticker sharing task is complete, the facilitator picks up the second envelope without looking inside and places it next to the tablet. Then they say: "Just like I promised, I'm not going to look inside the envelope. I will send it to that person without looking at it either."

- After all procedures are completed and the participant leaves the room, the number of stickers shared is recorded alongside the participant's ID.

9. **The facilitator says: "Thank you so much for spending time with me today. I'm so happy to have met you. We've finished everything now, so let's go back to your classroom together. I'm so glad you came!" — and walks the participant back to their classroom.**

10. **Before moving on to the next participant, the following should be recorded on paper: the assigned name of the participant, the version they were assigned to, the date of participation, all answers given by the participant, and the number of stickers they shared.**

APPENDIX E. ANCOVA ANALYSES WITH AGE AS A COVARIATE

Appendix E reports ANCOVA results on the effects of game type and character type on children's pizza and sticker sharing, controlling for age (in months). Levene's test showed homogeneity was met for sticker sharing but violated for pizza sharing. For pizza sharing, no significant effects of age or game type, nor interactions, were found. Character type had a marginal effect, with children interacting with animal characters sharing slightly more than those with human characters. For sticker sharing, age showed a significant effect, as older children shared more. No significant effects of game type or interactions were observed, while character type again showed a marginal effect.

Table E1 *Descriptive Statistics for Pizza Sharing Scores by Game and Character Type*

Game Type	Character Type	*N*	*M*	*SD*
Noncooperative	Animal	46	3.87	1.0
Noncooperative	Human	40	3.88	1.02
Cooperative	Animal	43	3.93	1.22
Cooperative	Human	35	3.23	1.24
Total	Animal	89	3.9	1.22
Total	Human	75	3.53	1.22
Grand Total		164	3.73	1.23

Table E2 *Descriptive Statistics for Sticker Sharing Scores by Game and Character Type*

Game Type	Character Type	*N*	*M*	*SD*
Noncooperative	Animal	46	76.54	42.76
Noncooperative	Human	42	96.85	43.99
Cooperative	Animal	42	76.52	48.46
Cooperative	Human	36	84.96	46.37
Total	Animal	88	76.53	45.30
Total	Human	78	91.36	45.21
Grand Total		166	83.50	45.73

Table E3 *Levene's Test of Equality of Error Variances for Pizza Sharing*

F	df1	df2	*p*
2.79	3	160	.042

Levene's test for pizza sharing was significant, indicating that the assumption of homogeneity of variances was violated across the experimental groups.

Table E4 *Levene's Test of Equality of Error Variances for Sticker Sharing*

F	df1	df2	*p*
0.52	3	162	.671

Levene's test for sticker sharing was non-significant, indicating that the assumption of homogeneity of variances was met across the experimental groups.

Table E5 *ANCOVA Results for the Effect of Game Type and Character Type on Pizza Sharing, Controlling for Age*

Source	df	*F*	*p*	η^2
Age (covariate)	1, 159	2.12	.148	.013
Game Type	1, 159	3.00	.085	.019
Character Type	1, 159	3.71	.056	.023
Game Type × Character Type	1, 159	0.52	.471	.003

Table E6 *ANCOVA Results for the Effect of Game Type and Character Type on Sticker Sharing, Controlling for Age*

Source	df	*F*	*p*	η^2
Age (covariate)	1, 161	12.72	<.001	.073
Game Type	1, 161	0.27	.604	.002
Character Type	1, 161	3.33	.070	.020
Game Type × Character Type	1, 161	0.95	.332	.006

APPENDIX F. ANALYSES AFTER OUTLIER REMOVAL

First, the distribution of the participants across the four experimental conditions was examined, and a chi-square test was used to test whether the distribution was statistically significantly different. The test results revealed no significant difference between the observed and expected frequencies, $\chi^2(3) = 2.54$, $p = .468$.

Then, the distribution of the sticker and pizza sharing variables was tested separately under each experimental condition. Kolmogorov–Smirnov and Shapiro–Wilk tests indicated that the normal distribution assumption was not met under all conditions (ps < .001). Therefore, nonparametric tests were preferred for group comparisons across conditions.

Sticker Sharing Behaviors

The nonparametric Kruskal-Wallis test was used to test whether there was a difference in sticker sharing behavior between the groups. The test result was not statistically significant, $\chi^2(3) = 6.68$, $p = .083$. Therefore, the descriptive statistics presented below are reported to illustrate the observed differences between the groups; however, these differences were not statistically significant. The tables below show means, standard deviations, and sample sizes for the four versions (Table F1), game type (Table F2), and character type (Table F3).

Table F1 *Sticker Sharing Scores by Game Version (Outliers Removed)*

Version	*N*	*M*	*SD*
Non-Cooperative, Human	36	2.89	2.20
Non-Cooperative, Animal	45	1.84	2.06
Cooperative, Human	32	2.22	2.27
Cooperative, Animal	35	1.66	2.07
Total	148	2.15	

Table F2 *Sticker Sharing Scores by Game Type (Outliers Removed)*

Version	*N*	*M*	*SD*
Non-Cooperative	81	2.31	2.17
Cooperative	67	1.93	2.17
Total	148	2.15	

Table F3 *Sticker Sharing Scores by Character Type (Outliers Removed)*

Version	*N*	*M*	*SD*
Animal	80	1.76	2.05
Human	68	2.57	2.24
Total	148	2.15	

Pizza Sharing Behavior

The nonparametric Kruskal-Wallis test was used to test whether there was a difference in pizza sharing behavior between the groups. The test result was not statistically significant, $\chi^2(3) = 6.84$, $p = .077$. Therefore, the descriptive statistics presented below are reported to illustrate the observed differences between the groups; however, these differences were not statistically significant. The tables below show means, standard deviations, and sample sizes for the four versions (Table F4), game type (Table F5), and character type (Table F6).

Table F4 *Pizza Sharing Scores by Game Version (Outliers Removed)*

Version	*N*	*M*	*SD*
Non-Cooperative, Human	36	3.78	0.54
Non-Cooperative, Animal	45	4.07	0.72
Cooperative, Human	32	3.59	0.91
Cooperative, Animal	35	3.77	0.88
Total	148	3.81	

Table F5 *Pizza Sharing Scores by Game Type (Outliers Removed)*

Version	*N*	*M*	*SD*
Non-Cooperative	81	3.94	0.66
Cooperative	67	3.69	0.89
Total	148	3.81	

Table F6 *Pizza Sharing Scores by Character Type (Outliers Removed)*

Version	*N*	*M*	*SD*
Animal	80	3.94	0.80
Human	68	3.69	0.74
Total	148	3.81	