EFFECTS OF COOPERATION AND COMPETITION ON PRESCHOOLERS' PROSOCIALITY TOWARD THIRD-PARTIES

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Humans interact permanently. These interactions are transient and vary across situations. One characteristic of interactions is their social interdependence—the relationship between individuals' goals. Social interdependence can take different forms: cooperative, competitive, or solitary. This dissertation investigated the influence of these forms of social interdependence on children's sharing and social inclusion. Past research suggests that cooperative interdependence promotes and competitive interdependence lowers the willingness to act prosocially as compared to solitary contexts. These effects occur within and after respective interactions. Further, previous studies indicate that cooperation and competition affect prosociality toward third-parties who were not part of the interaction.

However, many of these studies have low experimental rigor since the comparability between the experimental conditions is relatively low. For example, researchers compared cooperative games that cannot be lost with competitive games in which one party necessarily loses. This and other substantial differences between the experimental conditions do not allow for robust conclusions about the effects of cooperation and competition since alternative explanations might elicit these (e.g., fear of losing). Also, past research did not consider important variables, such as success or failure during the cooperation or competition, as predictors for children's prosociality. Finally, most studies investigated children's sharing behavior and neglected other prosocial behaviors, such as social inclusion. Thus, we conducted three studies with high internal validity (i.e., high comparability between conditions) to examine the effect of cooperation and competition on preschoolers' sharing and social inclusion while considering children's success and engagement in these interactions as potential predictors. In all studies, participants were from Leipzig and had mixed socio-economic backgrounds.

In Study 1, dyads of 4- to 5-year-old children played a coordinative game in either a cooperative, competitive, or solitary context. Hereafter, we assessed three prosocial measures: sharing, social inclusion, and prosocial acts in free play. Children shared an endowment of stickers with a third-party peer. We measured children's social inclusion behavior in a newly developed paradigm. In this social inclusion task, children play a ball-tossing game with a puppet while a second puppet approaches the interaction asking to join the game. We observed whether and how often children included the approaching puppet. Finally, dyads engaged in a free play, in which prosocial acts have been coded. Results revealed that children shared more stickers after playing in a cooperative as compared to a competitive context. The contexts of the game did not influence children's social inclusion or prosocial acts in free play. In the social inclusion paradigm, children were highly inclusive, which raises the question of whether a ceiling effect has diminished the potential effect of cooperation and competition.

In Study 2, we tested 3- to 6-year-olds' social inclusion behavior with a modified version of Study 1's task. The modified version aimed to overcome the detected ceiling effect. Study 2 investigated how social inclusion behavior develops throughout preschool age and how different intergroup scenarios influence this behavior. We found children's social inclusion to increase from age 3 to 6. Children's willingness to include an approaching puppet was lower when this puppet was an out-group member joining an in-group interaction as compared to a control condition without groups.

Study 3 conceptually replicated Study 1's procedure in an intergroup context. Similar to Study 1, dyads of 4- to 6-year-olds played a game in a cooperative, competitive, or solitary context. Here, the game was not coordinative, and we controlled wins and losses in the game to increase internal validity and to isolate the effect of mere goal relations as the cause for Study 1's effect. After playing the game, children shared stickers with a third-party in-group and out-group member. Also, we assessed children's social inclusion behavior in an intergroup context with Study 2's modified version of the task. The cooperative, competitive, and solitary context of the game did not influence children's sharing and social inclusion.

In a merged analysis and a general discussion, the results of all three studies are combined and interpreted. In total, our results suggest that cooperative and competitive relations of goals only influence children's prosocial behavior toward third-parties if interactions are highly coordinated.

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SUMMARY

Social interdependence—the relationship between individuals' goals (Deutsch, 1949a)—is a transient but omnipresent characteristic of humans' interactions. The relationship of goals can have different qualities, such that goals are unrelated (solitary contexts), relate positively (cooperative contexts), or relate negatively (competitive contexts). These three different forms of social interdependence influence children's prosocial behavior—in this thesis, defined as acts intended to benefit others (Eisenberg et al., 2015). Past research suggests that cooperation promotes prosociality, while competition lowers prosociality. In other words, when having the same goal, individuals support each other; when having conflicting goals, individuals hinder each other. These promoting and lowering effects occur *within* and *after* interactions in a cooperative or competitive context (Bay-Hinitz et al., 1994; Finlinson et al., 2000; Garaigordobil & Berrueco, 2007; Hamann et al., 2011; Melis et al., 2013). Further, some studies suggest that cooperation and competition do not only influence children's prosocial behavior toward uninvolved third-parties (i.e., others who have not been part of the interdependent interaction; (Battistich et al., 1989; Orlick, 1981; Street et al., 2004). These findings raise the question of whether cooperation and competition merely impact the specific relationship between interactants or create a lens that influences the perception of interactions with others generally.

However, previous studies have major limitations that do not allow for an answer of this question. First, no study investigated the impact of cooperative, competitive, and solitary contexts in one experimental design, which appears necessary to estimate the size of the effects of cooperation and competition against a baseline. Second, in many studies, the experimental rigor is relatively low as the socially interdependent contexts were not matched. For example, researchers compared cooperative games that cannot be lost with competitive games in which one party necessarily loses. The resulting low internal validity impedes the conclusion that different forms of social interdependence per se influence children's subsequent prosocial behavior. Further, previous studies do not consider potential mediating and moderating variables. In particular, the outcome of the interdependent interaction (e.g., winning or losing a game) and children's engagement during these interactions (e.g., physical activity while playing a game) seem to be promising variables when predicting children's subsequent prosocial behavior. The outcome might affect children's positive feelings, which are connected to the willingness to act prosocial (Aknin et al., 2018). Children's engagement might be a moderator since children who are more involved in a game might absorb the respective social interdependence more strongly. Finally, it is unclear how cooperation and competition influence children's prosocial behavior in intergroup contexts.

This dissertation investigated (a) how cooperative, competitive, and solitary contexts influence children's prosocial behavior toward third-parties, (b) how the outcome and children's engagement shape these effects, and (c) how the three social interdependences affect children's prosocial behavior in intergroup contexts. These questions have been examined

in three empirical studies in samples from a mid-sized German city. Prosocial behaviors of interest were children's sharing and social inclusion. A side goal of this thesis was the development of a participative task to measure children's social inclusion behavior since past research relied on fictive and non-interactive methods.

In Study 1, dyads of 4- to 5-year-old children (N = 96) played an interactive cooperative, competitive, or solitary game for 5 minutes. Hereafter, we assessed children's sharing with an absent third-party peer in a dictator game and social inclusion of a puppet in a newly developed ball-tossing paradigm. In this new paradigm, children played a tossing game with a puppet while another puppet approached the interaction. We coded whether children included the approaching puppet at all, their number of passes, the moment of first inclusion (i.e., round in which children include the first time), and children's directives for others' inclusion. Besides, we observed dyads' free play and coded prosocial acts. We considered the outcome of the game (i.e., wins and losses) as a predictor for children's prosociality. Children shared more stickers with a third-party after playing a cooperative game as compared to a competitive game. The different forms of social interdependence did not influence children's social inclusion behavior and their prosocial behavior in their free play. In the social inclusion paradigm, most children immediately included the approaching puppet. This ceiling effect might have hindered the detection of the effect of the different forms of social interdependence. The outcome of the game did not influence children's sharing and free play, but social inclusion, with faster inclusion after more losses.

In Study 2, we aimed to improve Study 1's social inclusion task since this revealed a ceiling effect. Further, we investigated the development of social inclusion behavior throughout preschool age and the influence of intergroup contexts on this behavior. Therefore, 3- to 6-year-old children (N = 216) played a modified version of the ball-tossing game used in Study 1. Similar to Study 1, we observed how children include an approaching puppet into an ongoing ball-tossing game. We tested children in three different conditions with different intergroup scenarios. In one scenario, children played the tossing game with an in-group member, and an out-group member approached the interaction. In a second scenario, an out-group puppet approached the interaction of children and a neutral puppet (i.e., no group membership). A third scenario was a control condition without any groups. The results revealed that children's general willingness to include the approaching puppet (i.e., passing the ball to it at least once) increased throughout preschool age. Children's inclusion was the lowest in the scenario, in which an out-group member approached an in-group interaction. Other measures of social inclusion—the number of passes, the moment of first inclusion, and children's directives for others' inclusion—did not differ with age and between conditions.

In Study 3, we conceptually replicated and extended Study 1 by investigating the effect of a cooperative, competitive, and solitary context on 4- to 6-year-old children's (N = 144) prosocial behavior in intergroup contexts. In contrast to Study 1, the game creating the contexts was non-coordinative. That is, children had their own apparatuses and did not need to coordinate their actions with their co-players, allowing a more precise investigation of the effect of mere goal interdependence. Here, we used Study 2's modified social inclusion paradigm with the intergroup scenario (i.e., out-group member approaching an in-group interaction), since this revealed the lowest inclusion rates. We assessed children's sharing in dictator games with an in-group and an out-group member. To examine the effect of engagement, we included children's motoric engagement during the gaming phase

as a moderator for their subsequent prosociality. Results suggested that the different socially interdependent contexts did not influence children's sharing and social inclusion behavior in an intergroup context. Children's engagement did not moderate the relation between the three conditions and prosocial behaviors. In contrast to Study 2, children's social inclusion behavior did not increase with age, but their directives for others' inclusion decreased with age.

Overall, the results of all three studies revealed the following: First, Study 1 found children's sharing to be higher after cooperating as compared to competing with a peer, while Study 3 did not reveal this pattern. A false-positive finding in Study 1 might explain this difference. Alternatively, differences in the games that we used to create the different forms of social interdependence might be responsible. Study 1's game was highly coordinative and might, therefore, elicited stronger cooperation and competition as compared to Study 3's game, which had no demand for coordination. According to the second explanation, the mere relation of goals does not cause spillover effects of cooperation and competition on prosocial behavior toward third-parties. It might be that coordination is necessary for this effect to occur. Social interdependence has many dimensions, including the relation of goal, coordination, or hierarchy (Gerpott et al., 2018; Kelley et al., 2003). Future research might investigate how different dimensions of social interdependence influence preschoolers' prosocial behaviors. In both Study 1 and Study 3, children's social inclusion was not affected by the cooperative and competitive context. Thus, interventions aiming to promote children's social inclusion should use different approaches.

Second, Study 2 found children's social inclusion behavior to increase, while Study 3 found this behavior to be stable. A merged analysis of the data of both studies revealed that the conclusions drawn from Study 2 seem to be more valid. That is, children's willingness to include others in ongoing interactions increases from age 3 to 6 and minimal intergroup contexts affect children's social inclusion form age 3.

ZUSAMMENFASSUNG

Soziale Interdependenz—die Beziehung von Zielen von Individuen (Deutsch, 1949a)—ist eine wechselnde, aber dennoch allgegenwärtige Eigenschaft von menschlichen Interaktionen. Die Beziehung von Zielen kann verschiedene Qualitäten haben: Ziele können positiv (kooperative Kontexte) oder negativ (kompetitive Kontexte) miteinander zusammenhängen oder unabhängig voneinander sein (solitäre Kontexte). Diese drei Formen der sozialen Interdependenz beeinflussen prosoziales Verhalten—Handlungen, die darauf abzielen andere zu unterstützen (Eisenberg et al., 2015)—bereits in Kindesalter. Bisherige Studien zeigen, dass Kooperation Prosozialität begünstigt, während Kompetition diese hemmt. In anderen Worten, wenn Individuen die gleichen Ziele verfolgen, helfen sie sich; wenn sie entgegengesetzte Ziele verfolgen, behindern sie sich. Diese Effekte lassen sich *während* und *nach* Interaktionen in kooperativen und kompetitiven Kontexten beobachten (Bay-Hinitz et al., 1994; Finlinson et al., 2000; Garaigordobil & Berrueco, 2007; Hamann et al., 2011; Melis et al., 2013). Einige Studien zeigen außerdem, dass Kooperation und Kompetition auch prosoziale Handlungen gegenüber Dritten beeinflussen (d.h., Akteure, die im interdependenten Kontext nicht beteiligt waren; Battistich et al., 1989; Orlick, 1981; Street et al., 2004). Diese Befunde werfen die Frage auf, ob Kooperation und Kompetition nicht nur die Beziehung von Interaktionspartnern beeinflussen, sondern, ob sie darüber hinaus eine „Linse" erzeugen, die Beziehungen mit anderen generell beeinflusst.

Allerdings haben bisherige Studien einige Schwächen, die keine klare Antwort auf diese Frage erlauben. Zum einen hat keine bisherige Studie kooperative, kompetitive und solitäre Kontexte gemeinsam in einem experimentellen Design untersucht. Dies scheint notwendig, um die Effekte der jeweiligen Kontexte einzuschätzen. Darüber hinaus ist in vielen Studien die experimentelle Genauigkeit relativ gering, da die verschiedenen Kontexte nicht angeglichen wurden. Zum Beispiel haben Forscher*innen kooperative Spiele, in denen nicht verloren werden konnte mit kompetitiven Spielen verglichen, in denen eine Partei zwangsläufig verliert. Die resultierende geringe interne Validität erlaubt keine eindeutigen Rückschlüsse über den Einfluss von sozialer Interdependenz auf das prosoziale Verhalten von Kindern. Außerdem hat keine bisherige Studie potenzielle Mediatoren und Moderatoren mitberücksichtigt. Insbesondere, das Ergebnis der interdependenten Interaktion (z.B. Gewinn oder Niederlage in einem Spiel) und das Engagement von Kindern (z.B. die körperliche Anstrengung) scheinen vielversprechende Variablen zu sein, um darauffolgende Prosozialität vorherzusagen. Der Erfolg einer Interaktion könnte den Affekt von Kindern verändern, welcher mit der Bereitschaft zu prosozialem Handeln verbunden ist (Aknin et al., 2018). Das Engagement von Kindern könnte ein Moderator sein, da Kinder, die sich während eines Spiels mehr engagieren, den jeweiligen Kontext stärker verinnerlichen könnten. Des Weiteren ist unklar, wie sich Kooperation und Kompetition auf das prosoziale Verhalten von Kindern in Gruppenkontexten auswirken.

Diese Dissertation hat untersucht (a) wie kooperative, kompetitive und solitäre Kontexte das prosoziale Verhalten von Kindern gegenüber Dritten beeinflussen, (b) wie das

Ergebnis der Interaktion und das Engagement der Kinder diese Effekte verändern und, (c) wie die drei Formen der sozialen Interdependenz prosoziales Verhalten von Kindern in Gruppenkontexten beeinflussen. Diese Fragen wurden in drei empirischen Studien mit Kindern aus Leipzig untersucht. Dabei wurden das Teil- und Einschlussverhalten von Kindern als prosoziales Verhalten erhoben. Ein Nebenziel dieser Dissertation war die Entwicklung eines interaktiven Paradigmas, welches kindliches Einschlussverhalten erfasst, da vorherige Studien dafür nicht-interaktive und fiktive Methoden nutzten.

In Studie 1 spielten Paare von 4- bis 5-jährigen Kindern (N = 96) ein interaktives Spiel in einem kooperativen, kompetitiven oder solitären Kontext für 5 Minuten. Danach wurde durch ein Diktator-Spiel gemessen, wie diese Kinder mit einem abwesenden Peer teilen und, inwiefern sie eine Puppe in einem neu entwickelten Paradigma einschließen. In diesem Paradigma haben die Kinder ein Ballspiel mit einer Puppe gespielt, während im Verlauf des Ballspiels eine andere Puppe zu dieser Interaktion hinzukam. Es wurde kodiert, ob die Proband*innen die hinzukommende Puppe zum Mitspielen einschließen, wann sie den Ball das erste Mal zu dieser Puppe passen, wie viele Pässe sie zu ihr spielen, und welche Form von Einschluss sie der anderen Puppe vorschreiben. Außerdem haben wir das freie Spiel der Proband*innen beobachtet und prosoziale Verhaltensweisen kodiert. Wir haben das Ergebnis des Spiels (d.h. Siege und Niederlagen) als statistischen Prädiktor für das prosoziale Verhalten mitberücksichtigt.

Nachdem die Proband*innen das kooperative Spiel gespielt haben, haben sie mehr geteilt, als nach dem Spielen des kompetitiven Spiels. Das soziale Einschlussverhalten und das prosoziale Verhalten im freien Spiel wurden nicht von den drei interdependenten Kontexten beeinflusst. In dem Paradigma, welches das soziale Einschlussverhalten gemessen hat, haben die meisten Kinder die neue Puppe sofort eingeschlossen. Dieser Deckeneffekt könnte den Effekt der drei Spielformen verhindert haben. Das Ergebnis des Spiels hatte keinen Einfluss auf das Teilverhalten und das freie Spiel. Kinder, die häufiger während des Spiels verloren haben, haben die hinzukommende Puppe schneller eingeschlossen.

Studie 2 zielte darauf ab das Paradigma zur Erfassung des Einschlussverhaltens zu verbessern, da hier in Studie 1 ein Deckeneffekt vorlag. Darüber hinaus wurde in Studie 2 untersucht, wie sich das Einschlussverhalten von Kindern über das Vorschulalter entwickelt und, wie sich verschiedene Gruppenkontexte darauf auswirken. Deshalb haben 3- bis 6-jährige Kinder (N = 216) eine modifizierte Version des Ballspiels aus Studie 1 gespielt. Ähnlich zu Studie 1 wurde beobachtet, wie die Proband*innen die hinzukommende Puppe in ein Ballspiel einschließen. Das Einschlussverhalten wurde in drei experimentellen Bedingungen mit unterschiedlichen Gruppenkontexten untersucht. In einer Bedingung haben die Proband*innen das Ballspiel mit einem Mitglied der gleichen Gruppe gespielt (Ingroup) und ein Mitglied einer anderen Gruppe (Outgroup) kam im Verlauf des Spiels hinzu. In einer zweiten Bedingung kam ein Outgroup-Mitglied zu einer Interaktion der Proband*innen mit einer Puppe ohne Gruppenzugehörigkeit hinzu. Die dritte Bedingung war eine Kontrollbedingung, in welcher weder die Proband*innen, noch die Puppen Mitglieder einer Gruppe waren.

Die Ergebnisse haben gezeigt, dass die allgemeine Bereitschaft die hinzukommende Puppe einzuschließen (d.h. den Ball mindestens einmal zur hinzukommenden Puppe passen) mit dem Alter steigt. In der Bedingung, in welcher ein Outgroup-Mitglied zu einer Interaktion von Ingroup-Mitgliedern hinzukam, war die Einschlussbereitschaft am niedrigsten. Das Alter der Kinder und die verschiedenen experimentellen Bedingungen hatten

keinen Einfluss auf andere Verhaltensmaße, wie die Anzahl der Pässe, der Moment des ersten Einschusses oder die Anordnung der Proband*innen, für andere Mitspieler*innen.

In Studie 3 wurde die Prozedur von Studie 1 konzeptuell repliziert und erweitert, indem der Einfluss von einem kooperativen, kompetitiven und solitären Kontext auf das prosoziale Verhalten von 4- bis 6-jährigen Kindern (N = 144) in einem Gruppenkontext untersucht wurde. Im Gegensatz zu Studie 1 wurde hierfür ein Spiel verwendet, welches nicht koordinativ war. Das bedeutet, dass die Proband*innen ihre eigenen Spielgeräte hatten und ihre Handlungen untereinander nicht abstimmen mussten, um zu gewinnen. Dies ermöglichte eine gezieltere Untersuchung des Einflusses der Zielinterdependenz. In Studie 3 wurde das modifizierte Paradigma zur Erfassung des Einschlussverhaltens aus Studie 2 verwendet. Dabei wurde ausschließlich das Intergruppenszenario genutzt (d.h. ein Outgroup-Mitglied kommt zu einer Ingroup-Interaktion), da hier die Einschlussrate besonders gering gewesen war. Zusätzlich haben die Proband*innen in zwei Diktator-Spielen Sticker mit einem Ingroup- und einem Outgroup-Mitglied geteilt. Um den Effekt vom Engagement der Kinder zu untersuchen, wurde die physische Aktivität der Kinder während des Spielens als Moderator in die statistische Analyse mit aufgenommen.

Die Ergebnisse haben gezeigt, dass das Teil- und Einschlussverhalten nicht von den drei verschiedenen Spielkontexten beeinflusst wurde. Das Engagement der Proband*innen moderierte den Zusammenhang zwischen den Spielkontexten und den prosozialen Verhaltensweisen nicht. Im Gegensatz zu Studie 2 war die generelle Einschlussbereitschaft über das Alter hinweg stabil. Allerdings wurden die Anordnungen für andere Mitspieler*innen mit zunehmendem Alter exklusiver.

Insgesamt lassen sich die Ergebnisse der drei Studien in zwei Punkten zusammenfassen. Erstens, in Studie 1 haben die Proband*innen nach einem kooperativen Spiel mehr geteilt als nach einem kompetitiven Spiel, was in Studie 3 nicht repliziert werden konnte. Dies könnte durch einen falsch-positiven Effekt in Studie 1 erklärt werden. Andererseits könnten auch Unterschiede zwischen den Spielen in Studie 1 und 3 dafür verantwortlich sein. Das Spiel aus Studie 1 war sehr koordinativ und könnte deswegen stärkere Kooperation und Kompetition hervorgerufen haben als das Spiel aus Studie 3, welches gar nicht koordinativ war. Gemäß dieser Erklärung reicht die reine Beziehung von Zielen nicht aus, um einen Effekt von Kooperation und Kompetition auf prosoziales Verhalten gegenüber Dritten auszulösen. Es könnte sein, dass Koordination eine notwendige Bedingung ist, um diese Effekte zu ermöglichen. Soziale Interdependenz hat viele Dimensionen, wie beispielsweise die Beziehung von Zielen, Koordination, oder Hierarchie (Gerpott et al., 2018; Kelley et al., 2003). Zukünftige Forschungsprojekte könnten untersuchen, wie sich diese verschiedenen Dimensionen auf prosoziales Verhalten von Vorschulkindern auswirken. Sowohl in Studie 1, als auch in Studie 3 haben Kooperation und Kompetition das Einschlussverhalten von Kindern nicht beeinflusst. Interventionen, die das Einschlussverhalten von Kindern fördern möchten, sollten also andere Ansätze nutzen.

Zweitens, das Einschlussverhalten steig mit zunehmendem Alter in Studie 2, wobei dieser Effekt in Studie 3 nicht gefunden wurde. Eine statistische Analyse der Daten beider Studien hat gezeigt, dass die Schlussfolgerungen von Studie 2 eher zutreffen. Folglich steigt die Bereitschaft von Kindern andere einzuschließen im Vorschulalter und wird ab diesem Alter von Gruppenkontexten beeinflusst.

CONTENTS

GENERAL INTRODUCTION

Humans interact with each other permanently. Human interactions are transient and vary across situations. A major characteristic of social interactions is their social interdependence—the relationship between individuals' goals (Deutsch, 2012)—which can have different forms. In a soccer match, for example, players of the same team have the cooperative goal to score goals for their team. In contrast, players of the opposing teams have the competitive goals to score more goals than the other team. These different relationships between individuals' goals are assumed to significantly influence humans' prosocial behavior—acts intended to benefit others (Eisenberg et al., 2015): Cooperative goals promote prosociality, while competitive goals lower prosociality (Deutsch, 1949a). Teammates in a football team support each other and correct each other's mistakes. Opposing players hinder and foul each other.

A plethora of empirical research has examined the effects of cooperation and competition on adult prosocial behavior (for a meta-analysis, see Johnson & Johnson, 2011). However, we are still far away from understanding the psychological mechanisms underlying the link between social interdependence and prosociality. It might be that cooperation and competition merely influence the specific relationship between the involved interactors. For example, after cooperating with a teammate, a person might only behave more prosocially toward this particular teammate. Alternatively, cooperation and competition might evoke a prosocial (or antisocial) orientation influencing upcoming interactions irrespective of previous experiences with that specific interactant. Accordingly, the soccer player might not be more prosocial only toward teammates, but also toward a spectator of the game. In order to disentangle these potential mechanisms, this dissertation investigated the effects of cooperation and competition on *children's* prosocial behavior toward uninvolved *third-parties* who have not been part of an interdependent interaction. By investigating how cooperation and competition influence behavior throughout childhood, we can learn how fundamental the reactions to such contexts are and how environmental factors shape such reactions (Bjorklund & Blasi, 2015; Liebal & Haun, 2018; Tomasello, 2019). By examining the effects of cooperation and competition toward uninvolved third-parties, we can learn more about the mechanisms underlying the increase and decrease of prosocial behavior.

Further, this dissertation studied how cooperation and competition affect young children's prosocial behaviors in intergroup contexts. Social interdependence and

humans' understanding of intergroup contexts are linked closely: Cooperating with others gives us a feeling of belonging to the same group while competing creates a feeling of being members of different groups (Deutsch, 1949b; Van Lange & Rusbult, 2012). For example, the cooperation within and competition between the two soccer teams is essential for the feeling of group cohesion (i.e., the team spirit). Cooperation and competition might particularly influence prosocial behavior in intergroup contexts since the feeling of group membership is substantially formed by these forms of social interdependence. However, whether cooperation and competition influence young children's prosocial behavior in an unrelated intergroup context is still not known. Similar to the effects on children's prosociality, it might be that cooperation and competition influence the relationship between the involved groups, or that these create a lens changing the perception of uninvolved third-party group contexts. For example, after a highly competitive local soccer match, a player might be particularly less prosocial toward fans of the opposing team (i.e., only toward the out-group of the match) or generally less prosocial toward out-group members in an unrelated intergroup context (e.g., when playing a game with her family after the soccer match). Again, the effect of cooperation and competition on *third-party* intergroup contexts can help us to disentangle these two mechanisms.

What follows is an overview of past research that investigated how different forms of social interdependence impact children's prosocial and intergroup behavior. Of particular interest is the Social Interdependence Theory (Deutsch, 1949a), as it provides the primary theoretical background for the empirical studies that are the main part of this dissertation. Three subsequent chapters individually describe empirical studies that I conducted throughout this dissertation. These chapters follow a similar structure, including an introduction, a description of methods, a report of the results, and a critical discussion. This structure may lead to redundant information and repetition of arguments but allows for the individual comprehension of each study. Hereafter, an analysis of the merged data collected in the three studies is given. Finally, a general discussion reviews the results of all analyses, lists the limitations of the current dissertation, and provides implications for interventions.

Social Interdependence Theory

The basic premise of the Social Interdependence Theory is that the relationship between two or more interactants' goals shape their behavior toward each other (Deutsch, 1949a, 2012). Individuals are in a socially interdependent relationship when their actions influence each other's goal attainments (Johnson & Johnson, 1989, 2005). That is, person A's goal achievement is affected by person B's actions and vice versa. For example, person A and person B play rock-paper-scissors against each other, and both want to win the game. Here, person B's action (showing the inferior or superior gesture) directly influences person A's goal attainment (winning or losing the game). This relationship also applies to person B, who is similarly affected by person A's actions.

Social interdependence can have different forms (Deutsch, 1949a, 2012). The social interdependence between person A and B in the rock-paper-scissors context is *negative*

since both players cannot achieve their opposing goals simultaneously (i.e., winning the game). Situations characterized by a negative interdependence can be defined as competitive contexts: One person's win is tied to the other person's loss. *Positive* social interdependences contrast such competitive contexts. That is, both players' goals align, and the success of one player logically implies the success of the other. Imagine the two persons playing rock-paper-scissors with a modified rule: both win if they choose the same gesture. If person A achieves her goal, person B automatically achieves hers as well. Both win and lose together. Situations characterized by a positive relationship between goals can be defined as cooperative contexts. Finally, the goals of individuals can be *independent*. In such situations, there is no relation between the achievement of individuals' goals. Here, no social interdependence exists. Imagine person A and B practice their rock-paper-scissors gestures beside each other. Person's A goal is not dependent on person B's goal achievement and vice versa. Such situations are henceforth defined as solitary contexts.

According to Deutsch (1949a), the three different forms of social interdependence elicit different psychological orientations and influence social behavior. Competitive contexts result in oppositional interactions, in which individuals aim to prevent others from their goal achievement in order to attain their own goals (Johnson & Johnson, 2005). Competitive contexts elicit distrust, aggression, obstructiveness, and preferences for advantageous inequality (i.e., preferring to have more than others; Deutsch, 2012; Johnson & Johnson, 2011). In contrast, cooperative contexts result in promotive interactions, in which individuals aim to increase the likelihood to achieve the goal they share with their interaction partner (Johnson & Johnson, 2005). As a consequence, cooperative contexts elicit trust, benevolence, and a morality directed toward equality (i.e., preferring to share equally; Deutsch, 2011b, 2012; Johnson & Johnson, 2005). Solitary contexts neither promote nor impede prosocial behaviors (Johnson & Johnson, 2005; Roseth et al., 2008).

Social Interdependence Theory makes two further assumptions: First, within the respective contexts, persons' interactions enter a maintaining loop (Johnson & Johnson, 2005). That is, social interdependences elicit behaviors, and these behaviors further intensify the respective interdependence (Deutsch, 2011a). For example, a deception of person A in the competitive rock-paper-scissors game might intensify the competition, and person B might react with provoking statements. Thus, an action induced by a competitive context maintains the context. Respective loops are also assumed for cooperative and solitary behaviors. Deutsch (1985) calls this process the *crude law of social relations*. Second, individuals tend to generalize the evaluation of others' actions to the person as a whole (Johnson & Johnson, 2005; Roseth et al., 2008). After the provoking statement of person B, person A might think that person B is generally aggressive and will behave accordingly, even outside the context of the game.

Thus, individuals draw generalized conclusions about others based on their actions in social interdependence, and accordingly, situational spill-over effects might occur. The psychological orientation elicited in a socially interdependent interaction still influences subsequent situations that are not externally characterized by the respective interdependence. Imagine that person A and B decide to stop playing the rock-paper-scissors game. Thus, their competitive interdependence is not valid anymore. However, the interdependent interaction elicited psychological orientations consisting of

evaluations of the other player as a whole. This orientation creates a lens through which they perceive the other person. For example, players might still feel resentful after competition or gratified after cooperation, although the game is finished. Also, the crude law of social relations assumes that the respective social interdependence and the related psychological orientation do not end abruptly, but slowly diminish. Consequently, one can predict two effects on prosocial behavior: First, during and after interactions in cooperative contexts, individuals should show more prosociality toward their interaction partners as compared to interactions in competitive or solitary contexts. Second, individuals should show less prosociality during and after interactions in competitive contexts as compared to cooperative and solitary contexts.

It is important to notice that Social Interdependence Theory does not make definite predictions about mixed forms of social interdependence, such as competition between cooperating teams (e.g., soccer teams; Johnson & Johnson, 2005). In a recent summary of the Social Interdependence Theory, Deutsch (2012) argued that the relative strength of positive and negative interdependence might influence individuals' behaviors when facing mixed forms of social interdependence. For example, when cooperation was more salient than competition, a cooperative (and less competitive) orientation would be elicited. However, what aspects of a situation give one form of social interdependence relatively more strength than the other has still not been specified. Mixed forms of social interdependence, such as intergroup competition, are an interesting field of research and have stimulated a vast body of research (e.g., Erev et al., 1993; Gunnthorsdottir & Rapoport, 2006; Majolo et al., 2016; Majolo & Maréchal, 2017; Puurtinen & Mappes, 2009; Radford et al., 2016; Zhu et al., 2015, 2016). This dissertation aims to investigate the mechanisms underlying the individual effects of cooperation and competition, and I consider it to be necessary to strictly separate these in order to learn more about their individual effects. Thus, mixed forms of social interdependence are beyond the scope of the current dissertation.

Social Interdependence Theory makes broad predictions about the influence of cooperation and competition on prosocial behavior. One prerequisite for such effects is that individuals need to perceive and understand social interdependence between themselves and others. The next section describes from which age humans start to understand cooperation and competition.

Children's Understanding of Social Interdependences

To be influenced by social interdependence, individuals need to (a) understand that their actions are related to the actions of others, (b) be aware of the different forms of social interdependence, and (c) follow related implications for their goal attainment (Johnson & Johnson, 1974). In humans, these prerequisites are not fulfilled from birth. Throughout early development, children begin to understand positive and negative forms of social interdependence and start to adjust their social behaviors accordingly.

Shortly after their first birthday, children begin to differentiate between cooperative and solitary contexts of third-parties (Henderson & Woodward, 2011; Tomasello & Carpenter, 2007). During this age, children are also capable of engaging in cooperative interactions with adults (Warneken et al., 2006). However, at this age, children act mostly in parallel (instead of jointly) when interacting with same-aged peers without adult scaffolding. The ability to coordinate their actions when cooperating with peers

seems to emerge between the ages of 2 to 3 years (Brownell et al., 2006; Brownell & Carriger, 1990). From this point onwards, children become profound cooperators, feeling committed to their co-workers (Hamann et al., 2012; Koomen et al., 2020) and being able to cooperate in complementary roles (Gräfenhain et al., 2009; Tomasello et al., 2005).

Children's understanding of competition emerges slightly later in ontogeny. From age 3, children start to understand that agents may have conflicting goals (Rakoczy et al., 2007) and can differentiate between winning and losing in competitive games as indicated by congruent emotional expressions (Priewasser et al., 2013; Stipek et al., 1992). As early as age 3 and more robustly from age 5, children become increasingly motivated to outperform competitive co-players. From around this age range, children promote their own performance and hinder their co-player in competitive contexts (Greenberg, 1932; Leuba, 1933).

The crude law of social relations suggests that social interdependences elicit a loop of behaviors intensifying the respective interdependence (Deutsch, 2011a). Reciprocal behavior can be seen as an indicator of this law. That is, others' positive or negative actions increase the likelihood of a congruent reaction. A first understanding of the principle of positive reciprocity—favoring benevolent others—emerges around age 3 when children start to distribute resources to third-parties using reciprocal heuristics (Hamlin et al., 2011; Olson & Spelke, 2008). From this age, children also actively engage in direct reciprocity, that is they behave more prosocially toward others who have been prosocial to themselves before (House, Henrich, Sarnecka, & Silk, 2013; Robbins & Rochat, 2011; Vogelsang & Tomasello, 2016; Warneken & Tomasello, 2013, but see Chernyak, Leimgruber, Dunham, Hu, & Blake, 2019). From age 4, children engage in direct negative reciprocity by being less prosocial toward others who harmed them before (Chernyak et al., 2019). These findings suggest that the crude law of social relations seems to work from around age 4 (for a review, see Leimgruber, 2018).

In sum, children begin to understand cooperation and competition in peer interactions around age 3 to 4. From this age, the predicted effects of Social Interdependence Theory should be observable. Preschoolers should show increased prosociality within and after cooperative contexts as compared to competitive or solitary ones, and competitive contexts should lower children's willingness to act prosocially as compared to the other two.

Social Interdependence and Prosociality

Prosocial Behaviors Within and After Interactions

There have been several attempts to test the predictions of positive and negative social interdependence on children's prosocial behavior derived from Social Interdependence Theory. A vast body of research corroborates the hypotheses that cooperative contexts promote preschoolers' prosociality as compared to solitary and competitive contexts, and that competitive contexts lower their prosocial behaviors as compared to cooperative and solitary contexts.

Within cooperative contexts, 3- to 5-year-old children behave more cooperatively (Bay-Hinitz et al., 1994; Orlick et al., 1978), show more helping and sharing (Finlinson et al., 2000; Grineski, 1989; Huyder et al., 2017; Huyder & Nilsen, 2012; Valcke, 2017), and make more group-oriented utterances (e.g., "Let us work together"; Gelb & Jacobson, 1988) as opposed to competitive contexts. Likewise, 5-year-olds are more trustful (Stengelin et al., 2018) and less deceptive (Reyes-Jaquez & Echols, 2015) in cooperative as opposed to competitive contexts. Even *after* participating in cooperative gaming interventions, 4- to 7-year-old children behave more prosocial toward their interaction partners as compared to interventions including competitive games (Bay-Hinitz et al., 1994; Garaigordobil & Berrueco, 2007; Grineski, 1991; Lozada et al., 2014; Orlick et al., 1978; Orlick & Foley, 1979; Rogers et al., 1981). Similarly, after cooperatively obtaining resources, dyads of preschoolers show more fairness in the subsequent distribution of this particular resource as compared to a solitary acquisition of resources or windfall scenarios (Corbit, 2019; Corbit et al., 2017; Hamann et al., 2011; Melis et al., 2013; Plötner et al., 2015; Ulber et al., 2015).

In sum, these studies show that social interdependence influences preschoolers' prosocial behaviors toward their interaction partners: Cooperative contexts promote prosocial behaviors as compared to competitive and solitary contexts. Furthermore, competitive contexts trigger more antisocial behaviors than cooperative contexts (Bay-Hinitz et al., 1994). Importantly, these effects occur both *within* and *after* interdependent interactions. To which extent children's prosociality extends to other resources or interaction partners will be discussed in the next section.

Spillover Effects of Prosocial Behaviors

Cooperation and competition do not only seem to affect preschoolers' sharing of the particular resources obtained in peer interaction, but also resources that are unrelated to the previous interaction. When allegedly participating in a competitive drawing contest, 4- to 6-year-old children shared fewer crayons with an absent competitor as opposed to a non-competitive control condition (Pappert et al., 2017). This lowered sharing rate of crayons in the competitive condition could be seen as functional since the chance of winning the contest increases when competitors have less drawing equipment. Interestingly, children also shared fewer resources that were unrelated to the drawing contest (i.e., stickers) in the competitive condition as compared to the control condition. This finding suggests that competition can elicit a psychological orientation that goes beyond competitive contexts and even affects children's sharing in subsequent unrelated contexts.

A completive pattern has been found for children's sharing after cooperative interactions. Replicating previous work, Corbit (2019) found 3- to 5-year-old children to share more resources with their interaction partner after they obtained the resource cooperatively as compared to a windfall control condition. In an additional condition, dyads obtained a resource cooperatively and could share a different, unrelated resource with their partner afterward (i.e., sharing candy after obtaining a toy). In this condition, children's sharing was higher as compared to the control condition suggesting that cooperative contexts promote children's prosocial tendencies in unrelated contexts.

Thus, the effects of different forms of social interdependence on children's prosocial behaviors do not seem to be limited to the respective contexts. Cooperation and

competition influence children's subsequent sharing of related and unrelated resources. This pattern of results raises the following questions: Do cooperation and competition only change children's prosocial behavior toward specific interaction partners? Or does cooperation also promote prosociality toward third-parties? That is, does cooperation foster generalized prosociality directed toward others that were not part of the cooperation? It might be that socially interdependent interactions merely influence the relationship between interaction partners. However, cooperation and competition might also create a lens that generally changes children's perception of upcoming interactions. Accordingly, the psychological orientation elicited by the respective social interdependence may not only change prosocial behavior toward previous interaction partners but also third-parties. In other words, not the specific relationship between competitors and cooperators changes, but the individuals themselves. Previous evidence partly corroborates the idea that an elicited orientation shapes interactions with third-parties.

Orlick (1981) assessed the impact of an 18-week cooperative gaming intervention on 5-year-old children's sharing behavior. In the intervention condition, kindergarten classes played cooperative games four days a week. The control condition comprised both solitary and competitive games. At the end of the intervention, children participated in a dictator game, in which they could share stickers with an anonymous peer from a different kindergarten. As compared to the control condition, children's sharing increased in the intervention condition, suggesting that repeated cooperative gaming can promote sharing toward uninvolved third-parties.

Street and colleagues (2004) assessed the effect of a 3-month cooperative gaming intervention on 9- to 12-year-olds' prosocial behavior. The intervention comprised biweekly sessions of playing cooperative games. This group was compared with a control group receiving regular physical education. After the intervention, parents and teachers reported that participants of the intervention group were generally more prosocial as compared controls. Importantly, the ratings did not relate to prosocial behavior toward classmates but a general attitude suggesting promoted prosociality toward third-parties.

Battistich and colleagues (1989) evaluated an intervention lasting five years (from kindergarten to fourth grade) that aimed to promote prosocial behaviors. The intervention program included cooperative tasks, sessions highlighting prosocial values, and helping activities (e.g., peer tutoring). The intervention group was compared with a group of students receiving regular education. After 5 years, children's prosocial strategies in conflict situations were assessed through interviews, in which children had to propose social problem-solving reactions in fictive story vignettes (e.g., one child takes away a toy from another). In these stories, participants had to imagine being the disadvantaged agent. Results indicated a higher use of prosocial strategies and more consideration of others' needs in the intervention group as compared to controls.

These results suggest that social interdependence shapes preschoolers' prosocial behaviors. Cooperation seems to promote children's willingness to act prosocially, while competition lowers prosociality. Also, these studies suggest that these effects occur both within and beyond social interactions. Finally, there is evidence suggesting that these effects transfer to uninvolved third-parties.

Social Interdependence and Intergroup Behavior

Social interdependence and intergroup behaviors are linked (Deutsch, 1949b; Sherif et al., 1954; Van Lange & Rusbult, 2012). When cooperating with others, a sense of group cohesion increases, while it decreases in a competitive context (Deutsch, 2012). As described above, both cooperation between teammates and competition between teams substantially account for team spirit in interactions (e.g., when playing soccer in two teams). From early on in development, children (a) cooperate more with in-group as compared to out-group members (for an overview, see Over, 2018), and (b) expect cooperation between third-party in-group members and competition between out-group members (Dunham, 2018; Jin & Baillargeon, 2017; Rhodes, 2012, 2013; Rhodes & Chalik, 2013).

In-Group Bias

From early in ontogeny, children tend to favorize their in-group over an out-group and cooperate more with in-group members. For example, infants favor own-gender peers (Shutts, 2015), peers of their ethnicity (Dunham et al., 2008), and speakers of their native language (Kinzler et al., 2007, 2009). Around preschool age, this in-group bias begins to show in contexts of arbitrary, minimal groups (Over, 2018). In comparison to the groups based on natural categorizations (e.g., language), minimal groups are entirely conventional and are assumed to be an indicator for the impact of mere membership on human behavior (Dunham, 2018). As early as age 3, and more stable form age 5, children show in-group favoritism in contexts of minimal groups as indicated by selective prosocial behaviors toward in-group members as compared to out-group members (Aboud, 1988; Chalik et al., 2014; Dunham et al., 2011; Dunham & Emory, 2014; Fawcett & Markson, 2010; Plötner et al., 2015; Rhodes, 2012; Richter, Over, et al., 2016). Likewise, 5-year-olds (but not 4-year-olds) keep secrets of in-group members more reliably than ones of out-group members (Misch et al., 2016), and take more care of their reputation among in-group than out-group members (Engelmann et al., 2013). Children's in-group bias may be driven by children's in-group favoritism, out-group derogation, or both (Aboud, 2003; Brewer, 1999). Developmental findings suggest that the favoritism of one's in-group seems to be present from around preschool age, while the derogation of an out-group becomes more nuanced after 6 years of age (Buttelmann & Böhm, 2014).

Cooperation, Competition, and Groups

Intergroup contexts influence expectations on others' cooperation and competition, even if these forms of social interdependence have not been mentioned explicitly. For example, from around their second year of life, children expect that in-group members support each other (Jin & Baillargeon, 2017; Rhodes, 2013) and are harmful to out-group members (Rhodes, 2012). Further, preschoolers expect others to favor their in-group members and to be less deceptive toward them (Dunham, 2018). Also, preschoolers evaluate intragroup harm as more condemnable than intergroup harm (Rhodes & Chalik, 2013).

Cooperative and competitive relationships between groups further shape these expectations: In-group support is stronger when groups compete as compared to contexts with a neutral or cooperative relationship between groups. For example, 3-year-old children expect intragroup help in intergroup conflict (Chalik et al., 2014) and preschoolers share more resources with their in-group members as opposed to out-group members in a context of intergroup competition as compared to a non-competitive control contexts (Majolo & Maréchal, 2017; Zhu et al., 2015). Likewise, 5- to 10-year-old children state to be less prosocial toward out-group members in a competitive as compared to a non-competitive intergroup context (Abrams et al., 2015). Further, cooperative intergroup contact reduces the selective favoritism of in-group members over out-group members (Allport, 1954; Deutsch, 1973; Pettigrew et al., 2011; Worchel, 1979). The cooperative and competitive relationship between groups also shapes children's social categorization of these groups (Ferera et al., 2018).

In one study, Spielman (2000) assigned 6-year-olds to minimal groups based on an arbitrary criterium. The relationship between these minimal groups was neutral, such that group competition was not mentioned explicitly. Then, the experimenter primed the participants by reading out a story vignette, including either a competitive or non-competitive interaction of peers (e.g., children having a race or playing on the playground). After hearing the story, children could divide resources between in-group and out-group members of the previously established minimal groups. Children shared more stickers with in-group than out-group members after being primed with competition as compared to neutral priming. In the neutral priming condition, children did not show any in-group favoritism as indicated by equal sharing rates between groups. Notably, the stories and the groups were unrelated, suggesting a spillover effect of the primed competition to the intergroup scenario. This finding indicates that competition can cause spillover effects to unrelated intergroup contexts. From these results, Spielman concluded that intergroup competition is an essential part of in-group favoritism.

Thus, being categorized in groups gives rise to cooperative and competitive expectations, and cooperative and competitive group relationships further intensify these. This inherent link between social categorizations and social interdependence might be a core component of humans' morality, which is hypothesized to have evolved to regulate humans' large scale cooperation (Graham et al., 2011; Rai & Fiske, 2011; Rhodes & Baron, 2019).

Research Gap

Past research suggests reliable effects of cooperation and competition on preschool-aged children's prosocial behaviors. However, some methodological aspects are limiting the interpretation of these findings. This section systematically lists the limitations of previous work and offers suggestions on how to overcome these.

Low Internal Validity

Many of the studies outlined above have low internal validity and neglected children's behaviors during cooperation and competition as predictors for their following

prosocial behavior. Previous approaches seem legitimate since the research often aimed to design interventions. However, potential confounders and unmatched experimental conditions may have led to wrong interpretations.

For example, during many cooperative gaming interventions, experimenters selectively reinforced behaviors that were in line with the respective social interdependence (e.g., Garaigordobil et al., 1996; Garaigordobil & Echeverría, 1995; Orlick, 1981). Also some interventions were combined with a reflection of specific values in line with the respective social interdependence (e.g., reflecting on the importance of sharing after playing cooperative games; Garaigordobil & Berrueco, 2007; Street et al., 2004). Such a selective reinforcement does not allow for reliable conclusions on whether social interdependence itself or the reinforcement of the experimenters, or both factors, are responsible for the detected results.

Further, the settings in which children either cooperated or competed were not matched in some of the previous studies. Nelson and colleagues (1969) compared a competitive bowling game with a condition in which children operated a remote-controlled dog. Some studies compared cooperative games in which the group can per se not lose with competitive settings in which one party would necessarily lose (e.g., Garaigordobil et al., 1996; Street et al., 2004). This implementation of cooperative games might influence the dynamic of the game and (probably) children's psychological orientations and emotions (e.g., anxiety or happiness; Corbin et al., 1979). Also, some studies examined the effect of interventions, including multiple elements (e.g., peer tutoring and cooperative activities). The "omnibus" nature of these interventions makes it difficult to determine the actual mechanisms that are responsible for the detected results (Battistich et al., 1989, p. 167).

Thus, comparability between the conditions is far from ideal in these studies. This low internal validity of previous designs calls for research with high experimental rigor to robustly estimate the impact of social interdependence on children's prosocial behaviors, and to rule out alternative explanations that are not related to the interdependence of interactions, such as selective reinforcement of experimenters or stress induced by the mere possibility to lose.

Missing Behavioral Predictors

Children's behaviors during the interdependent interactions have not been considered when trying to predict their subsequent prosocial behavior. In particular, children's goal achievement (e.g., winning or losing a game) might interact with the effects of the different forms of social interdependence. For example, the success (or failure) of cooperation affects children's relationships with their co-workers (Ames, 1981), which further might impact their prosocial motivations. Besides, children's goal achievement while playing games crucially influences their emotions: When winning, children (and probably adults) are happier as compared to losing (Stipek et al., 1992). Given that children's positive feelings predict their prosocial behavior (Aknin et al., 2018), children's success during the interdependent context may be an important predictor for their subsequent prosociality.

Further, children's engagement in interactions might moderate the effects of cooperation and competition. It seems plausible that children who are more engaged while playing a game absorb the respective social interdependence more strongly. For

example, players who strongly engage in a cooperative game cooperate more while playing this game as compared to less engaged players. Consequently, players who strongly engage in a cooperative game might have a more pronounced cooperative orientation as compared to less engaged players and, thus, act more prosocially afterward. Respective predictions can be made for competitive contexts. Thus, children's engagement in cooperation and competition might be an important predictor for their prosociality and might account for interindividual differences within experimental conditions.

Unclear Mechanisms

As outlined above, internal validity was low in some of the previous research, which limits conclusions about the underlying mechanisms of the detected effects. However, besides low internal validity, other methodological aspects restrict conclusions about the underlying mechanisms.

Many previous studies assessed how long-term cooperative gaming interventions shape children's prosocial behavior (e.g., Orlick, 1981; Street et al., 2004). To fully understand whether cooperation and competition are the main reasons for the detected effects, the investigation of immediate short-term effects is useful since the effects can be attributed to the social interdependence with greater accuracy, and potential history effects can be ruled out.

Further, only a few studies examined how cooperation and competition influence children's prosocial behavior toward third-parties as opposed to previous interaction partners (Battistich et al., 1989; Orlick, 1981; Street et al., 2004). The examination of the effects of cooperation and competition on prosocial behavior directed toward third-parties can help us to understand the underlying processes of the effects of cooperation and competition. As mentioned above, it might be that cooperation and competition only affect the specific relationship between previous interactants. If this relationship-specific hypothesis is true, third-party effects should not occur. Alternatively, cooperation and competition might elicit a lens changing the perspective on all upcoming interactions and change the interactants themselves and not their relationships. However, those studies previously investigating the effect of cooperation and competition on third-parties did not directly measure children's prosocial behavior (e.g., ratings of parent and teachers; Battistich et al., 1989; Street et al., 2004). These ratings of parents and teachers do not necessarily indicate children's actual prosocial behavior (Payne, 1980). Further, these studies suffer from the drawbacks related to low internal validity. For example, Orlick (1981) neglects that different forms of social interdependence can have different effects on children's prosocial behavior by combining solitary and competitive games in one condition. Further, the raters of children's prosocial behavior were not blind to conditions since they conducted the intervention (Battistich et al., 1989).

Unclear Direction of Effects

The direction of the effects of cooperation and competition is unclear. Does cooperation promote prosociality? Does competition lower prosociality? Or do both effects occur at the same time? To my knowledge, no published research has investigated the effect of cooperative, competitive, and solitary contexts on children's prosocial behavior in one experimental design. Many studies compared two different forms of social interdependence (e.g., Hamann et al., 2011; Huyder et al., 2017; Lozada et al., 2014;

Melis et al., 2013; Valcke, 2017) or combined solitary and competitive games in one condition (e.g., Orlick, 1981). Within the particular research question, these designs might have full eligibility. However, to disentangle the specific effects of cooperative, competitive, and solitary contexts, a comparison of all these forms of social interdependence is necessary. For example, the results of Street and colleagues (2004) suggest that the cooperative gaming intervention did not promote children's prosociality. Instead, it seems that children's prosocial behavior was lessened in the control condition. This finding would suggest that cooperation does not have a promotive, but rather stabilizing effect. In contrast, Battistich and colleagues (1989) found a promotive effect of their cooperative gaming intervention. By comparing all three forms of social interdependence in one design, the direction and relative size of the effects could be evaluated. Importantly, the conditions need to be matched to interpret this comparison in a meaningful way.

Unclear Spillover Effects on Intergroup Behavior

So far, the exact impact of an elicited cooperative and competitive orientation on children's subsequent intergroup behavior in an unrelated context is still unclear. Spielman (2000) primed children with a competitive or a neutral story and found children to show a stronger in-group bias after the competitive priming. The design of Spielman's study allows the detection of the effect of competition as such on children's intergroup behavior. However, the priming story in the neutral condition was somewhat cooperative (i.e., children playing together). Thus, the neutral condition could also be understood as a cooperative priming and does not fully constitute a baseline. Importantly, Spielman also tested children in a non-priming condition and found similar effects to the neutral condition. From this pattern of results, one can conclude that competition promotes in-group favoritism, while cooperation and neutral orientations do not have any effect. However, this would be in contrast to research suggesting that cooperation has an important role in overcoming in-group favoritism (e.g., Pettigrew et al., 2011). Conceptually replicating the design of Spielman and clearly separating the competitive, cooperative, and solitary context in three conditions is a promising agenda to reveal how cooperation affects children's in-group bias in unrelated contexts.

Selective Prosocial Behaviors

Most of the previous studies focused on children's *sharing* as a prosocial outcome after cooperation and competition (e.g., Corbit, 2019; Hamann et al., 2011; Lozada et al., 2014; Melis et al., 2013; Orlick, 1981; Pappert et al., 2017). The intense investigation of the relation of cooperation and fairness in sharing is reasonable since these are assumed to be connected in humans due to an evolutionary history of collaborative foraging (Hill, 2002; Sterelny, 2007; Tomasello, 2009).

However, prosociality is assumed to be a multifaceted construct consisting of different unrelated behaviors (Dunfield, 2014; Dunfield et al., 2011). Limiting the investigations on the effect of cooperation and competition to selective prosocial behaviors narrows conclusions for practical interventions. For example, knowing that cooperation only promotes sharing, but no other prosocial behaviors might change the value of cooperative gaming interventions. Further, Social Interdependence Theory does not make specific hypotheses for selective prosocial behavior but instead assumes a broad

change in a psychological orientation (Deutsch, 2011b). Accordingly, one would expect to find predicted effects of cooperation and competition across diverse prosocial outcomes since socially interdependent interactions generally affect children's prosocial motivation. To test this prediction and the scope of the predictions made by Social Interdependence Theory, the systematic investigation of the effects of cooperation and competition on various prosocial behaviors is a promising method.

In this endeavor, social inclusion behavior—the active involvement of others in social interactions—might be an interesting facet of prosociality. Social inclusion has been a somewhat neglected prosocial behavior in prior work (Peplak et al., 2017), and none of the cited studies above examined the effect of cooperation and competition on children's social inclusion behavior. However, the interplay of social interdependence and social inclusion is highly interesting since both phenomena are linked to intergroup contexts. The inclusion of others can also be interpreted as a statement regarding group membership and belonging (i.e., you belong to "us", and that is why you can join). Social exclusion—the counterpart of social inclusion—has been assumed to fulfill this function in intergroup contexts (Killen, Mulvey, et al., 2013).

Interestingly, the few studies that have investigated children's social inclusion behavior did this in intergroup contexts. The main finding of these studies is that the social inclusion of in-group members is more likely as compared to the social inclusion of out-group members. For example, Peplak and colleagues (2017) read story vignettes to 4- and 8-year-old children. In these vignettes, participants needed to decide whether to include in-group and out-group members into ongoing interactions (e.g., including an aggressive peer into a reading circle). Out-group membership was established through sex or conduct problems (e.g., aggression-related behavior or attention-deficit/hyperactivity disorder). Across both age groups, children were more willing to include in-group as compared to out-group members.

Using a similar approach, Scholes and colleagues (2017) asked 6- to 7-year-olds whether a character in a story should include a peer who shows aggressive behavior (e.g., pushing others). Here, about half of the children wanted the protagonist of the story to include the aggressive peer.

Mulvey, Boswell, and Niehaus (2018) assessed 8- to 11-year-olds' inclusion in a Cyberball video game. In this paradigm, participants play a ball-tossing game with avatars whose behavior follows a pre-defined algorithm (Williams, 2009). In the study by Mulvey and colleagues, children played the Cyberball game with two language in-group members, and after a while, a language out-group member requested to join the game. The in-group co-players stated that they do not want to include the out-group member and did not pass the ball to the out-group member. The results suggested that older children (10-11 years) were more inclusive than younger children (8-9 years) and included the out-group member more frequently.

These studies used non-participative tasks in which participants either interacted with avatars in a computer game (Mulvey et al., 2018) or heard stories about fictive peers (Peplak et al., 2017; Scholes et al., 2017). However, non-participative interactions hardly resemble the everyday experiences of young children and might have low ecological validity. In children's daily social encounters, they directly interact with others and rarely make decisions in fictive scenarios. Furthermore, in direct interactions, agents, who prefer an exclusion of others, or, who were excluded themselves, might

protest against children's decisions. Anticipating such reactions may shape children's inclusion behavior and should hence be considered for its assessment. Thus, there is a need for a novel paradigm measuring young children's social inclusion behavior. This paradigm should resemble children's everyday life situations in which inclusion behavior occurs and should adaptive so that it can simulate different intergroup situations.

Extending the effects of social interdependences to diverse prosocial behaviors can be fruitful in learning more about the scope of such effects. Social inclusion behavior seems to be a promising candidate in this endeavor since it is linked to intergroup contexts similarly to social interdependence. To assess social inclusion in preschool-aged children, however, a novel paradigm is needed since existing studies used methods with questionable validity for children of such young ages.

In summary, past research has suffered from several drawbacks related to experimental design and sampling methods. First, studies lack internal validity and often fail to consider moderating behavioral variables. These limitations can be addressed by conducting rigid experimental studies and taking children's goal achievement and their engagement during social interactions into account. Second, the mechanisms of the effects of cooperation and competition on children's prosociality are often unclear. In this regard, short-term effects and the impact on third-parties might reveal fruitful insights. Third, the effect of cooperation and competition on intergroup behavior is not fully understood. Replicating previous work and additionally separating all three forms of social interdependence might be a promising avenue for a better understanding of this interplay. Finally, past research extensively examined the effect of cooperation and competition on selective prosocial behaviors (i.e., mainly sharing) while ignoring other facets of prosociality. Here, social inclusion is an interesting behavior since it is generally understudied and related to intergroup scenarios.

Focus of The Dissertation

Based on these research gaps outlined above, the current dissertation addressed the following questions:

How Do Cooperative, Competitive, and Solitary Contexts Influence Preschoolers' Prosocial Behaviors Toward Third-Parties?

The first objective of this dissertation was to conduct an experimentally controlled investigation of the effects of cooperative, competitive, and solitary contexts on children's prosociality. Within this experimentally controlled design, we compared matched cooperative, competitive, and solitary contexts to compare the size of potential effects (e.g., using the same game in all three contexts). Further, this work aimed to explore the mechanisms underlying previous findings. Therefore, we examined the effect of social interdependences on children's prosocial behaviors directed toward third-parties. This investigation can reveal whether socially interdependent interactions have effects specific to the relationship of the interactants or create a general lens through which individuals perceive the relationship toward uninvolved others differently. Finally, we

assessed children's sharing behavior and social inclusion behavior toward third-parties as well as their free play with a previous interaction partner as dependent variables. By doing so, we can evaluate how cooperation and competition influence diverse facets of prosociality.

How Do Outcome and Engagement Impact the Effects of Social Interdependence?

The second question of this thesis is related to the mediating and moderating effects of the outcome of an interaction (i.e., success or failure) and the engagement during the interaction. Past research did not consider these behaviors as potential predictors for prosocial behavior. Understanding the effects of outcome and engagement can offer new insights into the mechanisms underlying previous findings. Besides, both factors might account for interindividual variation in children's prosocial behaviors in and after the different forms of social interdependence.

How Do Cooperative, Competitive, and Solitary Contexts Affect Prosociality in Intergroup Contexts?

Cooperation and competition are linked to children's intergroup behavior. However, the role of cooperative and competitive orientations on children's prosocial behavior in unrelated intergroup contexts is unclear. Spielman (2000) did not clearly distinguish the effects of all three forms of social interdependence. Thus, another objective of the current thesis is to clarify the impact of cooperation on children's in-group favoritism.

How Does Social Inclusion Develop Throughout Preschool Age and How Does Group Membership Influence Social Inclusion?

Only a few studies on children's social inclusion exist, and these used non-participative paradigms with fictive interaction partners. There is a demand for a participative paradigm to assess social inclusion behavior in preschool children. Here, we aimed to develop such a paradigm in order to evaluate the effect of cooperation and competition on preschoolers' social inclusion. Besides this investigation, we aimed to study the development of preschoolers' social inclusion and whether children's social inclusion is a function of group membership similar to social exclusion (Killen, Mulvey, et al., 2013).

Study Population

The current thesis investigated these questions in 3- to 6-year-old children growing up in Leipzig, a German city with approximately 550,000 inhabitants. Given that cultural contexts shape cooperative, competitive, and prosocial behavior from early on in development (Alcalá et al., 2018; Callaghan & Corbit, 2018; House et al., 2019; Kagan & Madsen, 1971, 1972; Schäfer et al., 2015; Slocombe & Seed, 2019; Stengelin et al., under review), the following paragraphs aim to describe the socio-cultural context in which children from this and similar cultural populations are socialized.

Children from Western societies (like Germany) typically grow up with specific experiences with cooperation and competition. In Western societies, parents engage in, scaffold, and reward cooperative interactions with their children from early on in development (Brownell et al., 2006; Keller, 2007). Nevertheless, German children

typically grow up in an environment valuing competition as well. In Western societies, many adults (including parents and teachers) believe that children need to learn how to cope with competition (Deutsch, 1993). Usually, this training is done by exposing children to competition from early in ontogeny: Most of the children's games and the schooling system in Western societies are competitive (Deutsch, 1993; Kohn, 1992), such that students' grades are often determined by the relative performance of their co-students. Thus, German preschool-aged children's understanding of cooperation and competition is already emended in a cultural context. It might be interesting to explore whether the promoting and lowering effects of cooperation and competition differ in their size in young German children.

In Western societies, the consideration of merit crucially influences children's behavior related to fairness. As compared to children from African gerontocratic or hunter-gatherer societies, Western children are more likely to consider their co-workers' productivity when distributing earned spoils (Schäfer et al., 2015). Likewise, Western children share more with hard-working as compared to less-working peers (Baumard et al., 2012; Hamann et al., 2014). Thus, the partner's engagement while cooperating seems to be a promising predictor for particularly Western children's subsequent prosocial behavior.

Besides, it has been assumed that early emerging behaviors can be considered as being more fundamental (Liebal & Haun, 2018). That is, early emerging behavior is assumed to be more stable across cultures. Independent of cultural variation, an ontogenetic perspective can, therefore, help us to understand how fundamental the reactions to cooperation and competition are. As described above, children from Western societies understand cooperation and competition between the ages of 3 to 5, implying that the understanding of social interdependences newly emerges in preschool children. Thus, it might be that the effects of cooperation and competition change throughout preschool age. In particular, younger children might not be affected to the same extent as older since their understanding of social interdependences is weaker. Besides, I aimed to investigate the effects of social interdependence on children's intergroup behavior. As outlined above, preschool age is a unique period in human development for intergroup behaviors since children begin to be sensitive for completely conventional groups. Therefore, the effects of cooperation and competition on intergroup behaviors might change throughout preschool age, making it an interesting age range to study.

Study Overview

What follows is a brief outline of the three studies and the analysis of merged data. These descriptions broadly sketch the study procedures and show relations between the studies. The upcoming chapters contain the detailed procedures, analyses, and results of each study.

Study 1

Study 1 examined the short-term effect of a cooperative, competitive, and solitary context on children's prosocial behavior toward uninvolved third-parties and their

interaction partners. Here, we considered children's goal achievement (i.e., wins and losses) as a predictor for their prosocial behavior. Participants were dyads of 4- to 5-year-old unfamiliar children (N = 96) to control for their previous relationship.

After playing a cooperative, competitive, or solitary game, we assessed children's sharing with and social inclusion of third-parties. To measure sharing behavior, children could divide an endowment of stickers between themselves and an absent third-party peer. Children's social inclusion behavior was assessed in a task in which children played a ball-tossing game with a puppet. Throughout this tossing-game, a second puppet approached the interaction, and children could freely pass to the two puppets. In the end, dyads could freely play for 5 minutes, and we coded their prosocial acts (i.e., helping, sharing, and comforting).

Children shared more stickers with a third-party after playing a cooperative as compared to a competitive game. The willingness to share after playing solitarily was intermediate between the two other contexts but did not substantially differ from either of these. The social interdependence of the game did neither influenced children's inclusion behavior nor their prosocial behavior in their free play. In the social inclusion task, children were highly inclusive, and most included the approaching puppet immediately. This ceiling effect might have hindered the detection of an effect of the different forms of social interdependence. In children's free play, prosocial acts rarely occurred for which the experimental set-up might have been responsible. Children's goal achievement had no significant impact on children's sharing, but on social inclusion, such that more losses resulted in faster inclusion (i.e., in an earlier round).

These results were partly in line with our predictions. For children's sharing, the detected pattern agreed with Social Interdependence Theory. For children's social inclusion of third-parties and their free play behavior, the results did not confirm our predictions. To rule out that the null result for children's social inclusion was due to a ceiling effect, we improved the social inclusion task in Study 2.

Study 2

The main goal of Study 2 was to modify the task so that inclusion rates are lower as compared to Study 1. Study 2's social inclusion task mimicked the one introduced in Study 1 but had a few modifications. Again, children played a ball-tossing game with a puppet while another puppet approached the ongoing interaction asking to join the game. In contrast to the paradigm of Study 1, the approaching puppet addressed both the initiator puppet and the child (and not the child only) to reduce children's feeling of direct responsibility. Further, children played fewer passes with both puppets (10 passes in Study 1; 4 passes in Study 2) since this measure did not reveal useful information in Study 1. Besides the reduction of the ceiling effect, Study 2 aimed to investigate the developmental trajectory of children's social inclusion behavior and influences of intergroup contexts.

To this end, we investigated 3- to 5-year-olds' social inclusion behavior in three different conditions (N = 216). The three conditions comprised a context in which an out-group member approached an ongoing in-group interaction (in-group/out-group condition), a context in which an out-group member approached the child and a neutral partner (i.e., no group membership; neutral/out-group condition), and a context without any group membership (control condition).

Results revealed that children's social inclusion behavior increased throughout preschool age. Children's likelihood to include the approaching puppet was the highest in the control condition, followed by the neutral/out-group condition and the in-group/out-group condition. Only the difference between the control condition and the in-group/out-group condition reached statistical significance. Children's inclusion rates were relatively low when an out-group member approached an in-group interaction making it a promising scenario to test the effects of cooperative, competitive, and solitary contexts.

Study 3

Study 3 intended to replicate and extend Study 1. Here, we investigated the effect of a cooperative, competitive, and solitary context on prosociality toward in-group and out-group members in 4- to 6-year-old children ($N = 144$). Similar to Study 1, dyads played a cooperative, competitive, or solitary game, and children's sharing and their social inclusion behavior were measured afterward. Here, we assessed these prosocial behaviors in a minimal group context. Study 3 aimed to replicate Study 1's findings on children's sharing, which suggested higher sharing rates after cooperation as compared to competition. Also, children participated in Study 2's intergroup condition of the social inclusion task: In this scenario, an out-group member approached an ongoing in-group interaction. In addition to Study 1, we considered children's engagement while playing the game as a predictor for their prosocial behavior, while wins and losses were experimentally controlled. We measured children's engagement through their physical activity while playing.

Results revealed that the different forms of social interdependence did not influence children's sharing and social inclusion behavior. Children's engagement while playing the game did not differ between the three conditions and did not moderate the effect of the social interdependences. Further, children did not show an in-group bias in their sharing. These results do not replicate Study 1's finding on children's sharing and reveal different developmental trajectories of children's inclusion behavior than Study 2.

Merged Analyses

To learn more from the data collected in the three studies, I ran a merged statistical analysis. In the first part of this analysis, I merged Study 1's and Study 3's data for children's sharing and examined how the three forms of social interdependence impact children's sharing across the two studies. This analysis revealed that the cooperative, competitive, and solitary context did not influence children's sharing. Sharing rates in Study 1 were generally higher as compared to Study 3. This finding questions Study 1's effect of social interdependence on children's sharing with third-parties.

In the second part, I merged Study 2's and Study 3's data on children's social inclusion in order to learn more about its developmental trajectory and sensitivity for intergroup context. I found that children's general willingness for inclusion (i.e., including the approaching puppet at all) increases throughout preschool age and that intergroup contexts lower this willingness. In our paradigm, children mostly showed one out of two behavioral patterns: They either included the approaching puppet immediately or not at all. The merged analysis corroborates the conclusions drawn from Study 2.

Chapter 2

STUDY 1: COOPERATIVE GAMES AND PRESCHOOLERS' PROSOCIALITY

This chapter contains a manuscript accepted for publication in PLoS ONE. The article can be retrieved under the following reference:

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Supplemental materials (S1 Table) has been made available online and can be retrieved from doi.org/10.1371/journal.pone.0221092

Playing a Cooperative Game Promotes Preschoolers' Sharing with Third-Parties, But Not Social Inclusion

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Abstract

This study examined the effect of gaming context on young children's prosocial behaviors. Dyads of 4- to 5-year-old children (N = 96) played the same game cooperatively, competitively, or solitarily. After playing the game for a total of ten minutes, sharing with and social inclusion of uninvolved third-parties as well as free play with previous co-players was observed. Children shared less with third-parties after playing the game competitively than after playing it cooperatively. Playing a solitary game resulted in intermediate levels of sharing. The structure of the game did not differentially impact measures of social inclusion or free play.

Keywords: Preschoolers, Prosociality, Cooperation, Competition, Games

Introduction

Preschoolers spend a substantial amount of their time playing games (Pellegrini, 2009). Doing so helps them to acquire motor skills and facilitates their socio-cognitive development (Piaget, 1932; Vygotsky, 1980). Furthermore, games can promote both adult-to-child- and child-to-child-transmission of moral values (Boyette, 2016; Lew-Levy et al., 2018; Piaget, 1932). To learn more about the acquisition of moral values via games, we investigated how games influence different aspects of preschoolers' prosocial behaviors—acts intended to benefit others (Eisenberg et al., 2015).

Social Interdependence Theory

Games differ in diverse characteristics such as content, determination of outcome (e.g., strategy, chance, or dexterity), and context (Roberts et al., 1959; Whittaker, 2012). The characteristic that describes the essential social dynamics of a game and probably influences children's social behavior substantially is the gaming context. Gaming context refers to the relation of players' goals in a game. Based on Social Interdependence Theory (SIT; Deutsch, 1949a), three gaming contexts can be derived: Cooperative, competitive, and solitary. Cooperative games are characterized by a positive interdependence (i.e., a positive relation between the players' goals): Players win and lose together. In competitive games, players' goals have a negative interdependence: One player's victory leads to the co-player's loss and vice versa. When playing solitary games, players' goals are independent, meaning that success or failure of one player does not affect the results of the co-players.

According to the SIT, the relationship between agents' goals has an impact on their social behavior (Deutsch, 1949a). Positive interdependence results in a cooperative mindset that is characterized by the anticipation of help, a benevolent attitude toward interaction partners, and an egalitarian morality (Deutsch, 2011b). Negative interdependence elicits contrary orientations characterized by the anticipation of resistance, aggression, and a preference for advantageous inequality (Johnson & Johnson, 2011). The absence of any interdependence neither promote nor hamper any of these attitudes (Roseth et al., 2008). Importantly, SIT claims that recipients generalize positive or negative actions of an agent to the agent as a whole (Johnson & Johnson, 2005; Roseth et al., 2008), thus resulting in carry-over effects to new situations. A second assumption is that "effects elicited by a given social relationship also tend to elicit that type of social relationship" (Deutsch, 2011a, p.30). This implies that cooperative actions of agents promote cooperative actions of their co-players. Corresponding relations are assumed for competitive and solitary behaviors.

Games and Prosociality

A large body of evidence supports the effects of cooperative, competitive, and solitary games on children's prosociality proposed above. While playing cooperative games, preschoolers behave more cooperatively (Bay-Hinitz et al., 1994; Orlick et al., 1978) and show more prosocial acts (Finlinson et al., 2000; Grineski, 1989) as compared to playing competitively. When playing cooperative games first-grades use more group-oriented statements (Gelb & Jacobson, 1988) and high-level negotiation strategies

(Zan & Hildebrandt, 2003) as compared to when playing competitive games. Additionally, preschoolers behave more aggressively while playing competitive games as opposed to playing cooperative games (Bay-Hinitz et al., 1994).

Not only during the gaming situation itself, but also after playing cooperative games, preschoolers show higher levels of cooperation in free play in comparison to competitive games (Bay-Hinitz et al., 1994). Children initiate more positive physical contact (Grineski, 1991; Orlick et al., 1978; Orlick & Foley, 1979) and more positive cross-ethnic interactions with their co-players after playing cooperative games (e.g., Rogers et al., 1981). Cooperative gaming interventions reduce subsequent aggressive behaviors (Bay-Hinitz et al., 1994) and promote subsequent altruism (Garaigordobil & Berrueco, 2007; Garaigordobil & Echeverría, 1995; Lozada et al., 2014) in 4- to 7-year-olds. Recent experimental work shows that collaboration has a crucial effect on children's prosociality. After working collaboratively, preschoolers share the rewards more equitably as compared to after working solitarily (Hamann et al., 2011; Melis et al., 2013). This effect seems to be due to a promoted sense of fairness rather than a general increase in children's generosity . Crucially, in these experimental studies, resources were obtained through collaborative or solitary activities and the distribution of resources was a part of the activity itself. Yet, 5-year-olds even shared fewer resources that were unrelated to competition (i.e., stickers in a coloring contest) with competitors as compared to third-parties (Pappert et al., 2017). Further, preschoolers helped, trusted, and liked partners with whom they experienced collaboration more than neutral others (Plötner et al., 2015).

Taken together, cooperative, competitive, and solitary games and activities substantially impact co-players' interactions. But do cooperative games in contrast to competitive and solitary games also promote prosociality toward uninvolved third-parties (i.e., non-players)? To address this question, Orlick (1981) implemented an 18-week gaming program to explore the effect of cooperative and solitary games on sharing behavior of 5-year-olds. Compared to a baseline, children shared more stickers with an anonymous peer after playing cooperatively but shared less in the solitary condition. Street and colleagues (2004) assessed the effect of a 3-month cooperative gaming intervention on the prosocial behavior of 9- to 12-year-olds. Children in the intervention group played cooperative games biweekly, while participants in the control condition received regular physical education. After the intervention, parents and teachers rated participants in the intervention group as generally more prosocial compared to participants in the control group. Corresponding evidence comes from Battistich and colleagues (1989), who compared two groups of elementary students (5-year intervention group vs. a control group receiving regular education) in their usage of prosocial strategies in hypothetical conflict situations. Amongst others, the intervention program included cooperative tasks, sessions highlighting prosocial values, and helping activities (e.g., peer tutoring). In interviews, children described their hypothetical social problem-solving reactions in story vignettes (e.g., one child takes away a toy from another). Importantly, participants were asked to imagine themselves being the disadvantaged agent in the narrated story. Results indicated a higher usage of prosocial strategies and more consideration of others' needs in the experimental group as compared to the control group.

In sum, existing evidence shows that in contrast to competitive and solitary games, cooperative games can foster prosociality toward co-players and third-parties who did not participate in the game. However, existing research suffers from three major drawbacks. The first and most important drawback is the low comparability between cooperative and control conditions. The previously games used do not only differ in their context, but also in the behavior being reinforced (e.g., experimenter reinforce prosocial behaviors in cooperative, but not in competitive or solitary conditions), the content of the game, and the difficulty of the task (Bay-Hinitz et al., 1994; Garaigordobil et al., 1996; Garaigordobil & Berrueco, 2007; Garaigordobil & Echeverría, 1995; Orlick, 1981; Street et al., 2004). Second, no prior study has systematically compared the impact of the same game played across all three gaming contexts. This comparison is necessary to ascertain whether cooperative games foster prosocial behavior in contrast to both solitary and competitive games, competitive games impede prosocial behavior as compared to solitary and cooperative games, or whether both processes work together. Third, existing evidence fails to assess and control for the gaming performance (i.e., winning or losing) as a predictor for subsequent prosociality. Gaming performances might influence children's mood, which has been found to impact their prosociality (Aknin et al., 2018). Therefore, gaming performance might have an impact on subsequent prosociality and should thus be considered as a potential mechanism. To overcome these shortcomings, the present study (*i*) uses the same game for all experimental conditions, (*ii*) compares all three gaming contexts, and (*iii*) includes gaming performance as a predictor for subsequent prosociality. Additionally, this is the first study addressing short-term effects of a cooperative gaming intervention in children. The investigation of short-term effects will give us further insight into the learning process underlying long-term gaming interventions.

The Current Study

To investigate how different gaming contexts influence preschoolers' prosociality toward co-players and third parties, we created a novel game that can be played cooperatively, competitively, and solitarily. In the game two preschoolers need to navigate marbles into holes in order to score. Dyads of 4- to 5-year-old children played this game in one of three contexts (between-dyad-design). We assessed 4- to 5-year-olds, because children at this age have developed an understanding of cooperative and competitive game structures (Schmidt et al., 2016). After playing the game, three measures of prosociality were assessed: Sharing, social inclusion, and free play behavior. Sharing was measured by a dictator game, in which children could divide an endowment of ten stickers between themselves and an unfamiliar absent third-party (same-sex peer). Social inclusion was assessed using a novel task, in which children could include a third-party into an ongoing ball-tossing game. Finally, we observed co-players during free play and coded their playing context and prosociality. We preregistered our study (osf.io/y4dk7) and indicated deviations from the preregistration. Detailed procedure, materials, coding sheets, analysis script, and data have been made publicly available on the Open Science Framework (osf.io/jasbz).

We predicted that playing a cooperative game would promote preschoolers' post-game sharing with and social inclusion of third-parties as compared to playing a competitive and solitary game. For free play, we predicted that after playing a cooperative

game, children would show more prosocial acts toward their previous co-player as compared to the other conditions. In addition, we predicted that children would transfer the gaming context to free play (i.e., more cooperative play after playing a cooperative game, more competitive play after playing a competitive game, and more solitary play after playing a solitary game).

Materials and Methods

Participants

In total, 96 children in 48 unfamiliar, same-sex, and same-age dyads participated in the study. Children were between 4 and 5 years of age (M = 5.03 years, SD = .59, range = 4.02 to 6.00), came from diverse socioeconomic backgrounds, attended kindergarten in a medium-sized German city, and were recruited from a laboratory-maintained database. A power analysis recommended a sample size of 126 to 133 participants (see preregistration). Due to personnel and time constraints, we decided to test 96 children. Our study might be slightly underpowered which might impede the interpretation of our results (see Discussion). The ethics committee of the Medical Faculty of Leipzig University approved the study (approval number 169/17-ek). Prior to testing, parents gave informed consent for their children's participation. Dyads were tested in a laboratory in sessions lasting approximately 40 minutes. Data collection took place between June and November 2017. Eighteen additional dyads were tested but excluded from analyses due to children's reluctance to participate (n = 12), participants' acquaintance (n = 2) or experimenter error (n = 4). To be included, subjects needed to have valid values for at least two out of three outcome variables (sharing, social inclusion, and free play). For the majority of the sample (88.5%) all three outcomes were available. Number of missing values were five for sharing, two for social inclusion, and four (two dyads) for free play.

Materials

Children played a game "KoKo", in which they needed to navigate colored marbles into holes on a round platform (Figure 1a). The round case (diameter approx. 23cm) and platform with two holes were made of dashboard. Marbles which fall into a hole are caught in a storage under the platform (Figure 1b). The base plate is colored either green or yellow under each hole. A Plexiglas lid with a hole in the center for placing marbles on the platform was used to prevent marbles from falling out the case. Each player can navigate the marbles by tilting the platform with two ropes colored green and yellow. Marbles had a diameter of 16mm and were colored green and yellow. Additional material for the game was a laminated scoreboard, green and yellow dots and black crosses (Figure 1c). We had a second identical game colored red and blue for the solitary condition.

Stimuli for the dictator game were portraits depicting a boy or a girl (matching the participant's sex) with happy facial expressions. Pictures were taken from the NIMH Child Emotional Faces Picture Set (Egger et al., 2011). Participants were provided with ten identical stickers. In the social inclusion task, we used a triangle of opaque fiberglass

tubes which were fixated on a wooden frame (Figure 2). Tubes were approximately 50cm long and had a diameter of 8cm, so that a rubber ball (diameter approx. 6cm) could easily fit through them. Additionally, two animal hand puppets (a bear and a cow) were used in this task. For the free play, we used 40 enlarged toy blocks.

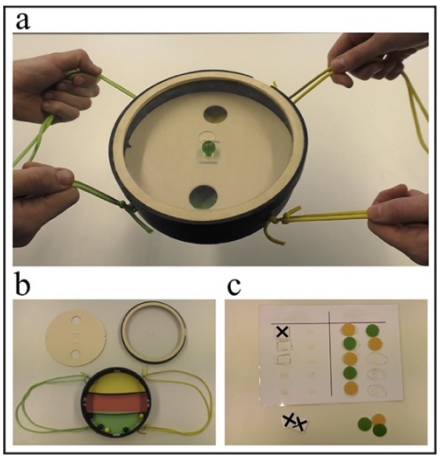

Figure 1. Material for gaming phases. Figure depicts (a) apparatus as played by the children, (b) deconstructed gaming apparatus for illustration, and (c) scoreboard, points, and crosses.

Design and Procedure

The study design comprised three between-dyad conditions: Cooperative (n = 32; 16 female), competitive (n = 32; 16 female), and solitary (n = 32; 16 female). Dyads were randomly assigned to one condition. Dependent measures were sharing with and social inclusion of a third-party, as well as playing context and prosociality in free play with co-players. Two experimenters conducted the study; Experimenter 1 (E1) conducted the gaming phases, the social inclusion task and free play, while Experimenter 2 (E2; blind to condition and hypotheses) conducted the dictator game. Before testing, children were randomly assigned to either the role of participant 1 (P1), who did the social inclusion task first followed by the dictator game, and participant 2 (P2), who completed the tasks in reversed order (detailed description below).

Procedure started after a warm-up phase, in which the direct interaction of the participants was limited by the experimenters. Throughout the experiment participants played KoKo two times for 5 minutes each (Figure 2). After the first gaming phase, the dictator game and social inclusion task were conducted separately, meaning that P1 first did the social inclusion task and P2 played the dictator game. Hereafter, both participants played KoKo again in the same condition. Subsequently participants changed roles, meaning that P1 participated in the dictator game and P2 in the social inclusion task. Afterwards, both participants played freely for 5 minutes.

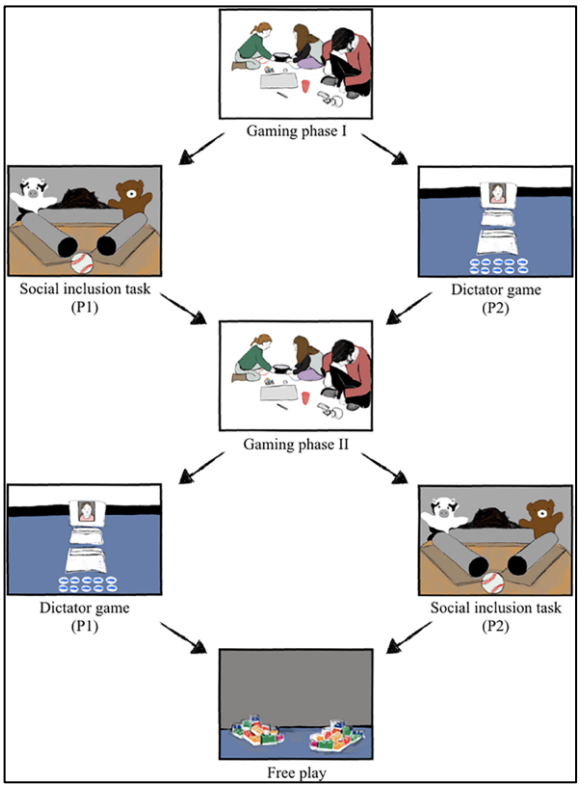

Figure 2. Experimental procedure for both participants. Participants experienced gaming phase I, gaming phase II, and free play together. Participant 1 (P1) first completed the social inclusion task and then the dictator game, while participant 2 first completed the dictator game and then the social inclusion task. The dictator games and inclusion tasks were tested in separate rooms.

Gaming Phase I

The procedure started with a gaming phase of KoKo. In each experimental condition, E1 introduced KoKo with different rules. In the cooperative condition, both participants had the same goal and mutually needed to navigate colored marbles into correspondingly colored holes on the platform. If participants scored, they jointly received a point on the scoreboard. If participants navigated the marble into the wrong hole they received a cross. If participants scored 10 points, they won a round together. If they received 3 crosses, dyads lost a round. In the competitive condition, participants had contrary goals. P1 needed to get a neutrally colored marble into the yellow hole, while P2 had to bring the same marble into the green hole. By scoring, participants individually received points. The participant that scored 5 points first won a round, whereas the other lost. In the solitary condition, participants each had their own gaming apparatuses. Both participants needed to maneuver colored marbles into corresponding holes. If participants scored, they received a point on their own scoreboard. If they failed, participants received a cross on their own scoreboard. Participants won a round if they scored 10 points. When they receive 3 crosses, they lost a round. In this condition, participants played the game in parallel in the same room, standing back to back, and were instructed to focus on their own game to prevent comparisons of the players' results and possible competition, which occurred occasionally.

In each condition, gaming duration was approximately 5 minutes (M = 308.21s, SD = 6.18, range = 292 to 328). E1 managed scoreboards and supplied participants with

new marbles. If participants completed a round within the gaming time, E1 immediately started a new round by clearing the scoreboard and supplying a new marble. Before playing the game, participants were asked three questions to check their comprehension of the game: Where they needed to get the marbles to score; what happened if they scored and failed; to whom the dots and crosses on the scoreboard belonged. If participants did not answer one of the three questions correctly, E1 repeated the relevant information and asked the participant again. All dyads passed the comprehension check either spontaneously or after one repetition. After the first gaming phase, P2 was guided to a separate room, in which E2 waited. P1 stayed in the test room with E1.

Dictator Game

E2 conducted a dictator game with P2. Our procedure was based on previous studies that successfully used this method in preschoolers (e.g., Blake & Rand, 2010). Participants got an endowment of 10 identical stickers and had the opportunity to share a self-chosen amount of these with an absent and unfamiliar peer. Importantly, stickers were not related to the game. The unfamiliar peer was introduced as a same-sex child, who would come to the laboratory the next day. Participants could share stickers by placing them in an envelope lying in front of a picture showing the unfamiliar child. Stickers that participants wanted to keep for themselves could be placed in a second envelope close to the participant. While placing the stickers, E2 turned around and did not observe the participant. To ensure that participants understood the instruction, they were asked four questions before dividing the stickers. They were asked to whom the stickers belonged; where they could place the stickers, they want to dispense; where they could place stickers, they want to keep for themselves; whether anyone could see them, while placing the stickers. The instruction was repeated if one of the questions was answered incorrectly. Most children (60.7%) passed the comprehension check spontaneously and all after one repetition.

Social Inclusion Task

Simultaneously, E1 conducted the social inclusion task with P1. To measure social inclusion behavior, a ball-tossing game was introduced. In the beginning of the tossing game, participants played the ball back and forth through each tube with a puppet operated by E1 (depicting a bear; hereinafter familiar puppet). Within this familiarization, the familiar puppet introduced a second unfamiliar puppet (depicting a cow) sleeping beside the apparatus by stating: “Look! There is someone sleeping. But we can continue to play.”. After one round of passing the ball through each tube, the familiar puppet stayed at one corner of the apparatus (counterbalanced) and initiated another two passes to the participant. When the familiar puppet held the ball, the unfamiliar puppet (also operated by E1) suddenly appeared at the vacant corner of the triangle stating “Hello”. The familiar puppet decided to pass the ball to the participant and not to the approaching unfamiliar puppet after looking at both tubes and thinking aloud about where to pass the ball by stating “Do I pass the ball to the cow or to *Name of child*?”.

Then participants could decide to which puppet they wanted to pass the ball. If any puppet received the ball, the puppet happily stated that the ball arrived and passed the ball back to the child. Puppets did not pass the ball to each other. If not included for two consecutive passes, the unfamiliar puppet gave standardized prompts, indicating the

desire to join the play. Prompts were as follows: “Hello, I am the cow.”, “Can I join you?”, “Could you pass the ball to me?”, “Pass the ball to me!”. Subsequent to each prompt the familiar puppet again decided to pass the ball to the participant and not to the unfamiliar puppet after thinking aloud about to whom to pass. Ten passes of the participant (and 10 returns of the puppets) with these rules were followed by a forced-choice trial, in which the familiar puppet asked participants to whom it should pass the ball (to the unfamiliar puppet or to the participants themselves). For nine subjects the number of passes was not 10 due to experimenter error (range 9 to 12 passes). Deviating from our preregistration, we decided to include these subjects into the data analysis, since all subjects with only 9 passes already included the unfamiliar puppet before the error took place. For the calculation of the inclusion ratio (see below) we considered all passes played by these subjects.

Gaming Phase II and Role Change

After being tested separately, both participants played KoKo for another 5 minutes. E1 reviewed the rules of the game and did a comprehension check as described earlier. Importantly, gaming context was the same as in the first gaming session, but participants changed colors (or apparatuses in solitary condition). Hereafter, the dictator game was conducted with P1 and the social inclusion task with P2, to assess sharing and social inclusion for both participants.

Free Play

Finally, free play of both participants was observed. After waiting for E1 to prepare the test room, participants played with enlarged toy blocks placed in two bunches (20 blocks each) at the opposite ends of the room. E1 guided the participants into the room and said: “Look! There are toy blocks and the two of you can play with these!”. Then E1 left the room and participants could freely play for 5 minutes. After the free play session, the procedure ended and children were awarded with a small gift for their participation.

Coding

All sessions were videotaped (two gaming sessions were not recorded but duration and result were coded live). Coding was done live and from video by the first author. We coded gaming performance for each participant by dividing participants’ points by the number of all marbles played. In addition to our preregistration, we coded the number of rounds that participants won and lost and calculated the difference between these. We decided to use the difference of the number of lost rounds from the number of won rounds as operationalization of gaming performance. We did so since the described ratio of points and total marbles is difficult to compare between conditions and does not take winning into account. The difficulty of comparing the three conditions arises from the different scoring systems. In the cooperative and solitary condition, children needed 10 points to be successful and three crosses entailed a loss, whereas in the competitive condition 5 points lead to a victory over the co-player. Consequently, the mean ratio of points and totally played marbles is always .50 in the competitive condition, since a marble is a benefit for one player and a misfortune for the other. This is not the case in the cooperative and solitary condition. The difference between won and lost rounds

seems to be a more suitable proxy for the gaming performance, because not only quantity (number of points), but also quality (winning and losing) are considered.

For the dictator game, we coded the number of shared stickers. For the social inclusion task, we coded whether participants included the approaching unfamiliar puppet within all 10 passes or not (hereinafter general inclusion), with which pass participants included the unfamiliar puppet the first time (hereinafter first inclusion), and the chosen option in the forced-choice trial. Additionally, we calculated an inclusion ratio of the passes to the unfamiliar puppet divided by all passes after the first inclusion. A higher ratio indicates more passes to the unfamiliar puppet. For each participant, free play was coded with regard to gaming context and the number of prosocial behaviors. For the coding of gaming context, playing sessions were segmented in 10s intervals. Gaming context could either be cooperative, competitive, or solitary. Play was coded as cooperative if participants asked for or attained the same goals (e.g., building something together). Play was coded as competitive if participants attained opposite goals (e.g., contests or stealing blocks from one another). Play was coded as solitary if a participant played independently (e.g., building towers alone). We also coded if a participant did not play (e.g., ignoring toy blocks). Sharing, helping, and comforting were considered as prosocial behaviors (Dunfield, 2014).

Reliability

Independent coders blind to hypotheses coded 25 percent of the data of all dependent and control variables. We calculated Cohen's κ for variables with nominal scales and intraclass correlation coefficient (*ICC*; Shrout & Fleiss, 1979) for metric scales. Interrater agreement for the ratio of points to total marbles (first gaming phase *ICC* = .97; second gaming phase *ICC* = 1.00) and the difference between won and lost rounds (first gaming phase *ICC* = .98; second gaming phase *ICC* = .97) was perfect. Interrater reliability was excellent for the dictator game (*ICC* = 1.0), general inclusion (Cohen's κ = 1.0), first inclusion (*ICC* = 1.0), inclusion ratio (*ICC* = 1.0), chosen option in the forced-choice trial (κ = 1.0), and the number of prosocial behaviors in free play (*ICC* = .75). Reliability for the gaming context of free play was substantial (Cohen's κ = .68).

Data Analyses

Our main question was whether gaming context has an effect on preschoolers' sharing with, social inclusion of third-parties, and free play with co-players. To address this, we analyzed our data using generalized linear mixed models (GLMM) for sharing, social inclusion, and number of prosocial behaviors in free play. We included experimental condition, age in days, the interaction of both, gaming performance of the phase immediately played before (difference between number of rounds won and lost), and sex as fixed effects in all models. For prosociality in free play, which always followed two gaming phases, we included the mean of both gaming performances. Dyad identification number was added as a random intercept effect. For each dependent variable, we firstly compared the fit of the full model with the fit of a null model, containing only the random intercept effect and sex by using a likelihood ratio test. In case of a significance, we used a likelihood ratio test comparing the full model to a reduced model without the respective predictor. Models analyzing sharing, number of prosocial behaviors in free

play, and moment of first inclusion were fit using a Poisson error structure. Models analyzing whether participants included the unfamiliar puppet at all and their decision in the forced-choice trial in the social inclusion task were fit using a binomial error structure. The model for ratio of inclusion was fitted using a Gaussian error structure. We analyzed playing context in the free play with a chi-squared test. All statistical analyses were conducted with R statistical software (R Core Team, 2018), using the package "lme4" (Bates et al., 2017) for all GLMMs. All data and script for statistical analyses have been made publicly available via the Open Science Framework (osf.io/jasbz).

Results

Pre-Analyses

Experimental groups did not differ in age, $F(2,93) = .030$, $p = .970$, gaming duration, $F(2,45) = 1.730$, $p = .189$, and gaming performance, $F(2,89) = .081$, $p = .922$. Dependent variables were not affected by sex (ps > .175). Task-order had no significant influence on the dependent variables (ps > .095). Although not significant, the effect of task-order on sharing seemed considerable, $\chi^2(1) = 2.781$, $p = .095$, in contrast to all other dependent measures (ps > .432). We therefore deviated from our preregistration and decided to include task-order in the null and full model of sharing to control for this potential influence. For all GLMMs, the interaction of age and condition did not reach significance (ps > .435).

Sharing

Children's willingness to share was overall significantly influenced by the independent variables, $\chi^2(6) = 13.177$, $p = .040$, see Table 1. The full-null model comparison was still significant when conducting the preregistered model with task-order as additional predictor, $\chi^2(6) = 13.949$, $p = .030$, see S1 Table. Gaming context affected sharing behavior, $\chi^2(2) = 6.004$, $p = .050$, see Figure 3, with higher sharing in the cooperative condition ($M = 4.33$, $SD = 1.14$) than in the competitive condition ($M = 2.90$, $SD = 2.15$, estimate = -.407, $SE = .166$). Sharing in the solitary condition ($M = 3.55$, $SD = 2.22$) did not differ from sharing in the cooperative (estimate = -.203, $SE = .158$) and competitive condition (estimate = .204, $SE = .165$). Although not significant, children tended to share more with increasing age, $\chi^2(1) = 2.806$, $p = .094$, estimate = .116, $SE = .068$. Gaming performance did not affect children's sharing significantly, $\chi^2(1) = 1.338$, $p = .247$, estimate = .076, $SE = .066$.

Table 1
Estimates of the generalized linear mixed model for sharing in the dictator game

Coefficient	*Dictator game*		
	Estimate	*SE*	*p*
Fixed parts			
(Intercept)	1.526	0.144	<.001**
Cooperative vs. Competitive	0.407	0.166	.014*
Cooperative vs. Solitary	0.203	0.158	.198
Solitary vs. Competitive	0.204	0.165	.215
Age	0.116	0.068	.091†
Gaming Result	0.076	0.066	.246
Task Order	-0.169	0.115	.141
Sex	-0.025	0.132	.849
Random parts			
$\tau_{00,\,Dyad}$		.051	
N_{Dyad}		46	
ICC_{Dyad}		.049	
Observations		89	
AIC		384.357	

Note. SE, standard error; ICC, intraclass correlation coefficient; AIC, Akaike information criterion.
†p < .10, *p <. 05, **p <. 01

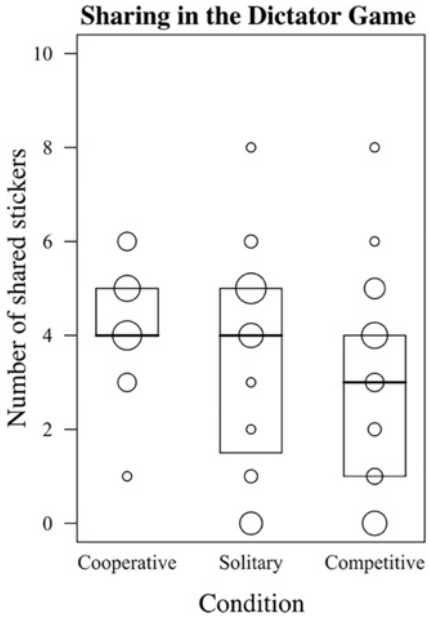

Figure 3. Number of shared stickers by condition. Height of the boxes indicate the interquartile range of the sample, solid lines median. Data points are depicted by dots, with larger dots indicating more data points.

Social Inclusion

Children's general inclusion, inclusion ratio, and forced-choice were similar across conditions, age, and gaming performances (for descriptive statistics, see Table 2). For these variables, full-null model comparisons did not reach significance (ps > .101). Children's first inclusion was overall significantly influenced by the independent variables, $\chi^2(6) = 23.646$, $p < .001$, see Table 3. First inclusion was not affected by gaming context, $\chi^2(2) = 3.751$, $p = .153$. Older children, $\chi^2(1) = 14.722$, $p < .001$, estimate = -1.463, SE = .412, and children with lower gaming performances, $\chi^2(1) = 5.287$, $p = .021$, estimate = .572, SE = .267, included the unfamiliar puppet faster. Importantly, the majority of the children (77.3%) included the unfamiliar puppet immediately with the first pass.

Table 2
Descriptive statistics for social inclusion

Condition	*General inclusion* % included	*First inclusion* *M (SD)*	*Inclusion ratio* *M (SD)*	*Forced-choice* % to child
Cooperative	71.88	1.87 (2.14)	.44 (.10)	18.75
Competitive	68.97	2.10 (2.15)	.46 (.14)	31.03
Solitary	74.19	1.39 (1.67)	.46 (.05)	26.67

Note. *M*, mean; *SD*, standard deviation. General inclusion refers to whether participants included the unfamiliar puppet within 10 passes or not. First inclusion refers to the pass with which the unfamiliar puppet was included the first time. Inclusion ratio is the ratio between passes to both puppets after inclusion, with a high ratio indicating more passes to the unfamiliar puppet. Forced-choice refers to whether participants wanted the familiar puppet to pass the ball to the unfamiliar puppet or to themselves.

Table 3
Estimates of the generalized linear mixed model for first inclusion

Coefficient	*First inclusion*		
	Estimate	*SE*	*p*
Fixed parts			
(Intercept)	-1.572	0.752	.037*
Cooperative vs. Competitive	0.809	0.821	.325
Cooperative vs. Solitary	-1.041	0.978	.287
Solitary vs. Competitive	-1.849	1.044	.076†
Age	-1.463	0.412	<.001**
Gaming Result	0.572	0.267	.032*
Sex	-0.722	0.745	.333
Random parts			
$\tau_{00,\ Dyad}$		2.121	
N_{Dyad}		43	
ICC_{Dyad}		.680	
Observations		66	
AIC		144.554	

Note. *SE*, standard error; ICC, intraclass correlation coefficient; AIC, Akaike information criterion.
†$p < .10$, *$p < .05$, **$p < .01$

Free Play

Prosociality in free play was neither influenced by condition, age, or gaming performance, $\chi^2(6) = 10.329$, $p = .111$. Yet, the frequency of prosocial acts was generally low (cooperative condition: $M = .63$, $SD = .98$, competitive condition: $M = .54$, $SD = 1.07$, solitary condition: $M = .93$, $SD = 1.38$). Gaming context did not impact subsequent playing context, $\chi^2(6) = 5.803$, $p = .446$. Across conditions, children mostly played cooperatively or solitarily and competitive play occurred rarely (Figure 4).

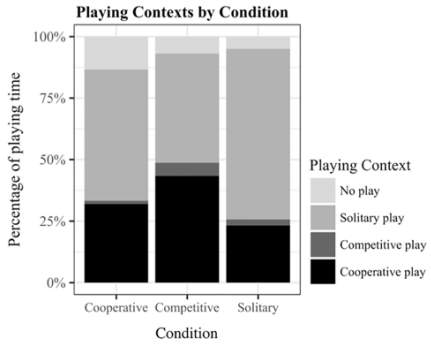

Figure 4. Playing context in free play. Diagram indicates percentage of time played cooperatively, competitively, solitarily and not played in free play by condition.

Discussion

Our results suggest that gaming contexts (i.e., whether a game is played cooperatively, competitively, or solitarily) affect preschoolers' prosociality toward uninvolved third-parties. Specifically, children shared more with an unknown peer after playing a cooperative game than after playing a competitive game. However, different gaming contexts did not affect preschoolers' social inclusion of a third-party and prosociality during free play with the co-player.

The difference in sharing after playing a cooperative and competitive game is in line with the predictions of Social Interdependence Theory (SIT), namely that gaming context has an influence on children's prosocial behavior (Deutsch, 2011b; Johnson & Johnson, 2011; Roseth et al., 2008). However, in contrast to SIT, the sharing rate after playing solitarily did not differ from that after playing cooperatively or competitively. Although, we found the predicted order of sharing rates at the descriptive level, only the difference between the two interdependent conditions reached statistical significance. The small effect size might be explained by the briefness of our intervention, which had a duration of only ten minutes in total. It seems conceivable that cumulative gaming experiences might enhance these differences in sharing rates between gaming contexts. However, this finding supports the assumption that gaming interventions affect subsequent prosociality even after a very brief exposure.

Although we included all three gaming contexts in our design, it still remains unclear whether it is the cooperative or competitive component that mainly drives the difference between these two gaming contexts: Does cooperation increase or competition decrease sharing rates (or do both effects occur at the same time)? Inspection of descriptive results reveals two notable patterns in this regard. First, competitive games seem to lower preschoolers' willingness to share (*Mdn* = 3) in contrast to cooperative and solitary games (both *Mdn* = 4). Second, low offers (0 to 2 stickers) occurred rarely after playing a cooperative game but more after playing a solitary and competitive game. We propose that, in contrast to competitive and solitary games, cooperative games might promote a sense of fairness (Corbit et al., 2017) rather than generosity. Following this interpretation, our results provide support for both hypotheses: Competitive games might lower prosociality resulting in decreased sharing rates and cooperative games might promote prosociality in the sense of refraining from very low, unfair sharing offers. However, these conclusions are based on descriptive results only and need to be tested in future studies.

In addition, it remains unclear which mechanisms drive the different sharing rates after cooperation and competition. A plausible mechanism might be promoted upstream reciprocity (Leimgruber, 2018): Being the recipient of a prosocial action might cause more prosociality toward third-parties and trigger a generalized reciprocity. This effect has previously been observed in 4-year-olds (Leimgruber et al., 2014). When playing a game cooperatively, children help each other to reach their (shared) goal and this mutual helping elicits benevolence toward others. A converse effect can be assumed for competitive games: Experiencing oppositional behavior of co-players might lower the willingness to act prosocially toward them. In contrast to Leimgruber and colleagues (2014), the previously experienced prosocial action in our game (i.e., balancing the

marble into a hole) was not the same as in the subsequent prosocial task (i.e., sharing in a dictator game). By using different actions, we demonstrate that the received and transmitted form of prosociality does not necessarily need to be expressed in the same action. Importantly, we do not claim that this effect is limited to children's games. Experiencing cooperation or competition in non-gaming contexts might have similar effects on children's prosocial behavior. To clarify whether cooperation induces fairness or benevolence future studies should use measures that more directly assess children's sense of fairness (e.g., acceptance or rejection of advantages inequity). Additionally, the helpfulness of a cooperative co-player could be manipulated to clarify whether an induced upstream reciprocity is the driving mechanism underlying this effect.

Contrary to our predictions, cooperative games did not increase social inclusion of third-parties compared to competitive or solitary games. Interestingly, age and gaming performance affected the occurrence of children's first inclusion. Older children tended to include others faster which might be explained by advanced empathy skills (Eisenberg et al., 2015) or more prior experience with ostracism, which might enable older children to understand a third-party's desire to join the group more rapidly. Contrary to the promotive effect of positive feelings on prosociality (Aknin et al., 2018), children with lower gaming performances showed a faster inclusion of a third-party player. This is in line with prior findings indicating that negative feelings can actually increase affiliative behavior (e.g., Over & Carpenter, 2009). Thus, the frustration children experienced when losing the game might have fostered subsequent affiliation with third-parties.

Importantly, though, across all three conditions, the frequency of social inclusion was high and social inclusion occurred fast. This ceiling effect might be due to the fact that inclusion was non-costly and the third-party was a neutral unfamiliar other (i.e., not, for example, an out-group member). Our novel paradigm to assess children's social inclusion might not have detected potential effects of the different gaming contexts, because of low discriminatory power. Future studies should investigate whether cooperative games foster or competitive games hinder social inclusion of third-parties by changing the present paradigm to provoke lower baseline inclusion rates. This could be achieved by making inclusion costly or difficult. For example, the group membership of the unfamiliar puppet could be manipulated, given that group affiliation has been shown to impact children's inclusion rates (Mulvey et al., 2018).

Surprisingly, our results did not reveal the predicted effect of gaming context on prosociality toward co-players in free play. This finding contrasts with a large body of evidence (Bay-Hinitz et al., 1994; Finlinson et al., 2000; Gelb & Jacobson, 1988; Grineski, 1989; Orlick et al., 1978; Orlick & Foley, 1979; Zan & Hildebrandt, 2003). In addition, gaming contexts did not impact subsequent playing contexts. Across all three conditions, children mostly played solitarily or cooperatively. Two reasons might explain the absence of the predicted effects on free play: First, children did not play the KoKo game immediately before the free play task, but engaged in a dictator game or a social inclusion task. The effects of the different gaming contexts might have decreased during this phase before free play started. Similar effects in two subsequent tasks have been observed in children's social behavior (e.g., Michaelson & Munakata, 2016). To prevent participants from being overloaded by the study procedure, which already lasted 40 minutes, we decided to skip an additional gaming phase. Moreover, we expected the effects of the game to be the strongest for the free play since children directly interacted

with the same co-player from the gaming phases. The second reason refers to the experimental setup. Toy blocks were presented in two separate piles. We decided to conduct a procedure with two piles because we anticipated high frequencies of cooperative play between co-players and wanted to create a high threshold. This, however, might have invited children to engage in solitary play (which we observed most of the time). Further, prosocial behaviors occurred rarely in free play, suggesting that the setting with two piles did not offer many opportunities for helping, sharing, or comforting. Due to floor effects for prosocial behaviors and consequently low discriminatory power, the absence of effect should be interpreted with caution.

For all predicted, but absent effects of gaming context on prosocial behavior (i.e., social inclusion and free play) and playing context, the briefness of our intervention and small sample size need to be considered. This is the first study to systematically examine short-term effects of all three gaming contexts on children's prosociality. Previous studies investigating these effects used cumulative gaming interventions lasting for at least 3 months and had less well matched non-gaming controls. Additionally, experimenters did not reinforce prosocial or cooperative behaviors in our study design, meaning that the effect is due to the mere gaming experience in the different contexts. As mentioned above, we decided to assess 96 subjects, although a power analysis suggested a sample size of 126 to 133 participants (see preregistration). Our study might be slightly underpowered to detect existing effects on children's free play.

We found that even a brief gaming experience with peers affects preschoolers' sharing behavior, highlighting the potential of games to shape social behaviors. Future studies should examine whether different kinds of prosocial behaviors are impacted differently by game-based interventions. For example, some prosocial behaviors (e.g., sharing) might be influenced immediately, while others (e.g., inclusion) only change after a long-term intervention.

Although we addressed several drawbacks of previous studies, our design inevitably had some limitations as well: First, we did not assess baseline performance for dependent measures. Differential effects, such as decreases of prosociality after competition, could be evaluated more clearly with pretests. Future interventional studies might use pretests in order to assess the effects of gaming contexts more accurately. However, it should not be overlooked that sharing could be quite sensitive to repeated assessment in a short period of time. Second, we only examined a sample from a Western, urban background and results might not be generalizable to children from different populations (Nielsen et al., 2017). Cross-cultural comparisons might be a fruitful avenue since games considerably differ between cultures (Roberts et al., 1959), correspond with cultural values (Boyette, 2016), and are a crucial nexus in the transmission of cultural values (Lew-Levy et al., 2018). Additionally, culture shapes the propensity to play games cooperatively or competitively (e.g., Kagan & Madsen, 1972) and play can have different functions for child development in different cultural niches (Roopnarine, 2012). Consequently, enjoyment of cooperative and competitive games might differ between cultural contexts and have different impacts on prosociality. Third, we assessed the impact of simple goal structures, namely cooperative, competitive, and solitary contexts. In everyday life (and especially games) these contexts are not clearly separated and often occur in mixed forms such as cooperation within competition (e.g., two teams playing against each other). SIT does not make clear predictions about behavioral changes of such

mixed forms of interdependence. Future studies might address these mixed forms and assess their influence on children's moral behavior. This could be fruitful in order to explore how robust the effects of cooperation and competition are in the presence of each other. Finally, one should consider that the two types of prosocial behavior towards third-parties (sharing and social inclusion) were directed toward two different recipients (anonymous peer and puppet). Prosocial behavior toward a peer might differ from that toward a puppet operated by the experimenter which might impede a direct comparison of the two variables. However, as described above, psychometrical properties of the social inclusion task generally handicap its interpretation.

Conclusions

In sum, we find that the way young children engage in games with each other can influence how prosocially they subsequently behave outside of the gaming context. Sharing with an uninvolved third-party systematically differed depending on whether children had previously played a cooperative or a competitive game with a peer. Crucially, this effect occurred immediately after a short amount of playing. Gaming context did not differentially influence overall rates of social inclusion of third-parties or the amount of cooperation in free play with co-players. Our findings lend support to theoretical proposals stating that games provide a fertile ground for young children to experience different modes of interaction which can promote prosocial values. In consideration of the superior number of competitive games in Western societies (Kohn, 1992) and common misconceptions about beneficial effects of competition in pedagogy (Deutsch, 1993), this finding offers interesting implications for preschoolers' educational environments.

STUDY 2: SOCIAL INCLUSION IN PRESCHOOLERS

This chapter contains a manuscript accepted for publication in Developmental Psychology. The article can be retrieved under the following reference:

Toppe, T., Hardecker S., and Haun, D.B.M. (2020). Social Inclusion Increases Over Early Childhood and Is Influenced by Others' Group Membership. *Developmental Psychology*, 56, (2), 324–35. https://doi.org/10.1037/dev0000873.

Please note that this manuscript comprises two studies. In the original article, these studies are named "Study 1" and "Study 2". To distinct all studies of the current dissertation, I named these "Study 2.1" and "Study 2.2".

Social Inclusion Increases Over Early Childhood and Is Influenced by Others' Group Membership

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Abstract

This study examined preschoolers' social inclusion—the active involvement of new partners into social interactions—in different intergroup contexts. Using an interactive paradigm, 3- to 5-year-old German children played a ball-tossing game with two puppets in which one puppet initiated the game with the child and another approached the game. In Study 2.1 (N = 144), the initiator was from an in-group while an out-group puppet approached the game (in-group/out-group condition) or the child and the two puppets did not have any group membership (control condition). Social inclusion was assessed by analyzing whether and how children included the approaching puppet into the game. Results revealed that children were more inclusive with increasing age. Across age, children were less willing to include the approaching puppet in the intergroup context as compared to the control context. To further investigate whether the difference between conditions was driven by a preference for the in-group or a derogation of the out-group, a second study (N = 72) was conducted. Here, the initiating puppet was neutral (i.e., no group membership) and the approaching puppet was from an out-group (neutral/out-group condition). In this condition, social inclusion was in between the two conditions of Study 2.1. Further, the developmental trajectory found in Study 2.1 could be replicated in Study 2.2 such that children were more likely to include the approaching puppet with increasing age. These results suggest that children's willingness to include others increases over preschool age and is influenced by both in-group favoritism and out-group derogation.

Keywords: Preschoolers, Social Inclusion, Intergroup Behavior, Minimal Group

Introduction

Despite adults' best attempts, children often exclude their peers (Fanger et al., 2012). They do so despite knowing that exclusion can hurt others and while claiming to have an inclusive attitude (Killen, Rutland, et al., 2013). Children's exclusion behavior has been investigated thoroughly, revealing remarkable insights into its development, underlying motivations, as well as interventions against intergroup biases (e.g., Killen & Rutland, 2011; Killen et al., 2013; Mulvey, 2015; Rutland & Killen, 2015). To assess exclusion behavior, previous studies have often used forced-choice paradigms, in which children had to exclude one out of two targets while including the other (e.g., Abrams, Rutland, & Cameron, 2003; Killen et al., 2013; Park & Killen, 2010; Rizzo, Cooley, Elenbaas, & Killen, 2018; Rizzo & Killen, 2016). Once exclusion decisions have been made, children usually do not interact with the targets of their decisions, and thus forgo the opportunity to include both targets. While these forced-choice paradigms provide a basis for understanding children's exclusion, much less is known about the other side of the same coin—children's inclusion. Social inclusion refers to the active involvement of others into one's social interactions. In the current studies, we investigated how the willingness to include others is shaped by intergroup contexts and how it develops over preschool years.

From early on in their development, children are confronted with social groups based on different criteria, such as language, gender, or ethnicity. Social Identity Theory predicts that individuals show an in-group bias by tending to favor their in-group over out-groups (Abrams & Rutland, 2008; Tajfel & Turner, 1986). According to the theory, group membership is an integral part of an individual's self-concept and individuals socially categorize themselves and others (Tajfel & Turner, 1979, 1986). Thus, by favoring their in-group, individuals maintain a positive identity and increase their sense of self-worth. In-group biases can be expressed in different ways, for example through enhanced liking or preference for in-group members over out-group members. These manifestations of in-group bias emerge early in development. By preschool age at latest, children show an in-group bias toward own-gender peers (Halim et al., 2017; Shutts, 2015), own-ethnicity peers (Dunham et al., 2008; Rutland et al., 2005), speakers of their own language (Kinzler et al., 2007, 2009), as well as peers with morphological similarity (Richter, Tiddeman, et al., 2016).

Further, preschoolers also begin to show in-group biases in the context of "minimal" groups that are established via arbitrary markers such as color preferences (Dunham et al., 2011; Richter, Over, et al., 2016). Since minimal groups are not affected by prior experience, such manipulations allow for the assessment of intergroup behaviors motivated by mere belonging without the interference of confounders that may covary with group membership (e.g., familiarity, stereotypes, communicative opportunities).

Between the age of 3 to 5 years, children expect minimal in-group members to support each other and to behave more negatively toward out-group members (Chalik et al., 2014; Rhodes, 2012). Preschoolers' selection and use of information are biased in favor of their minimal in-group. For example, 5- to 6-year-old children prefer to hear a story favoring their in-group over a story favoring an out-group or containing unbiased information (Over et al., 2017). Likewise, preschoolers imitate in-group members more confidentially than out-group members (Wilks et al., 2018) and tend to interpret ambiguous events in the

advantage of their in-group (Dunham & Emory, 2014). Beyond that, 6-year-olds engage in selective third-party punishment, as children this age are more likely to penalize selfish resource allocations of out-group members than of in-group members (Jordan et al., 2014). By keeping a secret of in-group members more reliably as compared to a secret of out-group members, 5-year-olds (but not 4-year-olds) acknowledge loyalty to minimal in-group members (Misch et al., 2016). By 5 years of age, children care more for their reputation with in-group than of out-group members as indicated by promoted sharing when being observed by in the former group as compared to the latter (Engelmann et al., 2013). Young children orient to in-group norms when making decisions in intergroup contexts, such that exclusive in-group norms reduce 4- to 8-year-olds liking of out-group members (Nesdale, 2011; Nesdale & Dalton, 2011). Minimal group scenarios elicit solid in-group bias around age 5, while these effects are rather mixed in 3-year-olds (Dunham et al., 2011; Dunham & Emory, 2014; Plötner et al., 2015; Richter, Over, et al., 2016). This indicates a developing sensitivity for arbitrary groups between the ages 3 to 5.

Self-enhancing intergroup behavior can be motivated by two processes (Aboud, 2003; Brewer, 1999): Either favoritism for one's in-group, which aims to increase the status of one's own group, or derogation of out-groups, which aims to lower the status of other groups. Previous evidence indicates that both processes are present in the first year of life (Hamlin et al., 2013). However, favoritism of one's in-group seems to be more stable from early development, while derogation of out-group members becomes more nuanced after 6 years of age (Buttelmann & Böhm, 2014).

When interpreting this evidence, one has to consider that children's in-group bias is accompanied by an increasing consideration of moral concerns in their social behavior in intergroup contexts (e.g., fairness; Richardson, Mulvey, & Killen, 2012). This trajectory is indicated by equal rates of second- (McAuliffe & Dunham, 2017) and third-party punishment (Jordan et al., 2014) of in- and out-group members around age 7. From this age, implicit measures are more suitable since implicit, but not explicit in-group biases seem to be more stable across development (Dunham et al., 2008; Raabe & Beelmann, 2011).

In sum, Social Identity Theory suggests that preschoolers should show lowered inclusion rates of minimal out-group members as compared to in-group members. In addition, in-group bias should increase over preschool ages as children become more sensitive for arbitrary intergroup contexts during these years.

As far as we know, only three studies systematically assessed children's social inclusion in intergroup contexts. Two of these studies have used fictional story vignettes to test children's inclusion decisions. In one of these studies, 4- and 8-year-olds were confronted with vignettes in which they could include in-group and out-group members (Peplak et al., 2017). Out-group members were peers of the opposite sex and peers with behavioral problems (e.g., aggression-related behavior or attention-deficit/hyperactivity disorder). In these vignettes, out-group membership could potentially undermine group functioning creating a conflict of inclusion (e.g., should one include an aggressive peer pushing others into a reading circle). In both age groups, children stated much more willingness to include in-group members as compared to out-group members. Yet, in the case of the vignettes containing peers with behavioral problems, it remains unclear whether out-group membership or antisocial behavior itself caused the lowered inclusion rates.

In the second study using story vignettes (Scholes et al., 2017) 6- to 7-year-old children were asked whether a third-party (character in the story) should include a peer who shows

aggressive behavior (e.g., pushing others). About the half of their sample stated that the protagonist of the story should include the aggressive peer. This highly inclusive tendency is in contrast to the low rates found by Peplak et al. (approximately 5%), suggesting that children believe that others should be inclusive toward out-group members, but do not show the same degree of inclusiveness in their own interactions (see also Killen, Rutland, Abrams, Mulvey, & Hitti, 2013).

Using a more participative approach, Mulvey, Boswell, and Niehaus (2018) assessed 8- to 11-year-olds' inclusion of peers in a Cyberball video game—a paradigm in which participants play a ball-tossing game with computer-controlled co-players and freely decide to whom of the co-players they pass the ball (Williams, 2009). Children started to play the ball-tossing game with two language in-group members. Throughout the game, a language out-group member appeared intending to join the game. The in-group co-players established an exclusive norm, that is they explicitly stated that they do not want to include the out-group member. The game with all four players continued for approximately 20 tosses. Older children (10-11 years) tended to be more inclusive than younger children (8-9 years), passing the ball more often to the out-group member.

Taken together, past research suggests that children report and show increasingly inclusive behavior toward peers from preschool age through adolescence. Moreover, inclusion behavior seems to strongly depend on the group membership of potential co-players: Inclusion of in-group members is more likely as compared to the inclusion of out-group members.

In the current studies, we aimed to extend these findings in three ways. First, we investigated the ontogeny of social inclusion in early childhood. Previous work has mainly focused on middle childhood (Mulvey et al., 2018; Scholes et al., 2017) or has investigated a narrow preschool age range (Peplak et al., 2017), although in-group bias seems to develop during preschool ages already (for review, see Dunham, 2018). Moreover, preschoolers tend to become more peer-oriented and increasingly initiate social play (e.g., Barbu, Cabanes, & Maner-Idrissi, 2011), which might impact their social inclusion behavior.

Second, we assessed children's inclusion behavior in a participative interaction. Prior studies have measured social inclusion in hypothetical or non-interactive scenarios. That is, participants did not directly interact with the targets of their decisions and targets did not directly respond to the participants' decisions. Instead, children have been confronted with either fictional story vignettes (Peplak et al., 2017; Scholes et al., 2017) or video games with portrayed avatars (Mulvey et al., 2018). In daily social interaction, however, excluded individuals may protest against their maltreatment and the loyalty toward exclusive in-group members may be threatened in case of inclusion. As such, interactive settings resemble children's daily experiences and require less abilities to understand fictive scenarios. Therefore, interactive setups might be more ecologically valid for assessing social inclusion behaviors in young children.

Third, we addressed the underlying motivations of preschoolers' inclusion behaviors: By comparing children's inclusion in an intergroup context versus a non-group control context (Study 2.1) as well as an intergroup context without an in-group member (Study 2.2), we intended to disentangle whether children's behaviors are driven by in-group favoritism, out-group derogation, or both motivations. Knowing the main driver underlying children's inclusion behaviors might be useful for the creation of interventions against in-group biases.

Thus, we investigated how children's social inclusion behavior develops across preschool years and how it is shaped by different intergroup contexts. To this end, we tested 3- to 5-year-old children in a novel task inspired by the Cyberball paradigm (Williams, 2009). In contrast to past research, we aimed to create a more participative situation: Participants repeatedly tossed a ball with two puppet co-players who reacted to the participants' passing behavior (e.g., by voicing their desire to be included; see detailed description below). Importantly, children could, by alternating which puppet received the ball, include both puppets into the ongoing game and were not forced to choose between one of the two targets in a one-shot scenario. In Study 2.1, children either played the ball-tossing game with an in- and an out-group puppet (in-group/out-group condition) or two neutral puppets (i.e., no manipulation of group membership; control condition). We assessed children's frequency and speed of inclusion as well as their affiliation toward co-players after playing the game as indicated by their touching preference when hugging goodbye.

In addition to the experimental condition, we explored how the diversity of children's daily environment affects their social inclusion, assuming that daily contact with out-group members might have beneficial effects on intergroup relations (Abbott & Cameron, 2014; Cameron et al., 2011; Crystal et al., 2008). As an approximation for children's environmental diversity, we assessed the number of peers with special needs, migrant background, or bilingual socialization in children's daycare group. With this exploratory analysis, we try to learn more about interindividual differences in children's intergroup behavior.

Based on previous research, we expected the willingness to include others (a) would increase with age and (b) would be decreased toward out-group targets. Further, we predicted (c) an interaction between age and group membership with older children being more sensitive for the intergroup context. In particular, we expected that the decrease in children's likelihood to include an out-group member as compared to a neutral co-player would become more pronounced with increasing age. We did not make specific predictions regarding the relation between daycare group diversity and children's inclusion behavior (link to preregistration: osf.io/fxkz3).

Study 2.1

Method

Participants

A sample of 144 children aged between 3 and 5 years (mean age: 4 years, 7 months, range: 3 years, 0 months to 5 years, 11 months; 50% female) participated in the study. This sample size was based on a prior power analysis expecting a medium effect with a power of .80 and alpha error probability of .05 (see preregistration). Recommended sample size ranged between 80 to 162 subjects. Because of counterbalancing and personnel constrain, we decided to test 144 subjects.

Children were from a medium-sized German city and recruited from a laboratory-maintained database of parents who had agreed to their children participating in studies. The database includes children from approximately 150 daycare centers located in all districts of the city. Children from 31 daycare centers (where testing also took place)

participated in Study 2.1. Additionally, 32 children were tested, but excluded due to experimenter error (N = 13), disturbance of session (N = 6), error of video equipment (N = 3), failed comprehension check (N = 1), or reluctance to participate (N = 9). Around 18% of the participants' daycare group members had special needs, a migrant background, or grew up bilingual (range: 0 to 44%). The study is part of a project that was approved by the ethics committee of the Medical Faculty of Leipzig University (project name: "Non-pathological development of social behaviors and competences in children and adults with behavior-based observational, peripheral physiological and psychometrical methods"; protocol number: 169/17-ek).

Materials

In a warm-up phase, toy blocks were used. In the ball-tossing game, we used a triangle of opaque fiberglass tubes fixed on a wooden frame (see Figure 5). Tubes were of similar length (50cm) and had a diameter of 8cm, so that a rubber ball (diameter 6cm) could easily fit through them. To establish group membership, we used caps and scarves in four different colors: red and blue in the control condition and green and yellow in the in-group/out-group condition. Besides this, four hand puppets (two each depicting a girl and a boy) dressed with green and yellow caps and scarves were used.

Figure 5. Apparatus used for the inclusion task (in-group/out-group condition).

Design and Procedure

The between-subject design comprised a control (N = 72) and an in-group/out-group condition (N = 72). We randomly assigned children to one of the two conditions. In both conditions, children and the experimenter played with toy blocks to warm-up. After building an object with all toy blocks, the experimenter guided the participant to two caps lying on the floor. In the in-group/out-group condition, these caps were colored green and yellow. Children could freely choose their preferred color and were equipped with a matching cap and scarf (lying inside the cap). Hereafter, two hand-puppets operated by the experimenter were introduced. Both puppets were matched to child's sex. The in-group puppet (puppet wearing the same color as the participant) was introduced first, followed by the out-group puppet (puppet wearing a different color from the participant). When introduced, puppets asked for the child's name, told their name and the color of their cap and

scarf, and stressed that they either had chosen the same (in-group puppet) or a different color (out-group puppet). Henceforth, the experimenter placed both puppets in front of the participant and repeated the colors associated with participant and puppets. The experimenter moved the in-group puppet close to the participant and stated that they were in one group ("You are in the green/yellow group.")[1]. The out-group puppet was placed further away and the experimenter stressed that this puppet would be a member of a different group ("She/He is in the yellow/green group."). The procedure was identical in the control condition, except for one modification. Here, children could choose between a red and a blue colored cap and scarf. Puppets wore green and yellow caps and scarves and were introduced in a randomized order. After being introduced, puppets were placed in front of the child, the experimenter repeated assigned colors and stressed that all were "colorful". There was no mention made of groups.

To check their comprehension children had to name (1) their own color, (2) the colors of the puppets, and (3) state whether their own color matches the colors of the puppets. If children failed to answer correctly, the experimenter repeated the colors of all three and asked the same questions again. One child did not pass the comprehension check and was excluded from the final sample (see Participants section above).

Hereafter, either the in-group (in-group/out-group condition) or a neutral puppet (control condition) introduced a ball-tossing game. In the beginning, this puppet (hereafter first puppet) and the participant passed the ball back and forth through each tube of the apparatus. Then, the first puppet stayed at one corner of the apparatus (counterbalanced) and initiated another two rallies. When the first puppet held the ball, the second puppet (either the out-group puppet or the neutral puppet) appeared at the vacant corner of the triangle stating "Hello". Holding the ball, the first puppet decided to pass the ball to the participant after thinking aloud about where to pass ("Will I pass the ball to *Name of the second puppet* or to *Name of child*?"). When given a turn, participants could freely decide to which of the puppets they pass the ball. Both puppets always passed the ball to the participants to guarantee, that independent of their behavior, children took four consecutive decisions. If not included for two consecutive rallies, the second puppet gave a standardized prompt, indicating a desire to join the game ("Can I join your game?") while the first puppet held the ball. After this prompt, the first puppet again decided to pass the ball to the participant after weighing both alternatives. Four rallies were played, followed by a directive trial, in which the first puppet asked the participant where to pass the ball (to the second puppet or the participants themselves). Finally, in an affiliation test, the experimenter said that the game was over and that the participants could hug the puppets goodbye.

To assess the diversity of the participants' daycare groups, educators were asked about the size of the respective group and how many children of this group had special needs or were from a migrant or bilingual background. We calculated a diversity index by dividing the number of the latter by the respective group size. Data collection took place between May and July 2018 and was conducted by two experimenters who each tested one half of the sample (balanced conditions and ages).

[1]Please note, that the study was conducted in German and that the experimenter did not explicitly use the words "group" or "team" in Study 1. Two bilingual speakers of German and English confirmed the translation given above. The procedure with the exact German wording is available at the Open Science Framework.

Coding and Reliability

All coding was done from video by the first author. We coded whether participants included the second puppet at least once throughout the four rallies, in which rally they included the second puppet first (missing value if not included), and how often they passed the ball to the second puppet (0 if not included). Additionally, children's decision in the directive trial and preference in the affiliation test (indicated by their first touch) were coded. Children who touched both puppets simultaneously (N = 15) or did not want to touch either puppet (N = 28) were excluded from affiliation analysis. An independent coder, blind to hypotheses, coded a randomly chosen quarter of the data. The agreement between the coders was excellent (all Cohen's κ = 1).

Data Analyses

To address how social inclusion develops and is shaped by an intergroup context, we analyzed our data with generalized linear models (GLMs). In all models, we used age (as a continuous variable), condition, the interaction of age and condition, and the diversity index as predictors while controlling for sex, position of puppets, and experimenter. These models slightly deviate from our preregistration, in which we only controlled for participants' sex. To avoid multiple testing problems, we included the position of puppets and experimenter as controls in all models instead of running a separate (preregistered) preanalyses examining their impact on the dependent variables.

For each dependent variable, we firstly compared the fit of the full model with the fit of a null model (containing sex, position, and experimenter) by using a likelihood ratio test. If the comparison between the full and the null model was significant, we further tested the significance of the predictors listed above by further pairwise model comparisons. Models analyzing whether children included the second puppet at least once, their decision in the directive trial, and affiliation were fit with a binomial error structure. Models for the rally of first inclusion and the number of rallies with the second puppet were fit with a Poisson error structure. Statistical analyses were conducted using R software (R Core Team, 2018). Scripts for analyses, data, detailed procedure (including a video), and supplemental material have been made publicly available at the Open Science Framework (osf.io/4uqtn/).

Results

Descriptive results are given in Table 4. For children's general inclusion (i.e., including the second puppet at least once in the four trials), the full-null model comparison was significant, $\chi^2(4) = 20.956$, $p < .001$. A model containing the interaction between age and condition did not differ significantly from a model containing main effects only, $\chi^2(1) = .610$, $p = .435$. The effect of age became significant, $\chi^2(1) = 4.886$, $p = .027$, with older children being more likely to include the second puppet (estimate = .403, SE = .186, see Figure 6a). There was a significant effect of condition, $\chi^2(1) = 16.187$, $p < .001$, such that children were less likely to pass the ball to the second puppet in the intergroup condition than in the control condition (estimate = -1.431, SE = .369, see Figure 6a). The diversity of children's

daycare groups did not significantly influence their general inclusion, $\chi^2(1) = .264$, $p = .608$, estimate = .773, *SE* = 1.506.

Table 4
Descriptive statistics

Condition	*General Inclusion*	*First Inclusion*	*Number of Passes*	*Directive*	*Affiliation*
Control	.708 (.460)	1.392 (.850)	1.514 (1.163)	.722 (.451)	.520 (.505)
In-group/out-group	.389 (.491)	1.286 (.535)	0.875 (1.125)	.625 (.488)	.451 (.503)
Neutral/out-group (Study 2.2)	.597 (.494)	1.186 (.500)	1.347 (1.235)	.778 (.419)	.472 (.504)

Notes. Results are reported as *M* (*SD*). General inclusion refers to whether participants included the approaching puppet at least once in the four trials with 1 indicating inclusive and 0 non-inclusive behavior. First inclusion refers to the rally in which participants included the approaching puppet the first time (coded with 1 to 4). Number of passes refers to passes to the approaching puppet (coded with 0 to 4). Directive refers to whether participants wanted the first puppet to pass the ball to the approaching puppet (coded with 1) or to themselves (coded with 0). Affiliation indicates whether children touched the approaching (coded with 1) or the first puppet (coded with 0) first.

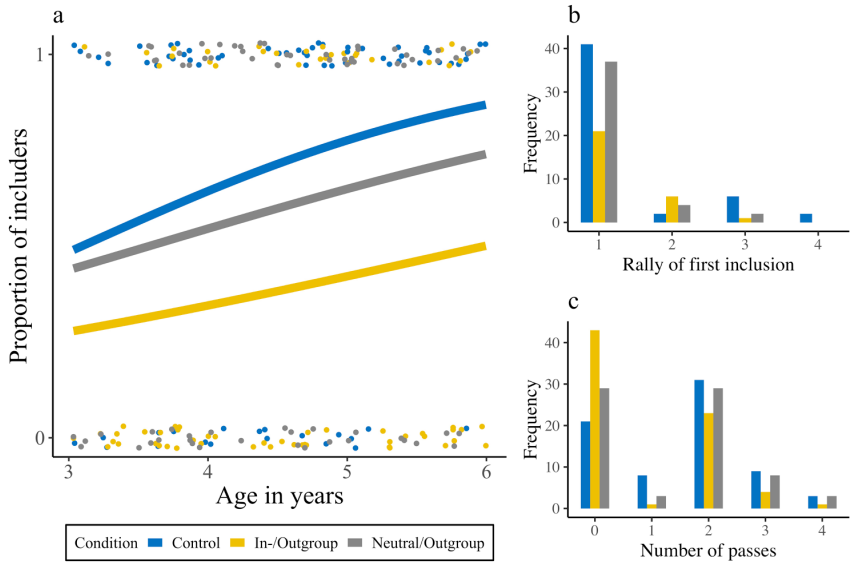

Figure 6. Panels indicate (a) proportion of includers across age and conditions, (b) the frequencies of the rally of first inclusion, and (c) the number of passes to the approaching puppet. Control condition is colored in blue (dark gray), in-group/out-group condition in yellow (light gray), and neutral/out-group condition in gray (intermediate gray).

The full-null model comparison investigating the number of passes to the second puppet was significant, $\chi^2(4) = 19.158$, $p < .001$. A model containing the interaction between age and condition did not differ significantly from a model containing main effects only, $\chi^2(1) = .171$, $p = .679$. There was a significant effect of age, $\chi^2(1) = 5.234$, $p = .022$, with older children being more likely to pass the ball more often to the second puppet (estimate = .178, *SE* = .078). Children passed the ball less often to the out-group puppet than to the neutral puppet, as indicated by a significant effect of condition, $\chi^2(1) = 13.310$, $p < .001$, estimate = -.568, *SE* = .159. The effect of the diversity of children's daycare groups on the

number of passes to the second puppet did not reach significance, $\chi^2(1) = 1.348$, $p = .246$, estimate = .768, $SE = .656$[2].

However, data on the number of passes might be confounded with the general willingness to include the co-player since children who chose to not include the second puppet were part of the respective analysis (coded with 0 passes). We therefore conducted an exploratory GLM with a subsample of only those children who included the second puppet ($N = 80$) and examined how the number of passes is influenced by age, condition (interaction of both), and diversity while controlling for sex, position of puppets, and experimenter (same model as in other analyses). In this subsample of includers neither age, condition, or diversity had a significant impact on the number of passes, $\chi^2(4) = .661$, $p = .956$.

Descriptive results indicated that children who included the second puppet behaved quite homogenously. If they included the approaching puppet, children mostly did so immediately in the first rally (see Figure 6b) and passed the ball alternately between the two puppets (see Figure 6c).

For the rally in which children included the second puppet the first time, $\chi^2(4) = 4.693$, $p = .320$, children's directives, $\chi^2(4) = 4.816$, $p = .307$, and their affiliation when hugging goodbye, $\chi^2(4) = 3.581$, $p = .466$, results revealed no significant effect of the variables of interest. In addition to our preregistration, we explored whether children's inclusion in the directive trial significantly differed from chance. In both conditions, children preferred the first puppet to pass the ball to the second puppet as compared to themselves (total sample: $t(143) = 4.428$, $p < .001$; in-group/out-group condition: $t(71) = 2.176$, $p = .033$; control condition: $t(71) = 4.181$, $p < .001$). The preference to include the second puppet over themselves was still present in the subsample of includers ($t(78) = 3.212$, $p < .002$) and non-includers ($t(64) = 3.027$, $p < .004$).

Children's inclusion behaviors did not differ significantly between experimenters (ps > .200). Position of puppets did not significantly affect children's inclusion (ps > .325), but affiliation, $\chi^2(1) = 5.552$, $p = .018$, estimate = .981, $SE = .422$, such that children showed a preference for touching the puppet on the right side from their perspective when hugging goodbye. Sex did not influence any behavior of interest (ps > .500), except children's directives, $\chi^2(1) = 7.366$, $p = .007$, with girls being more inclusive than boys (estimate = 1.010, $SE = .381$). Results of the preregistered analyses are similar to the ones reported here (see osf.io/4uqtn/).

Discussion

These results reveal that preschoolers' general willingness to include others increases across the ages 3 to 6 which is in line with previous findings (Barbu et al., 2011). Further, children were less willing to include an out-group member into an ongoing game with an in-group

[2]Since a test for dispersion indicated a notable trend toward overdispersion (sample estimate = 1.150, $z = 1.471$, $p = .071$), we ran the same analysis with a Quasi-Poisson error structure. Results from these analyses were similar to ones from the planned analysis. Again, the full-null model comparison was significant, $\chi^2(4) = 19.204$, $p = .003$, and a model containing the interaction between age and condition did not differ significantly from a model containing main effects only, $\chi^2(1) = .170$, $p = .709$. With increasing age children included the second puppet more often, $\chi^2(1) = 4.361$, $p = .037$, estimate = .176, $SE = .085$. Children included the second puppet less often in the in-group/out-group than in the control condition, $\chi^2(1) = 10.835$, $p < .001$, estimate = -.564, $SE = .175$. The effect of the diversity of children's daycare group on the number of passes to the second puppet did not reach significance, $\chi^2(1) = 1.039$, $p = .308$ estimate = .741, $SE = .72$.

member as compared to a neutral agent in a context without any group membership. This finding is in accordance with Social Identity Theory (Tajfel & Turner, 1979, 1986), suggesting that children's behavior is influenced by minimal intergroup scenarios already in preschool ages.

In Study 2.1, children generally included the out-group puppet less often and played fewer passes to an out-group member as compared to a neutral agent. This finding is consistent with the observations of Mulvey and colleagues (2018). After including the second puppet, however, children did not pass the ball less often to an out-group puppet as compared to a neutral puppet. This indicates that once children decided to include the approaching puppet, their number of passes was not influenced by group membership anymore. Most children either chose not to include the second puppet at all or they included this puppet immediately followed by alternating passes between both co-players. Consequently, children's general willingness to include others seems to increase in early development and is lowered in an intergroup context in which an out-group member approaches an in-group interaction. However, once children included the approaching puppet, group membership and age did not further affect their subsequent passing behavior.

Other aspects of inclusion (e.g., the moment of first inclusion) were not influenced by age or the intergroup context. When being asked where their co-player should pass the ball, children preferentially suggested to include the approaching puppet in both conditions. This finding agrees with the differences between children's expectation toward others and their actual inclusion behavior (Killen, Rutland, et al., 2013; Peplak et al., 2017; Scholes et al., 2017). Children's affiliative behavior toward co-players did not change by increasing age and was not impacted by the two conditions. The diversity children experience in their daycare groups did not affect their inclusion behavior. Contrary to our expectations, the likelihood to include an out-group member as compared to a neutral agent did not decrease with age which would have been indicated by a significant interaction between children's age and condition. That is, the sensitivity for minimal groups did not become more nuanced across the ages 3 to 5. Instead, preschoolers of all ages showed the same sensitivity for the minimal intergroup context in their general willingness to include others.

In Study 2.1, we investigated children's social inclusion either in an intergroup context (in-group/out-group condition) or in a setting without any group membership (control condition). It remains unclear which motivations underlie this effect. In the intergroup context, the approaching player was an out-group member and the player who introduced the tossing game was an in-group member. From this procedure, it is not possible to distinguish whether children's inclusion was driven by favoritism toward the in-group member or by derogation of the out-group member (Aboud, 2003; Brewer, 1999). To further investigate these two possible motivations, we assessed an additional condition in a second study using the same paradigm. In this condition (neutral/out-group condition), an out-group member approached the ongoing game between the child and a neutral player (i.e., no group membership). The neutral puppet did not pass the ball to the approaching out-group member. Thus, in contrast to the in-group/out-group condition of Study 2.1, no favoritism toward an in-group member could impact children's decision to include.

Similar inclusion rates between this context (neutral/out-group condition) and the control condition of Study 2.1 would suggest that in-group favoritism is the main driver of the decreased inclusion rates in an intergroup setting. In contrast, similar inclusion rates between the neutral/out-group condition and the in-group/out-group condition would

indicate that out-group derogation is the main driver of the lowered inclusion in the intergroup setting. Intermediate rates would indicate that a combination of both motivations drives children's inclusion decisions in intergroup contexts.

Study 2.2

Method

Participants

Participants were 72 3- to 5-year-old children (mean age: 4 years, 6 months, range: 3 years, 4 months to 5 years, 11 months; 50% female) who were recruited from the same database as in Study 2.1. We decided for this sample size to make the additional condition of Study 2.2 comparable to the conditions of Study 2.1. One additional child was tested, but excluded from analyses due to experimenter error. In Study 2.2, we recruited children from 7 daycare centers, in which testing took place.

Materials and Procedure

We used the same materials as in Study 2.1. The only modification was that only one puppet was equipped with either green or yellow cap and scarf, while the other had no group markers (i.e., no cap or scarf).

The procedure of Study 2.2 mimicked that of Study 2.1. After a short warm-up with toy-blocks, children could freely choose their preferred color of two caps (green and yellow) and were equipped with a cap and a scarf. Hereafter, two hand-puppets were introduced. Both puppets were matched to participants' sex. The neutral puppet (puppet not wearing any colored markers) was introduced first, followed by the out-group puppet (puppet wearing different colored markers as the child). After being introduced, the experimenter slightly moved the neutral puppet and stressed that this puppet would not belong to any group ("She/He is not in a group"). The out-group puppet was moved away from the participant and the experimenter stated that the child and this puppet were not in the same group.

To ensure comprehension of the procedure, children had to name (1) their color, (2) state whether puppets had chosen a color, and (3) whether the colors of themselves and the out-group puppet matched. All children passed the comprehension check. Then, the tossing game was conducted with the same procedure as in Study 2.1—the neutral puppet introduced the game and the out-group puppet appeared at the vacant corner. We decided not to assess the diversity of children's daycare group since Study 2.1 did not reveal any significant effects on children's inclusion behavior. Data collection took place between May and July 2019.

Coding and Data Analyses

The first author coded the same variables as in Study 2.1. Again, children who touched both puppets simultaneously ($N = 11$) or did not want to touch either puppet ($N = 7$) were excluded from affiliation analysis. An independent blind coder coded a random sample of 25% of the data. The agreement between the coders was excellent (all Cohen's $\kappa = 1$). We

ran a statistical analysis including the merged data of both studies and excluded the diversity index as a predictor. The detailed procedure of the additional condition, merged data, script for analyses, and supplemental material have been made publicly available (osf.io/4uqtn/).

Results

Descriptive results of the neutral/out-group condition are given in Table 4. For children's general inclusion (i.e., including the second puppet at least once in the four trials), the full-null model comparison was significant, $\chi^2(5) = 23.070$, $p < .001$. The model containing the interaction between age and condition did not differ significantly from the model containing main effects only, $\chi^2(2) = .663$, $p = .718$. Across Study 2.2 and the two conditions of Study 2.1, results revealed a significant effect of age, $\chi^2(1) = 7.024$, $p = .008$, with older children being more likely to include the second puppet (estimate = .387, *SE* = .149, see Figure 6a). Children's general inclusion behavior was significantly influenced by the experimental conditions, $\chi^2(2) = 16.001$, $p < .001$, see Figure 6a. Children's willingness to include the second puppet in Study 2.2's neutral/out-group condition was between Study 2.1's control (estimate = .745, *SE* = .411, $p = .070$) and in-group/out-group conditions (estimate = -.670, *SE* = .389, $p = .085$). Descriptively, the difference of children's willingness to include between the neutral/out-group and the control condition ($d = -.111$) was about the half of the difference between the neutral/out-group and in-group/out-group condition ($d = .208$).

Similar to Study 2.1, the number of passes to the second puppet was significantly influenced by the variables of interest when analyzing the merged data of Study 2.1 and Study 2.2, $\chi^2(5) = 19.422$, $p = .002$. A model containing the interaction between age and condition did not differ significantly from a model containing main effects only, $\chi^2(2) = .457$, $p = .796$. There was a significant effect of age, $\chi^2(1) = 5.843$, $p = .016$, with older children passing the ball more often to the second puppet across all three conditions (estimate = .149, *SE* = .062). Further, results revealed a significant effect of condition, $\chi^2(2) = 13.279$, $p = .001$. Children passed the ball less often to the second puppet in the in-group/out-group condition of Study 2.1 than in the neutral/out-group condition of Study 2.2 (estimate = -.425, *SE* = .178, $p = .017$)[3]. The number of passes in the neutral/out-group condition of Study 2.2 and Study 2.1's control condition did not differ (estimate = .129, *SE* = .159, $p = .416$). Similar to Study 2.1, these effects on the number of passes could not be found in a subsample of includers ($N = 122$), $\chi^2(5) = .825$, $p = .975$. Inspection of descriptive results indicated that, similar to Study 2.1, the majority of the children in the neutral/out-group condition of Study 2.2 either included the second puppet immediately with their first pass and passed alternately or completely declined to include the second puppet (see Figure 6b and c).

[3]Here, we found a significant overdispersion in the sample (sample estimate = 1.141, $z = 1.756$, $p = .040$) and ran the same analysis with a Quasi-Poisson error structure. Results were similar to the planned analysis. Overall, the variables of interest had a significant impact on the number of passes to the approaching puppet, $\chi^2(5) = 19.422$, $p = .006$. The interaction between age and condition did not significantly influence children's number of passes, $\chi^2(2) = .457$, $p = .826$. Older children tended to pass the ball more frequently to the approaching puppet, $\chi^2(1) = 11.237$, $p = .004$, estimate = .149, *SE* = .067. The number of passes was significantly influenced by condition, $\chi^2(2) = 4.945$, $p = .026$, with highest rates in the control condition followed by the neutral/out-group condition (estimate = -.129, *SE* = .173) and in-group/out-group condition (estimate = -.554, *SE* = .172).

The moment of first inclusion (i.e., first pass to the second puppet), $\chi^2(5) = 3.817$, $p = .576$, and children's affiliative behavior toward the puppets (i.e., first touch when hugging goodbye), $\chi^2(5) = 4.108$, $p = .534$, were not significantly affected by any variable of interest when analyzing the merged data of Study 2.1 and Study 2.2. Across the neutral/out-group condition of Study 2.2 and the two conditions of Study 2.1, children showed a preference to touch the puppet on their right sight when hugging goodbye, $\chi^2(1) = 12.712$, $p < .001$, estimate = 1.181; $SE = .339$.

Neither condition nor age had a significant influence on children's directives in the combined data of Study 2.1 and Study 2.2, $\chi^2(5) = 8.176$, $p = .147$. Similar to the data of Study 2.1, girls marginally tended to more inclusive in their directives than boys in the merged data set of Study 2.1 and 2.2, $\chi^2(1) = 3.789$, $p = .052$, estimate = .589; $SE = .305$. Further, children wanted the first puppet to include the second puppet above chance in all three conditions (total sample: $t(215) = 6.721$, $p < .001$; neutral/out-group condition: $t(71) = 5.630$, $p < .001$). Also, after including Study 2.2's neutral/out-group condition, this inclusive tendency in their directives was significant for children who either had previously included the second puppet ($N = 122$, $M = .705$), $t(121) = 4.942$, $p < .001$, or neglected to do so ($N = 94$, $M = .713$), $t(93) = 4.535$, $p < .001$.

Discussion

In Study 2.2's neutral/out-group condition children's general willingness to include the approaching puppet at least once in the four trials was in between the two conditions assessed in Study 2.1 and increased with age. Further, children's total number of passes increased with age and was affected by the experimental conditions, with higher inclusion rates in Study 2.2's neutral/out-group condition as compared to Study 2.1's in-group/out-group condition. The number of passes did not differ between the neutral/out-group and Study 2.1's control condition. However, the effects on the number of passes disappeared when only analyzing a subsample of includers. This finding indicates that intergroup contexts and age mainly influence preschoolers' general willingness to include the approaching puppet and not their total number of passes.

The moment of children's first inclusion, their directives, and their affiliative behavior were not affected by age and condition. Again, children showed a preference to include the approaching puppet over themselves when given the chance to direct the behavior of the initiating puppet. This effect was independent of children's previous social inclusion behavior.

General Discussion

The main findings of the present studies are that, firstly, children's general willingness to include others into an ongoing game (i.e., whether or not to include an approaching co-player at least once) increases between the age of 3 to 6. Secondly, preschoolers' general willingness to include others is influenced by intergroup contexts of arbitrary minimal

groups, with a lowered willingness in contexts including both in- and out-group members in contrast to settings without any groups. In Study 2.2, a context with a neutral and an out-group co-player (i.e., without an in-group co-player) resulted in intermediate inclusion rates compared to the other two contexts. Finally, independent of the intergroup context, age, and their previous inclusion behavior, children showed a preference to include an approaching player over receiving the ball themselves, when being allowed to dictate what other co-players should do.

We found that children's inclusiveness increases over early childhood. This result agrees with past research showing a shift from solitary to socially more complex forms of play in preschool children (Barbu et al., 2011). The increased likelihood of social inclusion might be explained by more sophisticated cognitive capacities (e.g., attention or working memory), socio-cognitive skills (e.g., empathy or theory of mind), or growing experiences with ostracism. Enhanced theory of mind abilities, for example, might lead children to more inclusive behavior by enabling them to grasp the desire of the approaching puppet faster. This idea is supported by evidence showing a relation between theory of mind abilities and prosocial behavior (e.g., Imuta, Henry, Slaughter, Selcuk, & Ruffman, 2016). Another explanation for the developmental increase in children's social inclusion might be related to children's sensitivity to reciprocity. With increasing age, children might be more capable to overcome the tendency to return objects to individuals who gave these to them. That is, younger children's lower likelihood to include the approaching co-player may result from their pronounced tendency to continue the already existing reciprocal play with the initiating player. This explanation seems plausible considering that 2-year-olds display a strong motivation to continue dyadic reciprocal play (Warneken et al., 2006) and preschoolers undergo crucial developments of attentional skills (e.g., Breckenridge, Braddick, & Atkinson, 2013; Steele, Karmiloff-Smith, Cornish, & Scerif, 2012). In line with this explanation, children's inclusion in their directives was stable across ages supporting the idea that younger children might have been motivated, but not capable, to include the approaching co-player during the ongoing game.

Yet, it needs to be considered that our paradigm did not directly assess a shift from solitary to social play like the study by Barbu and colleagues (2011). Regardless of their inclusion decisions and co-player choices, the nature of the game was innately social. Here, we rather found a shift from dyadic to triadic forms of play, which, however, also requires increased skills to organize and coordinate playful situations that develop during preschool age (e.g., Parten, 1932).

In accordance with Social Identity Theory, preschoolers' general inclusion behavior was influenced by the different intergroup contexts. Children showed lower inclusion rates in a context in which an in-group member introduced the tossing game and decided not to include an approaching out-group member as compared to a control context without group membership. The results of Study 2.2 revealed further insights into the motivations underlying social inclusion. Combined with the results of Study 2.1, it appears that both processes, in-group favoritism and out-group derogation, impact inclusion behavior in preschool ages. This result is in line with past research suggesting an early emergence of outgroup derogation (Hamlin et al., 2013). Yet, children's general inclusion was descriptively more similar between Study 2.2's neutral/out-group condition and Study 2.1's control condition as compared to Study 2.1's in-group/out-group condition. This indicates that ingroup favoritism may be a slightly stronger motivation influencing preschoolers' inclusion

decisions. The motivation to derogate the out-group may become more pronounced over middle childhood (Buttelmann & Böhm, 2014).

Contrary to our predictions, the effect of group membership did not vary with age although previous research using minimal groups suggests that the sensitivity for arbitrary minimal groups increases during preschool age (e.g., Dunham, Baron, & Carey, 2011; Plötner, Over, Carpenter, & Tomasello, 2015). Our finding supports positions claiming that children are sensitive to minimal groups from three years of age (Fawcett & Markson, 2010; Richter, Over, et al., 2016) or even before this age (e.g., Mahajan & Wynn, 2012). Following this assumption, it is conceivable that 3-year-olds show the same sensitivity for group membership as 5-year-olds and that their early sensitivity becomes more evident in interactive as compared to fictive settings (but see Plötner, Over, Carpenter, & Tomasello, 2015). However, we did not measure participants' sensitivity for group membership directly. Older children might have been more sensitive to the intergroup context, without additionally changing their inclusion behavior.

In contrast to previous studies (e.g., Mulvey et al., 2018) and our hypotheses, the number of passes to the approaching puppet was only partially influenced by age and conditions. Although the effects of both factors were significant in our planned analyses, further exploration revealed that these effects seem to be driven by children's general inclusion (i.e., including the approaching puppet at least once). Mulvey and colleagues, however, examined the inclusion behavior of older children than in our two studies (8- to 11-year-olds). As indicated by the developmental trajectory found in the current studies, it might be that in our paradigm nearly all children include the approaching player (even out-group members) across middle childhood. This agrees with evidence suggesting that children's explicit in-group bias decreases with age (Raabe & Beelmann, 2011). However, from around age 7, the number of passes—a more implicit measure of in-group bias—might be more useful to detect effects of intergroup contexts on inclusion behavior since implicit in-group bias seems to be more stable across development (Dunham et al., 2008). In addition, one has to consider that children played only four passes with two co-players in our paradigm. In the setting of Mulvey and colleagues, children played the tossing game with three co-players over approximately 20 passes. The higher number of passes might allow for more implicit effects that we could not detect with our paradigm.

Contrary to our expectations, we did not find an effect of condition and age on the timing of children's first inclusion, their affiliation toward the puppets, and their directives. As mentioned above, the majority of children who included the approaching co-player usually did so immediately, which explains the absence of conditional effects on children's first inclusion. Children seemed to decide for either an inclusive or exclusive strategy immediately once the third player approached the game. The first contact with new co-players seemed to be of crucial importance for preschoolers' inclusion since they only rarely seem to switch their strategy throughout a game. Interventions might focus on these immediate first contacts and scaffold inclusive behaviors to promote positive intergroup contact for longer periods.

The affiliative behavior toward the puppets might not have been influenced by group membership, because the tossing game was finished before affiliation was assessed. The experimenter stated that the game was over, and participants could hug the puppets goodbye. Thus, the end of the game might have decreased the salience of the established groups.

Interestingly, children's directives were generally inclusive and even non-includers preferred the inclusion of the approaching puppet over a pass to themselves (70.8% in the total sample). This is in line with a generally inclusive attitude that has been observed previously (Cooley et al., 2019; Killen, Rutland, et al., 2013; Scholes et al., 2017). It might be that the inclusive attitude is suppressed by an exclusive in-group norm (see also Nesdale, 2011; Nesdale & Dalton, 2011). When giving the chance, children changed the norm of exclusion and preferred to include others. An alternative explanation might be that children show a knowledge-behavior gap such that they think that one should include others (and direct others to do so), but do not include others in their own interactions. Such a knowledge-behavior gap has been observed in other moral behaviors (e.g., sharing; Blake, 2018).

In Study 2.1, we assessed the diversity of children's daycare group. However, this index did not reveal any significant effects on any social inclusion measure. Although being inconsistent with previous evidence (e.g., Allport, 1954; Pettigrew & Tropp, 2006; Pettigrew, Tropp, Wagner, & Christ, 2011), this exploratory result does definitely not challenge the idea that contact between children of different groups can reduce in-group bias. We assume that the indicators assessed for diversity (e.g., number of bilingual children) and the established minimal groups in the experimental setup might have been too different in our study. Matching group manipulation (e.g., by language) and assessing respective diversity (e.g., bilingual children) may be a promising idea for future studies. Further, our design might have been too underpowered to detect potential effects of daycare group diversity since this factor has not been considered in the power analysis. A larger sample and more variation in the diversity of daycare groups might reveal effects that could not be identified through our design.

Limitations

Although addressing the drawbacks of past research, the current study has limitations: First, this study was conducted with children from a Western, industrialized population. This limits broad generalizations outside this context (Nielsen et al., 2017) given the cross-cultural variability previously observed in children's sensitivity for intergroup contexts (Wetherell, 1982) and other aspects of intergroup behavior such as psychological autonomy (e.g., Keller & Kärtner, 2013; Rogoff, 2003) or conformity (e.g., Bond & Smith, 1996). To fully understand how young children's social inclusion in intergroup contexts is shaped throughout ontogeny, cross-cultural comparisons are needed.

Another unresolved issue that requires further investigation is the proximate motivation underlying children's in-group bias. One potential proximate motivation could be the promoted liking of the in-group member. That is, children merely like the in-group puppet more than the out-group puppet and preferred to pass the ball to it. A closely related motivation might be expectations of reciprocity toward the puppet who introduces the tossing game. This approach is supported by evidence showing a sensitivity for direct positive reciprocity by the age of 3 (for review, see Leimgruber, 2018) and 5-year-olds' expectations of reciprocal behavior of in-group members in minimal group contexts (Dunham et al., 2011). Yet, this idea is challenged by recent evidence suggesting that positive reciprocity reliably emerges around age 7 and is preceded by negative reciprocity (Chernyak et al., 2019). Another idea for a possible proximate motivation might be that children adhered to an exclusive group norm. Past research indicated that preschoolers show loyalty to their in-group

members (Misch et al., 2016) and that older children (7- to 9-year-olds) are influenced by in-group norms in intergroup contexts (Nesdale, 2011; Nesdale & Dalton, 2011). It might be that the interactive setting with a higher risk of protests of the in-group member increased preschoolers' loyalty to such norms. However, in our paradigm co-players did not explicitly establish an exclusive norm and therefore the exact proximate motivation remains unclear. The assessment of children's reasoning of their inclusion decisions might be fruitful in these endeavors.

Further, the approaching puppet did not wear a cap in the Neutral/Out-group condition in Study 2.2. This is different from the conditions of Study 2.1, in which all group members were wearing a cap. This asymmetry in the puppets' clothing might have differential effects on children's attention and consequently impacted their willingness to include the approaching puppet. Following this assumption, attentional processes and not only intergroup cognition might have affected children's inclusion decisions.

Finally, the neutral/out-group condition of Study 2.2 was added post-hoc and was not part of our preregistration. Thus, the assignment to conditions was not fully randomized making the design of Study 2.2 quasi-experimental, rather than strictly experimental. This impedes inferences about the causality underlying the detected effects across both studies since the effects might have been caused by selective subpopulations (i.e., differences in daycare centers, cohort effects). The results of the merged data of Study 2.1 and 2.2 should, therefore, be interpreted with caution and require replication.

Conclusion

In summary, we introduced an interactive paradigm to assess preschoolers' social inclusion. Independent of different minimal intergroup contexts, children tended to be more inclusive and integrated co-players into their social interactions more often with increasing age. Intergroup contexts resulted in a lower general willingness to include co-player as compared to contexts without group membership. This effect was most likely driven by a mixture of children's favoritism of the in-group member and their derogation of the out-group member. Interactive paradigms might be a fruitful way to assess preschoolers' intergroup behavior and reveal their early sensitivity for such contexts.

STUDY 3: COOPERATION, COMPETITION, AND IN-GROUP BIAS IN PRESCHOOLERS

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The Influence of Cooperation and Competition on Preschoolers' Prosociality Toward In-Group and Out-Group Members

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Abstract

Past research suggests that children favor their in-group members over out-group members as indicated by selective prosociality such as sharing or social inclusion. This study examined how playing a cooperative, competitive, or solitary game influences German 4- to 6-year-olds' in-group bias and how these three gaming contexts affect children's general willingness to act prosocially (independent of the recipient's group membership; N = 144). After playing the game, experimenters introduced minimal groups and assessed children's sharing with an in-group and an out-group member as well as their social inclusion of an out-group member into an in-group interaction. The different gaming contexts did not impact children's in-group bias or general willingness to act prosocially. Children's in-group bias was not present for their sharing. With increasing age, children were more likely to neglect social inclusion of out-group members in their third-party directives. These results oppose past research and raise doubt on the importance of cooperation on children's intergroup and prosocial behavior.

Keywords: Cooperation, Competition, Preschoolers, Intergroup Behavior, Minimal Groups, Social Inclusion, Dictator Game

Introduction

Social Identity Theory (Tajfel & Turner, 1979, 1986) assumes that individuals favor their own group over an out-group. This in-group bias results from two processes: First, individuals tend to categorize others and themselves by meaningful differences creating a "fundamental lens" through which they see others and themselves (Chalik et al., 2019, p.2) and which serves as a basis for their self-concept. Second, individuals strive for high self-esteem and tend to enhance themselves. That is, one has the desire to be positively distinct from others. These two processes lead individuals to evaluate their entire in-group more favorably as compared to an out-group, which indirectly maintains high self-esteem.

Past research suggests that these processes emerge in early development. From infant age onwards, humans categorize others based on markers, such as gender or ethnicity (Bar-Haim et al., 2006; Quinn et al., 2002), and favor in-group members of such groups (Dunham et al., 2008; Shutts, 2015). Around preschool age, children begin to show an in-group bias in contexts of groups that have been established by arbitrary criteria (e.g., randomly selected colors of clothing items). These "minimal" groups are particularly interesting since they indicate how mere group membership impacts human behavior without the interference of confounders, such as familiarity. Besides their expectation of minimal in-group members to support each other (Chalik et al., 2014; Rhodes, 2012), 3- to 5-year-old children show more liking of in-group members and share more resources with them as compared to out-group members (Dunham et al., 2011; Lee et al., 2018; Richter, Over, et al., 2016; Schuhmacher & Kärtner, 2019; Yang & Dunham, 2019). Preschoolers are less likely to include out-group members into an in-group interaction as compared to control context without groups (Toppe et al., 2020). However, evidence on the developmental trajectory of children's in-group bias in the context of minimal groups is still mixed. While some studies found an in-group bias in minimal group situations to emerge at age 3 (Fawcett & Markson, 2010; Richter, Over, et al., 2016; Toppe et al., 2020), other investigations suggest an onset from around age 5 to 6 (Aboud, 1988; Dunham et al., 2011; Dunham & Emory, 2014; Plötner et al., 2015). Notably, some studies did not find an in-group bias for sharing behavior throughout preschool age (Plötner et al., 2015).

Prior work assumes that in-group bias lays the foundation for prejudice and intergroup conflicts (Gönültaş & Mulvey, 2019). In the enterprise to reduce in-group bias, the elicitation of a cooperative orientation has been a promising approach. Having a cooperative orientation leads individuals to interpret their own and others' interactions as inherently cooperative and directed towards a common goal (Deutsch, 2011b). The underlying idea is that individuals perceive the relation between groups as cooperative when having a cooperative orientation, which reduces (or even eliminates) in-group bias.

This approach seems promising given the importance of group interdependence—whether groups cooperate or compete—for intergroup behavior (Sherif et al., 1954). When groups compete, in-group bias is stronger as compared to settings with absent or cooperative relations. For example, when facing intergroup competition, preschoolers share and cooperate at higher rates with their in-group members as opposed to out-group members (Majolo & Maréchal, 2017; Zhu et al., 2015). Further, 5- to 10-year-olds' report lower prosocial intentions toward out-group members in competitive as compared to a non-competitive scenario (Abrams et al., 2015). In an interesting study, Spielman (2000) primed 6-

year-old children with stories either including a competitive or neutral interaction of peers. The competitive story was about two children having a race, while the neutral story was about two children playing together on the playground. Hereafter, children distributed resources with members of the in-group and the out-group. Children showed a stronger in-group bias in the competitive as compared to a neutral priming condition and a no priming control condition as indicated by a greater difference between donated stickers with in-group as compared to out-group members. In the neutral priming and a non-priming control condition, children did not show any in-group bias, and their donations were mostly equal between in-group and out-group members. Importantly, the stories used for priming were not related to the established groups suggesting a spill-over effect of the primed competition to the intergroup scenario. Thus, having a competitive as compared to a neutral orientation (e.g., induced through priming) increases children's in-group bias.

However, in Spielman's neutral priming story, two children play together on a playground, giving it a somewhat cooperative and not entirely neutral touch. According to this view on the priming stimuli, the results suggest that competitive priming increases in-group bias, while cooperative priming and the non-priming condition do not show any in-group bias. This interpretation would imply that primarily competition in intergroup contexts increases in-group bias, while the promotion of cooperation does not have particularly beneficial effects on reducing in-group bias. This conclusion speaks against existing work stressing the importance of cooperation for the reduction of in-group bias (Allport, 1954; Deutsch, 1973; Pettigrew et al., 2011; Worchel, 1979). A systematic investigation of the effects of a competitive, cooperative, and neutral orientation can help us to better understand the distinct effects of these orientations on children's in-group bias.

Besides diminishing in-group bias, cooperative orientations might further promote the general willingness to act prosocially regardless of a recipient's group membership. According to the Social Interdependence Theory (Deutsch, 1949a, 2011b, 2011a), a cooperative orientation arises when individuals interact in a context characterized by a positive relation of agents' goals (i.e., when working toward a common goal). A cooperative orientation comprises the anticipated prosociality of others and an increased prosociality toward these (Deutsch, 2011b). An opposite effect is assumed by competitive contexts (i.e., when having opposite goals) that elicit a competitive orientation characterized by anticipated resistance and decreased prosociality (Johnson & Johnson, 2011). Neutral contexts, in which agents' goals are independent, do not change the expectation of others' prosociality (Roseth et al., 2008). The respective orientation does not only change prosocial behaviors within the context of their occurrence but is also transferred to new situations (Johnson & Johnson, 2005). In other words, when two individuals cooperate, their prosociality toward one another should increase in subsequent situations due to the elicited cooperative orientation. Respective effects can be predicted for competitive and neutral contexts.

Past research corroborates these predictions. Preschoolers' prosocial behavior toward interaction partners is more likely within cooperative as compared to competitive contexts (Bay-Hinitz et al., 1994; Finlinson et al., 2000; Gelb & Jacobson, 1988; Grineski, 1989; Orlick et al., 1978; Reyes-Jaquez & Echols, 2015; Stengelin et al., 2018; Zan & Hildebrandt, 2003). Cooperative as compared to competitive (Bay-Hinitz et al., 1994; Garaigordobil & Berrueco, 2007; Grineski, 1991; Lozada et al., 2014; Orlick et al., 1978; Orlick & Foley, 1979; Rogers et al., 1981) and neutral contexts (Hamann et al., 2011; Melis et al., 2013; Plötner et al., 2015) increase preschoolers' prosocial behavior toward their

previous interaction partners even in subsequent interactions. Further, cooperation and competition affect preschoolers' sharing of resources unrelated to previous cooperation or competition. The involvement in an alleged drawing contest as opposed to a non-competitive context decreased 4- to 6-year-olds' sharing of both related (i.e., crayons) and unrelated resources (i.e., stickers; Pappert et al., 2017). Similarly, cooperation promoted 3- to 5-year-olds' sharing of an unrelated resource as compared to a control context with no interdependence (i.e., sharing more candy after cooperatively retrieving a toy; Corbit, 2019). However, Plötner and colleagues (2015) find preschoolers' sharing of unrelated resources to be unaffected by previous cooperative interactions.

Finally, children share more resources with uninvolved third-parties after experiencing long-time cooperative gaming interventions as compared to control conditions comprising regular education practices (Battistich et al., 1989; Orlick, 1981; Street et al., 2004). Also, Toppe and colleagues (2019) examined the short-term effect of different interdependent contexts on prosociality directed toward a third-party and confronted dyads of 4- to 5-year-old children with a game played either cooperatively, competitively, or solitarily. Children's sharing with and social inclusion of a third-party, as well as the free play of co-players, were assessed after 5 minutes of play. Children shared more resources after playing a cooperative as compared to a competitive game. Children's social inclusion and prosociality in free play were not affected by the different contexts of the game. Although it was included as a statistical control variable, the study design did not experimentally control the outcome of the game (i.e., winning or losing). However, controlling the outcome of the game might allow more robust conclusions on the effect of different gaming contexts, since the dynamic of the game would be kept constant between subjects. Further, Toppe and colleagues (2019) did not consider children's engagement in the game as a potential predictor for their subsequent prosociality. It seems plausible that children who are more engaged while playing a game absorb the respective social context more strongly. For example, players who strongly engage in a cooperative game, cooperate more while playing this game as compared to low engaging players. Consequently, high engaging players might have a more pronounced cooperative orientation as compared to low engaging players and, thus, act more prosocially afterward. One can predict a respective effect for competitive games. Hence, children's engagement might interact with the different forms of interdependence and account for interindividual differences within experimental conditions, and should be considered as a predictor for children's prosociality. Finally, Toppe and colleagues used a highly interactive game to elicit the cooperative and competitive psychological orientation. That is, children needed to constantly coordinate their actions with their co-players in order to be successful. This high demand for coordination between co-players is similar to most of the previous studies, investigating the effect of cooperative and competitive games (Battistich et al., 1989; Bay-Hinitz et al., 1994; Corbit, 2019; Finlinson et al., 2000; Garaigordobil & Berrueco, 2007; Hamann et al., 2011; Lozada et al., 2014; Melis et al., 2013; Plötner et al., 2015; Street et al., 2004; Zan & Hildebrandt, 2003; but see Pappert et al., 2017). Social Interdependence Theory, however, states that the relation of goals is the main driver of the predicted effects regardless of whether players need to actively coordinate their actions (Deutsch, 1949a, 2012), with cooperation to promote, and competition to lower prosociality. Reducing the demand for coordination might help to learn more about the mere influence of the relation of goals on children's prosocial behavior.

In sum, eliciting a cooperative orientation might be a promising intervention on children's intergroup and prosocial behavior. On the one hand, a cooperative orientation might reduce preschoolers' in-group bias. On the other hand, it might promote preschoolers' general prosociality toward others. The current study aimed to examine these two effects and to replicate the findings of Spielman (2000) and Toppe and colleagues (2019).

To investigate how cooperative, competitive, and solitary (i.e., no interdependence) orientations impact preschoolers' in-group bias and prosociality, we assessed the sharing and social inclusion behavior of 4- to 6-year-old children in a minimal group situation. Before the assessment of these prosocial behaviors, dyads of children played a cooperative, competitive, or solitary game (hereinafter referred to as intervention game) to elicit the respective orientation. To measure their sharing, children could divide stickers between themselves and recipients having different group memberships (in-group and out-group member). We examined how the three gaming contexts affect children's sharing with the in-group and out-group member and their total amount of shared stickers (i.e., independent of the recipients' group membership). The social inclusion of out-group members into an in-group interaction was measured with a task similar to the one used by Toppe et al. (2019). Since the task used by Toppe and colleagues revealed a ceiling effect, we used a modified version of the same task that resulted in lower inclusion rates (Toppe et al., 2020). In the task used here, children played a ball-tossing game with an in-group puppet. Throughout this tossing game, an out-group puppet approached the two in-group members asking to join the game. We coded whether and to what extent children included the approaching out-group puppet and how they want their in-group member to behave in this task.

Given the urgent need for replications in psychological research (Duncan et al., 2014), our study aimed at a conceptual replication of the results found by Spielman (2000) and Toppe and colleagues (2019) with a larger sample size. Besides, we intended to extend these two studies. First, Spielman (2000) did not systematically distinguish the effect of a cooperative orientation on children's prosociality. So far, we do not know whether the effects of a cooperative and a solitary context on preschoolers' in-group bias are similar or not. Thus, a systematic investigation of all three contexts—cooperative, competitive, and solitary—is needed to evaluate the effects found by Spielman. Second, and in contrast to Toppe et al. (2019), we experimentally control the outcome of the game and consider children's engagement while playing the intervention game as a predictor for their subsequent prosociality. Stronger engagement in the game might result in a stronger effect of its respective context. We measured children's engagement in the intervention game through their physical effort while playing. Besides this potential moderating effect, we tested whether children's engagement in the intervention game would be the highest in the competitive context since social comparisons are assumed to be more salient in the competitive as compared to the cooperative and solitary context (Festinger, 1954; Seta, 1982). Finally, Toppe et al. used a highly coordinative game which might have confounded the mere effect of goal relations with the effect of coordinating with interaction partners. Thus, we used a non-interactive game to elicit the respective psychological orientations to learn more about the mere effect of goal relations on children's prosocial behavior.

Past research led us to three hypotheses (for preregistration, see osf.io/ay8hm): First, children would show an in-group bias such that they share more with an in-group as compared to an out-group member across all experimental conditions. We further investigated

how the different gaming contexts (cooperative, competitive, and solitary) would shape the differences between the stickers shared with the in- and the out-group member and their social inclusion behavior of out-group members. Second, children's total number of shared stickers would be influenced by the different gaming contexts, with more shared stickers after playing a cooperative game as compared to a competitive or a solitary game. Playing a competitive game compared to a cooperative or a solitary game would lead to fewer shared stickers. Third, children's engagement while playing the intervention game would be higher in the competitive context as compared to the cooperative and solitary context. We further explored how children's engagement would moderate their in-group bias and general prosociality.

Materials and Methods

Participants

The sample used for analysis consisted of 144 German children aged between 4 and 6 years (mean age = 4.96 years; age range = 4.03 to 6.05 years; 50% female). A prior power analysis expecting a medium effect with a statistical power of .80 and a type I error probability of .05 suggested this sample size. Children were from a mid-sized German city, and recruitment was based on a laboratory-maintained database, including children from about 150 day-care centers. Participants tested in this study were from 20 day-care centers located in different districts of the city, allowing the assumption that children had diverse socioeconomic backgrounds.

In Germany and other Western societies, children typically grow up with specific experiences related to groups, social interdependence, and fairness. For example, U.S.-adults show stronger in-group biases and assume more intergroup competition in minimal group contexts as compared to adults from (non-Western) Japan (Falk et al., 2014). Parents in Western societies typically scaffold and reward cooperative interactions with their children from early in ontogeny (Brownell et al., 2006; Keller, 2007) and, at the same time, believe that their children need to learn how to get on within competition (Deutsch, 1993). Further, in Western societies, the consideration of merit crucially influences children's sharing behavior and sense of fairness. German children distribute spoils based on their own and others merit in earning these, whereas children from African gerontocratic or hunter-gatherer societies apply different sharing heuristics (Schäfer et al., 2015). Likewise, children from Western societies share more with hard-working as compared to less-working peers (Baumard et al., 2012; Hamann et al., 2014). Hence, the partner's engagement during cooperative endeavors seems particularly relevant for German children's subsequent sharing decisions.

The study was part of a project that has been approved by the ethics committee of the Medical Faculty of Leipzig University (project name: "Non-pathological development of social behaviors and competences in children and adults with behavior-based observational, peripheral physiological and psychometrical methods"; protocol number: 169/17-ek). For all children, parents gave informed consent for participation. Testing took place in the participants' day-care centers. An additional 5 dyads were tested but excluded from data analysis due to reluctance to participate (4 dyads) and experimenter error (1 dyad). Due to

restricted visibility in video recordings, gaming engagement could not be coded for one dyad in the competitive condition. The sharing behavior of 3 children was excluded due to a failed comprehension check. Due to technical problems, the sharing behavior of 4 children was not recorded, but live coded behavior was used for data analyses.

Materials

Children played an intervention game in which they could rotate a tube to allegedly manipulate the course of a train (Figure 7a). Tubes were made of plastic material, fixed in a wooden mount, and had rubber naps for grip. Tube apparatuses were taped on the ground. The automotive train operated on wooden tracks, and the course of the train included a switch roofed by a cover made of cardboard. The switch could be operated with a stick protruding out the cover, but still being hidden from participants' sight. The switch split the track of the train toward two ends. Depending on the condition, one or two cables connected the tubes with the switch, and laminated stars or crosses were placed on plastic holders at the end of the tracks. Stimuli for the dictator games were four portraits (each two depicting a girl and a boy) with a happy facial expression taken from the NIMH Child Emotional Faces Picture Set (Egger et al., 2011). In each dictator game, children received five identical stickers, which they could put into colored envelopes (Figure 7b). In the social inclusion task, we used a triangle of plastic tubes fixed on a wooden frame and a rubber ball that could run through the tubes (Figure 7c). Also, four hand puppets (each two depicting a girl and a boy) with green and yellow caps and scarves were used. To establish group membership, children were equipped with green caps.

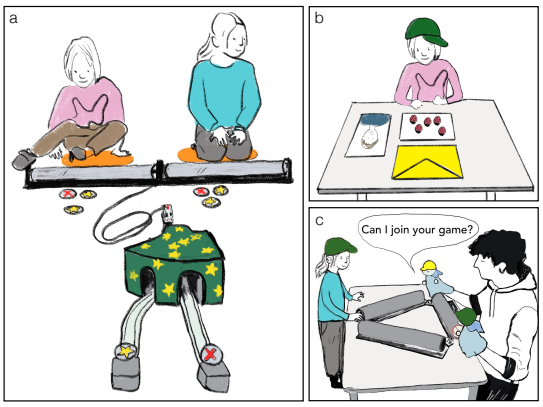

Figure 7. In panel (a), the apparatus for the intervention game is depicted (arrangement for the cooperative condition). Panels on the right show (b) the setup for the Dictator Game and (c) the apparatus used in the social inclusion task.

Design and Procedure

We randomly assigned dyads to one of three experimental conditions: Cooperative (N = 48), competitive (N = 48), and solitary (N = 48). Dyads played the intervention game in two phases with the same context (between-dyad design). Dependent measures were children's engagement while playing the game, sharing with in- and out-group members, and social inclusion of an out-group member into an in-group interaction. Two experimenters conducted the study.

Importantly, we tested twice as many children in the solitary condition (N = 96) since only one child interacted with the gaming apparatus while the other child was parallelly engaging in a non-gaming activity (i.e., drawing). In deviation from our preregistration, we only included the data of those children who played the intervention game in the solitary condition (targets; N =48) and excluded the data of children who did not play the intervention game (observers; N = 48) from our analyses. Our initial idea was to analyze the data of the observers as well since it might constitute a non-gaming baseline. However, most observers oriented toward the game frequently and were slightly frustrated that their partner (but not they) could play the game. From our view, this situation does not constitute a baseline. Besides, we did not have any prediction on how this particular social comparison affects children's subsequent prosociality. Thus, we decided to exclude these children from data analysis.

Further, we surveyed parents by a questionnaire given to their children. Amongst others, survey data included socio-economic variables and socialization practices. The response rate was about 42%. Parental data and relation to children's behaviors are beyond the scope of this manuscript. The behavioral data analyzed here is publicly available at osf.io/pu89t/. Data of the parental survey is available upon request.

First Gaming Phase

In each condition, two experimenters introduced the intervention game with a different context. In the cooperative condition, children's tubes were placed directly beside each other, and a single cable ran from the tubes to the covered switch. At one end of tracks a star and on the other a cross was placed. The first experimenter (E1) told the children that the game is played cooperatively and that both would win or lose together. Children were told that they needed to win more stars than crosses in order to win the game and that they would lose if they received more crosses than stars. In each round, the train started to drive from the starting position and the final position (either the end with star or cross) determined the outcome of the respective round. Children were told that they could influence the course of the train using the tubes in front of them: If both rotated the tubes fast enough, the train would drive to the star. If not, the train would end at the cross. Before children started to play, E1 and the second experimenter (E2) demonstrated two rounds of the game. In the first demonstration round, both experimenters turned their tubes slowly, and the train drove to the cross. In the second demonstration round, the experimenters turned their tubes fast, and the train ended at the star (E1 secretly changed the switch when placing back the train to the starting position). Hereafter, dyads played the game for eight rounds. After each round, both experimenters stated the outcome ("The train drove to the star/cross."), placed the respective token in front of the tubes, and placed a new token at the respective end of the track. The game always ended in an equal number of stars and crosses (four of each), and the order of winning and losing throughout these eight rounds (hereafter referred to as course of the game) was experimentally controlled.

In the competitive condition, the two tubes were placed slightly oblique, and from each tube, a cable ran to the switch. On both ends of the track, a star was placed. Children were instructed that the game would be played against each other and that if one of them won the game, the other one would lose. The player who collected more stars would win the game. Then, E1 explained that in every round, the train would start to drive from the starting position and that the final position would determine the outcome of the respective

round: The participant on whose side the train ended, would receive a star. Children were told that they could influence the course of the train by rotating their tube: When turning the tube faster than their opponent, the train would drive to their side. E1 and E2 explained this with two demonstration rounds. In the first demonstration round, E1 turned her tube while E2 did not, and the train drove to E1's side. In the second demonstration round, E2 turned her tube while E1 did not, and the train drove to E2's side (E1 secretly changed the switch when placing back the train to the starting position). Hereafter, children played the game for eight rounds. After each round, both experimenters stated the outcome ("The train drove to the side of *Name of Child*.") and placed the star in front of the participant. The game always ended in an equal number of stars for each player (four of each). There were two courses of the game (i.e., order of winning and losing over the eight rounds) that were experimentally controlled.

In the solitary condition, one child played the game (target child) while the other child (observer) drew pictures parallelly. Here, only one tube was used. At the end of the tracks, a star and a cross were placed. E1 introduced the game to the target child. Rules were exactly the same as in the cooperative condition, with only one modification: The target child received stars and crosses solitarily while the dyad partner was not involved in the game. There were two courses of the game that were experimentally controlled and always ended in an equal number of stars and crosses (four of each). While the target child played the train game, E2 equipped the observer with crayons and papers. E2 explained that they could draw a picture while E1 and the target child would play something different. Then, E2 pretended to work on something and gave suggestions if children had no ideas for their drawings. If children observed the target child playing the train game, E2 guided their attention back to their drawing.

After the first gaming phase (duration approximately 5 minutes), one of the experimenters left the room with one participant (P1) and went to a quiet place in the day-care center (e.g., other room or empty corridor), while the other experimenter and the second participant (P2) stayed in the test room. The roles of P1 and P2 were assigned randomly.

Group Assignment

After the first gaming phase, the experimenters assigned both participants to a minimal group in separate rooms. Importantly, participants did not know that their co-player was assigned to a group, too. Experimenters mentioned that there were two groups (green and yellow), looked into a bag, uncased a green cap, and stated that the participant would be a member of the green group. Children were always assigned to the green group, but group allocation appeared to be random. Children received a cap, and the experimenters stressed their group membership.

Dictator Game

P1 participated in two consecutive dictator games. The experimenter introduced two same-sex peers while placing two portraits in front of P1. The experimenter explained that one child belonged to the green (in-group member) and the other to the yellow group (out-group member), which was indicated by respectively colored envelopes placed in front of the portraits. To ensure comprehension, children needed to state their own group and whether they share group membership with the portrayed peers. Then, the experimenter moved either the portrait and envelope of the in-group or the out-group member away so

that children only saw one depicted peer (counterbalanced). Children were given five identical stickers and an instruction to share these with the peer by putting the stickers into the colored envelope. The stickers participants wanted to keep for themselves could be placed in a second envelope close to the child (colored brown). While distributing the stickers, the experimenter turned around and did not observe the child.

To ensure that participants understood the instruction, they were asked four questions before dividing the stickers. They were asked to whom the stickers belonged; where they could place stickers, they want to share; where they could place stickers, they want to keep for themselves; whether anyone could see them while placing the stickers. The experimenter repeated the respective information one more time if children answered a question incorrectly. Three children did not pass the comprehension check in the dictator game, and their sharing behavior was excluded from statistical analysis. The second dictator game with the other portrayed peer followed the same procedure so that all children shared with an in-group and an out-group member.

Social Inclusion

Parallel to the dictator game, the other experimenter conducted a social inclusion task with P2 in the test room. After the group assignment, the experimenter operated two hand-puppets and introduced these to P2. Both puppets matched the participant's sex. The in-group puppet (wearing a green cap and scarf) was introduced first, followed by the out-group puppet (wearing a yellow cap and scarf). Puppets asked for the child's name, told their names and the group they were assigned to, and stressed that they were either in the same (in-group puppet) or in a different group (out-group puppet). Then, the experimenter placed both puppets in front of P2 and repeated the child's and the puppets' group membership. The experimenter moved the in-group puppet close to the child while stating that they were members of the same group ("Both of you are in the green group."). The out-group puppet was placed further away, and the experimenter stressed that this puppet belonged to a different group ("She/He is in the yellow group.").

To ensure comprehension, children had to name their group, the group of the puppets, and state whether they share group membership with the puppets. Respective information was repeated one more time by the experimenter if children failed to answer one of these three questions. All children passed this comprehension check.

Hereafter, the in-group puppet introduced a ball-tossing game and revealed the covered apparatus. The in-group puppet and the child passed the ball back and forth through each tube of the apparatus. The in-group puppet stayed at one corner of the apparatus (counterbalanced) and initiated another two rallies. When the in-group puppet held the ball, the out-group puppet appeared at the vacant corner of the triangle stating "Hello". While holding the ball, the in-group puppet decided to pass the ball to the child after thinking aloud about to whom it would pass the ball to ("Do I pass the ball to *Name of out-group puppet* or to *Name of child*?"). Children could freely decide to which of the puppets they pass the ball. Both puppets always passed the ball to the child. If not included for two consecutive rallies, the out-group puppet gave a prompt indicating the desire to be included when the in-group puppet held the ball ("Can I join your game?"). Again, the in-group puppet decided to pass the ball to the child after weighing both alternatives.

Four rallies were played in this way, followed by a directive trial, in which the in-group puppet asked the child to whom it should pass the ball (to the out-group puppet or the

participant). When children were holding the ball, the experimenter avoided eye-contact and faced the floor. If children did not pass the ball for about 10 seconds, the in-group puppet encouraged them to pass the ball ("Now, it is your turn.").

Second Gaming Phase

After the first assessment of sharing and social inclusion, children gave their caps back to the experimenters and reconvened in the test room. Again, children played the intervention game with the same rules as in the first gaming phase after E1 shortly brushed up the rules. In the cooperative and competitive condition, children changed tubes. In the solitary condition, children's roles remained the same, and the target child played the intervention game a second time.

After eight rounds, children participated in the social inclusion task and dictator games. Now, children changed roles so that for all children, both social inclusion and sharing were assessed. Before the second assessment of the dependent variables, experimenters refreshed the group assignment and asked the participants about their group membership to ensure comprehension. Then, sharing and social inclusion were assessed with the same procedure described above.

Dyads in the solitary condition played the intervention game cooperatively after the assessment of all dependent variables so that children who only observed their peers in the testing phase could also play the game.

Coding and Reliability

Sessions were videotaped with two camcorders. Coding was done live and from video by the first author. To measure gaming engagement for each gaming phase, we coded the number of tube rotations in each round and divided this by the number of rounds of the gaming phase. For some children (N = 17), not all rounds could be coded due to limited visibility (range of missing values = 1 to 8). For the dictator game, we coded the number of shared stickers with the in-group and the out-group member. For the social inclusion task, we coded whether participants included the approaching out-group puppet within the four rallies at least once, in which rally participants included the out-group puppet the first time, the total number of passes to the out-group member, and the chosen option in the directive trial. Two coders blind to hypotheses coded a random quarter of the data. Interrater reliability was excellent for children's sharing and social inclusion behaviors (all Cohen's $\kappa = 1$) and excellent for the number of rotations while playing the intervention game (all ICCs > .95; all ps < .001).

Data Analyses

To statistically test our hypotheses, we fitted generalized linear mixed models (GLMMs; Baayen et al., 2008) in R (R Core Team, 2018) using the lme4 package (Bates et al., 2017). For all GLMMs, a likelihood ratio test comparing a full model (including all predictors and controls) to a reduced model without a predictor was used to indicate the significance of the respective predictor. All GLMMs included age (measured in days) as a continuous variable and dyad identification number as a random intercept effect to control for within-dyad variance. The GLMMs for children's sharing, their first inclusion, the number of passes, and their directives revealed singular fits, meaning that some cells of the estimated variance-covariance matrix have been estimated as exactly zero (Bates et al., 2017). This

can occur in multilevel models, and in such a case, likelihood ratio tests may be inappropriate to determine the significance of a predictor (Bates et al., 2017; Chung et al., 2013). When a GLMM computed with the lme4 package suggested a singular fit, we used a maximum penalized likelihood approach, which is a partially Bayesian method using regularizing priors (blme package; Chung et al., 2013). When using the bglmer function of this package, pairwise model comparisons are valid to detect the significance of predictors. Notably, the results between the models calculated with the lme4 and the blme package differ marginally and did not change any interpretation of the significance of a predictor. The script for analyses is publicly available at osf.io/pu89t/.

Results

Engagement

In the GLMM analyzing children's gaming engagement, we added the interaction of age and condition as a predictor while controlling for participants' sex and trial number. Further, we included subject as a random intercept to account for within-subject differences. The model was fitted using a Gaussian error distribution. The interaction between age and condition did not reach significance, $\chi^2(2) = 1.150$, $p = .563$. The GLMM containing the main effects of age and condition revealed a significant effect of age on the number of rotations, $\chi^2(1) = 5.430$, $p = .020$, estimate = 3.067, $SE = 1.345$, see Figure 8a, such that children showed more gaming engagement with increasing age as indicated by more rotations per round. Condition did not significantly affect the number of rotations, $\chi^2(2) = 2.423$, $p = .298$. The number of rotations increased over trials, $\chi^2(1) = 74.440$, $p < .001$, estimate = 0.494, $SE = 0.056$, while sex did not have a significant impact on the number of rotations, $\chi^2(1) = 0.077$, $p = .782$.

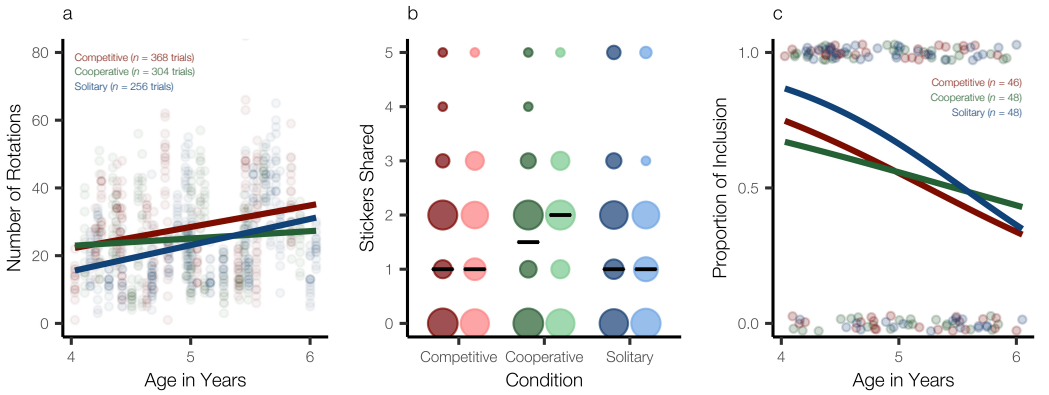

Figure 8. Panel (a) shows the number of rotations in the intervention game across age. Panel (b) shows the number of shared stickers in the dictator games. Data are depicted by dots, with larger dots indicating more data points. Solid lines indicate medians. Brighter dots show the stickers shared with the out-group member, darker dots show the stickers shared with the in-group member. Panel (c) shows the proportion of includers for the directive trial in the social inclusion task across age and conditions (i.e., directing the in-group puppet to include the out-group puppet and not the children themselves).

However, the absolute number of rotations might not be an accurate measure for the impact of the game's context on children's engagement. Since competitive contexts promote social comparisons (Seta, 1982), it might be that the different conditions did not influence children's absolute, but rather their relative performance. In other words, children might be more likely to adapt their engagement to that of their co-players when playing a competitive as compared to a cooperative or solitary game. If their competitors put more effort into a game, children might also be more engaged in order to win the game. Therefore, we examined the difference between co-players' engagement, which should be smaller in competitive contexts compared to cooperative or solitary contexts in addition to our preregistered analysis. For this analysis, we used the difference of co-player within each dyad for the cooperative and competitive condition and excluded the solitary condition. We ran a GLMM with the same predictors as in the preregistered analysis, but excluded the dyad identification number as random intercept effect. This exploratory GLMM revealed no significant influence of the interaction between condition and age, $\chi^2(1) = 2.255$, $p = .133$. In a model containing main effects, age, $\chi^2(1) = 0.133$, $p = .716$, and condition, $\chi^2(1) = 0.056$, $p = .813$, did not influence the difference between children's engagement significantly. The difference between co-players engagement significantly increased over trials $\chi^2(1) = 21.169$, $p < .001$, estimate = 0.572, $SE = 0.123$, while sex did not have a significant impact, $\chi^2(1) = 0.906$, $p = .341$.

Sharing

To examine whether condition and age affect children's sharing behavior, we ran a GLMM with children's sharing with in-group and out-group members as dependent variables. As fixed effects, we included the three-way interaction between condition, age, and group membership of the recipient (in-group vs. out-group), and the two-way interaction between condition and gaming engagement. Participants' sex, the gaming phase (first vs. second), and gaming course (order of wins and losses), as well as order of sharing (in-group vs. out-group first), were included as control variables. The model was fitted using a Poisson error distribution.

The three-way interaction between condition, age, and recipient's group membership did not reach significance, $\chi^2(2) = 0.622$, $p = .733$. Further, none of the two-way interactions between condition, age, recipient's group membership, and children's gaming engagement was significant (ps > .160). A model containing main effects only revealed that children's sharing did not significantly differ after playing a cooperative, competitive, or solitary game, $\chi^2(2) = 0.077$, $p = .962$, see Figure 8b. Children did not share significantly more with in-group as compared to out-group members $\chi^2(1) = 0.137$, $p = .711$. Also, age, $\chi^2(1) = 0.013$, $p = .909$, and engagement while playing, $\chi^2(1) = 1.095$, $p = .295$, did not affect children's sharing significantly. None of the control variables had a significant impact (ps > .090).

Social Inclusion

Table 5 shows the descriptive results for children's social inclusion behavior. To test whether children's social inclusion of out-group members differed as a function of age and condition, we conducted four GLMMs for the behaviors coded in the social inclusion task. All these models included condition, age, and gaming engagement as fixed effects. We controlled for participants' sex, gaming phase, gaming course, and the position of puppets

(in-group puppet left vs. right). The models for the rally of first inclusion and the number of passes to the out-group puppet were fit using a Poisson error distribution. Models analyzing whether participants included the out-group puppet at least once and their decision in the directive trial were fit using a binomial error distribution.

For all social inclusion behaviors, models including the interaction between condition and age and the interaction between condition and engagement did not significantly differ from a model containing main effects only (*p*s > .192). Further, condition (*p*s > .410), age (*p*s > .482), and gaming engagement (*p*s > .227) did not significantly influence whether children included the approaching out-group member at least once, the moment of their first inclusion, and the number of passes to the out-group member. None of the control variables had a significant impact on these outcomes (*p*s > .179).

Children's directives for the in-group puppet (passing to the out-group puppet or to the participant) were significantly affected by age, $\chi^2(1) = 5.978$, $p = .014$, estimate = -0.442, $SE = 0.183$, see Figure 8c, such that with increasing age children were more likely to direct their in-group member to pass the ball to themselves as compared to the out-group member. Condition, $\chi^2(2) = 0.968$, $p = .616$, gaming engagement, $\chi^2(1) = 0.889$, $p = .346$, and controls (*p*s > .678) had no significant effect on children's directives.

Table 5
Results for children's social inclusion

Condition	*General Inclusion* *% including out-group*	*First Inclusion* *M (SD)*	*Number of passes* *M (SD)*	*Directive* *% including out-group*
Cooperative	54.17	1.77 (1.14)	1.04 (1.13)	56.25
Competitive	63.04	1.45 (0.78)	1.33 (1.14)	56.52
Solitary	62.50	1.47 (0.82)	1.15 (0.97)	64.58

Notes. General inclusion refers to whether participants included the out-group puppet at least once in the four trials. First inclusion refers to the rally in which participants included the out-group puppet the first time (coded with 1 to 4). Number of passes refers to passes to the out-group puppet (coded with 0 to 4). Directive refers to whether participants stated that the first puppet should pass the ball to the out-group puppet or themselves.

Discussion

The current study investigated how a cooperative, competitive, and solitary game context affects German preschoolers' (a) intergroup behavior in a minimal group context and (b) their prosociality toward others more generally. After playing a game in either a cooperative, competitive, or solitary fashion, we assessed children's sharing with an in-group and an out-group member as well as their social inclusion of an out-group member into an in-group interaction. The three contexts of the game did neither influence children's intergroup behavior nor the general level of prosociality when sharing with a third-party. Children's directives for their in-group member became more exclusive with increasing age.

Intergroup Behavior

Our investigation revealed mixed findings for children's intergroup behavior. On the one side, children's directives in the social inclusion task became more exclusive with increasing age, such that older children were more likely to suggest the in-group puppet to pass the ball to themselves as compared to an out-group member. This finding might indicate that

children's in-group bias increases with age. On the other side, we did not find an impact of group membership on children's sharing and no developmental trend in children's own social inclusion behavior (as compared to their directive for the in-group puppet). Thus, we do not find an in-group bias for most of the children's prosocial behaviors, which is in contrast to evidence suggesting the emergence of in-group bias in minimal group contexts around preschool age from similar cultural contexts (e.g., Aboud, 1988; Dunham et al., 2011; Dunham & Emory, 2014; Fawcett & Markson, 2010; Richter, Over, et al., 2016). Our results agree with the results by Spielman (2000) and Plötner et al. (2015), who found children's sharing to be independent of the recipients' group membership, suggesting that children's sensitivity for conventional groups seems to emerge after preschool age. Children's decreasing willingness to direct their in-group members to include an out-group member can only be understood as a hint and not a clear indication for their in-group bias. That is, in their directives, children had the choice between themselves and the out-group puppet. Hence, an increase of children's exclusiveness independent of the interactants group membership might also explain this finding. One could disentangle the motivation underlying this behavior in a task, in which children can decide whether their in-group member should include an out-group member or an additional in-group member.

In the current study, we investigated the effect of a competitive, cooperative, and neutral (i.e., solitary) context on children's in-group bias. The different game contexts during the intervention did not significantly influence children's in-group bias, as indicated by their sharing and social inclusion. This finding contrasts with the results by Spielman (2000), who found that children's in-group favoritism increased after being primed with third-party competition as compared to a neutral or no priming condition. It might be that preschoolers' in-group bias cannot be fostered or diminished by priming interdependent contexts. Based on his results, Spielman concluded that intergroup competition might be an essential element of in-group bias in minimal group situations. Our findings do not support this view. Instead, our results support the view that the mere (dichotomous) categorization of others into minimal groups can result in an in-group bias (for an overview, see Rhodes & Baron, 2019). That is, competition between groups is not necessary for children's expectations of between-group harm (Rhodes, 2012) and in-group bias (Dunham, 2018). Importantly, this does not mean that competition has no relevance to intergroup behavior. In particular, group competition can increase children's in-group bias (e.g., Abrams et al., 2015; Majolo & Maréchal, 2017; Zhu et al., 2015). However, when drawing these conclusions, one has to keep in mind that we did not find an in-group bias in our preschool-aged sample. It might be that intergroup competition is an essential part of in-group bias, but the phenomenon per se only occurs after preschool age.

Furthermore, it has to be noted that we did not replicate the exact procedure of Spielman. Our procedure differed from that of Spielman in three fundamental ways: First, the participants in Spielman's study (6-year-olds) were on average older than the children tested here (4- to 6-year-olds). It might be that older children are more sensitive to the priming of competitive interdependences. However, this should have been indicated by an interaction between age and condition, which was absent in our data. Second, in Spielman's procedure, children have been assigned to a group before the orientation has been elicited, while we did this the other way around. We decided to establish group membership after playing the intervention game to minimize the chance that dyad partners would know their partner's group membership. Here, we wanted the game to be independent of the groups.

Before the second gaming phase, children were told to keep the groups a secret toward their dyad partner, and none of the participants mentioned the groups during the gaming phase. It might be that the competition has a more significant impact on children's intergroup behavior after the establishment of the groups. In particular, the establishment of groups has a cooperative element since children mutually have to agree on these. This collective agreement might diminish the effect of a previously elicited competitive orientation and consequently not affect intergroup behavior. The mutual agreement might not have the same salience when groups have been established before allowing the competitive orientation to shape the perception of the relation of groups. Third, the gap between the elicitation of the orientation and the assessment of children's sharing was shorter in Spielman's investigation as compared to the current study. Children distributed the resources immediately after the priming phase in the study by Spielman. In our design, the experimenter and the child went to a separate quiet room which in some day-care centers took a few minutes. Given the subtle nature of priming effects, it might be that we diminished the elicited orientation through this procedural detail.

General Prosociality

Our findings do not corroborate that playing a game with merely a cooperative, competitive, or solitary goal structure influences children's sharing toward third-parties. The total number of shared stickers with an in-group and an out-group member was not affected by the context of the game. Our findings contrast with studies suggesting that elicited cooperative and competitive orientations have an impact on the behavior toward third-parties (e.g., for children: Orlick, 1981; Street et al., 2004; Toppe et al., 2019; for adults: Greitemeyer & Cox, 2013). Here, we cannot replicate the Toppe et al.'s (2019) effect on preschoolers' sharing in a larger sample and a more controlled experimental setting. Possibly, interdependent interactions only elicit an orientation that is specific for the actors involved in the interaction. In other words, cooperation between Person A and B might only influence prosociality between these parties, but not toward third-parties, who were not involved in the interaction (e.g., Bay-Hinitz et al., 1994; Corbit, 2019; Finlinson et al., 2000; Garaigordobil & Berrueco, 2007; Gelb & Jacobson, 1988; Grineski, 1989, 1991; Hamann et al., 2011; Lozada et al., 2014; Melis et al., 2013; Orlick et al., 1978; Orlick & Foley, 1979; Pappert et al., 2017; Plötner et al., 2015; Rogers et al., 1981; Stengelin et al., 2018; Zan & Hildebrandt, 2003).

However, one crucial difference in the procedure of the current study and the study by Toppe et al. (2019) might be responsible for the different findings. The intervention game introduced in this study was less interactive as the one used by Toppe et al. (2019) and did not require any coordination between the players. In the current study, children did not directly interact but rather acted parallelly when playing the game cooperatively, while children were forced to coordinate their actions in Toppe et al.'s design (2019) as they were holding strings for playing with the apparatus. Here, we decided to use a less interactive game to control for children's goal achievement in the game (i.e., winning and losing), and to isolate the effect of goal interdependence from the players' coordination of actions. We find that mere goal interdependence does not influence children's prosocial behavior toward third-parties. Thus, coordination might be necessary to elicit the spill-over effects of cooperation and competition on prosociality toward third-parties. This conclusion would be in line with studies suggesting that collaboration—a highly coordinated form of

cooperation—is related to children's promoted sense of fairness (Corbit et al., 2017; Hamann et al., 2011; Melis et al., 2013; Ulber et al., 2017). Further, most of the previous studies finding an effect of cooperation and competition on young children's prosocial behavior used games demanding coordination between co-players (Battistich et al., 1989; Bay-Hinitz et al., 1994; Corbit, 2019; Finlinson et al., 2000; Garaigordobil & Berrueco, 2007; Hamann et al., 2011; Lozada et al., 2014; Melis et al., 2013; Plötner et al., 2015; Street et al., 2004; Zan & Hildebrandt, 2003).

Interdependent interactions have many dimensions, such as coordination, conflict, or mutual dependence (Gerpott et al., 2018; Kelley et al., 2003), and it might be that the interplay of these dimensions—and not a single dimension per se—is crucial for effects on young children's prosocial behavior. The investigation of how the interplay of different dimensions of interdependence (e.g., goal relation, coordination, mutual dependence) shape children's (pro)social behavior might be a promising area for future research. It might be that preschoolers require settings with high interdependence on many dimensions to be affected by these since their collective intentionality is still weak (Tomasello, 2019). Similar approaches acknowledging diverse dimensions of interdependence have been suggested for the investigation of children's social cognition (e.g., visual perspective-taking; Li et al., 2019). Social Interdependence Theory and its predictions are broad (Deutsch, 2012), and a more detailed approach addressing diverse dimensions of interdependent interactions might be needed to learn more about their effects on children's social behavior. The influence of interactions with different relations of goals (cooperation vs. competition) and degree of coordination (high vs. low) on preschooler's prosocial behaviors might be a fruitful investigation in this endeavor.

Gaming Engagement

Contrary to our predictions, children's engagement while playing the intervention game (measured by the number of tube rotations) was not higher when playing a competitive as compared to a cooperative or solitary game. This finding deviates from previous work suggesting a promoted performance during competitive encounters (Festinger, 1954; Rhodes & Brickman, 2008; Seta, 1982). Our finding supports the view that social comparisons do not impact preschool children's engagement in a task (Boggiano & Ruble, 1979; Ruble et al., 1976, 1994). One explanation for this pattern of results might be that children did not understand the interdependence of the different contexts of our intervention game and were not sensitive to social comparisons. Following this assumption, children focused on their own outcome without considering their relationship to their co-player. However, a host of evidence has shown that children at the age range tested here are capable of understanding of competition and cooperation and that their behavior is sensitive to these forms of social interdependence (Hu & Zhu, 2018; Jin et al., 2017; Majolo & Maréchal, 2017; Schmidt et al., 2016).

One could also question our null result by methodological aspects. First, as outlined in the previous section, children did not directly interact with each other in the intervention game. Rotating one's tube was independent of the co-player, and the game did not require any form of coordination. It might be that different interdependences influence children's engagement only when their actions are causally related to those of their co-players. Second, the only feedback children received on their engagement was the result of the rounds. Potentially, more precise feedback (e.g., the exact number of rotations) and immediate

interdependence of actions might have made the social comparison more salient and caused differences in children's engagement between the different contexts. Finally, children's physical engagement is not necessarily equivalent to their psychological engagement. For example, children who are highly engaged in a competition might focus more on their competitor's performance and not put all efforts into their own physical activity. Accordingly, other behaviors such as children's emotional reactions after a round might be more suitable predictors for children's psychological engagement.

Conclusion

In summary, we investigated how cooperative, competitive, and solitary orientations influence German 4- to 6-year-olds' prosocial behavior in a minimal intergroup context. Except for children's directives for their in-group members' social inclusion, we do not find evidence suggesting the emergence of in-group bias. The elicited cooperative, competitive, and solitary orientation did not affect children's intergroup behavior. Our results suggest that in-group bias in minimal group contexts does not seem to emerge within preschool age. Further, we could not replicate findings suggesting a promotive effect of a cooperative orientation on children's prosociality as compared to a competitive orientation. This effect might only occur under specific forms of interdependence characterized by goal relativeness and high coordination. Thus, there remains much to be learned on young children's understanding of conventional groups and how different dimensions of interdependence shape their social behavior.

MERGED ANALYSES

By the means of three studies, the current thesis investigated how different forms of social interdependence shape preschoolers' prosocial behavior. Study 1 and Study 3 examined how cooperative, competitive, and solitary contexts influence children's sharing and social inclusion, while Study 2 focused on the development of a new paradigm to measure young children's social inclusion behavior.

The findings of the three studies are mixed. Study 1, but not Study 3, revealed that cooperation and competition can affect children's sharing with a third-party. Study 2 indicated that children's willingness to include others increases throughout preschool age, while Study 3 could not replicate this development using the same paradigm. To better understand these mixed findings, we merged the collected data. First, we merged the data on children's sharing of Study 1 and Study 3 and analyzed how the three different forms of social interdependence affect children's sharing with third-parties across the two studies. Second, we combined the data of Study 2 and Study 3 and analyzed how children's social inclusion behavior develops throughout preschool age and how different intergroup contexts shape this behavior.

This chapter merely reports the results of the merged analyses, while these are discussed thoroughly in the next chapter. Both data sets and the script for statistical analysis are publicly available at osf.io/qzgb5/.

Third-Party Sharing in Study 1 and Study 3

The merged data of Study 1 (n = 91) and Study 3 (n =141) contained the sharing behavior of N = 232 children aged between 4 and 6 years. We analyzed the effect of the cooperative (n = 73), competitive (n = 80) and solitary condition (n = 79) on the number of shared stickers in the dictator game (Study 1) and the sum of shared stickers in the two dictator games (Study 3). Similar to the analyses in Study 1 and Study 3, we ran a generalized linear mixed model fitted with a Poisson error structure to examine this effect. Besides condition (cooperation vs. competition vs. solitary), the model contained age, sex, and study (Study 1 vs. Study 3) as fixed effects. In addition, dyad identification number was added as a random intercept effect to control for within-dyad variance. We examined likelihood

ratio tests comparing a full model (including all predictors and controls) to a reduced model without a predictor to indicate its significance.

A model containing the interaction between condition and age did not significantly differ from a model with main effects only, $\chi^2(2) = 0.364$, $p = .834$. In the model with main effects only, children's sharing was not significantly influenced by condition $\chi^2(2) = 3.306$, $p = .191$, age, $\chi^2(1) = 1.844$, $p = .174$, and sex, $\chi^2(1) = 0.083$, $p = .773$. Children's sharing significantly differed between the studies, with fewer stickers shared in Study 3 ($M = 2.56$, $SD = 2.27$) as compared to Study 1 ($M = 3.48$, $SD = 2.04$), $\chi^2(1) = 7.826$, $p = .005$, estimate = 0.320, $SE = 0.113$.

Thus, cooperation as compared to competition or a solitary activity does not significantly promote children's sharing with third-parties across Study 1 and Study 3. Further, children's sharing differed between studies, with more shared resources in Study 1 as compared to Study 3. Differences in the procedures might explain this result: In Study 1, children received 10 stickers and could divide this endowment between themselves and one third-party peer. In Study 3, children received 5 stickers in two dictator games, in which they could share the stickers with an in-group and an out-group member.

Social Inclusion in Study 2 and Study 3

The merged data set of Study 2 ($n = 216$) and Study 3 ($n = 192$) comprised the social inclusion behavior of $N = 408$ 3- to 6-year-old children. Similar to the statistical analyses in these studies, we calculated four general linear models and used pairwise model comparisons to determine the significance of predictors. Dependent variables were (a) children's general inclusion (whether they include the approaching puppet at all), (b) the number of passes to the approaching puppet, (c) the rally, in which children included the approaching puppet the first time, and (d) their decision in the directive trial (passing to approaching puppet vs. themselves). In all four models, condition (in-group/out-group vs. neutral/out-group vs. control), age, sex, and study (Study 2 vs. Study 3) were the fixed predictors. Models for children's general inclusion and their directives were fitted with a binomial error structure; models for the number of passes, and children's first inclusion with a Poisson error structure. None of the models revealed a significant interaction of condition and age (ps > .15). All reported results refer to models containing main effects only, in which sex had no significant influence (ps > .25).

Children's general inclusion significantly differed across conditions, $\chi^2(2) = 15.938$, $p > .001$, see Figure 9a. Children's willingness to include the approaching puppet at least once was the lowest in the scenario, in which an out-group puppet approached an in-group interaction ($M = .50$, $SD = .53$). Children's behavior in this in-group/out-group condition significantly differed from a control condition with no groups ($M = .71$, $SD = .46$; estimate = 1.364, $SE = 0.358$, $p < .001$), and from a condition, in which an out-group puppet approached an interaction of an in-group member and a neutral puppet (neutral/out-group; $M = .60$, $SD = .49$; estimate = 0.872, $SE = 0.344$, $p = .011$). Children's general inclusion in the neutral/out-group condition and the control context did not differ significantly (estimate = -0.492, $SE = 0.356$, $p = .167$). Across conditions, children's general inclusion significantly increased with age, $\chi^2(1) = 4.466$, $p = .035$, estimate = 0.229,

SE = 0.109,see Figure 9a. Further, children were more likely to be inclusive in Study 3 as compared to Study 2, $\chi^2(1) = 5.766$, $p = .0163$, estimate = 0.690, *SE* = 0.289.

A similar pattern was present for the number of passes. The number of passes significantly differed across conditions, $\chi^2(2) = 13.501$, $p = .001$. Children in the in-group/out-group condition (*M* = 1.06, *SD* = .1.08) were less inclusive and played fewer passes to the approaching puppet as compared to children in the control condition (*M* = 1.51, *SD* = 1.16; estimate = 0.550, *SE* = 0.158, $p < .001$) and neutral/out-group (*M* = 1.35, *SD* = 1.24; estimate = 0.437, *SE* = 0.162, $p = .007$). Children's number of passes in the neutral/out-group and control condition did not differ significantly (estimate = 0.113, *SE* = 0.140, $p = .418$). Children were marginally more likely to play more passes to the approaching puppet with increasing age, $\chi^2(1) = 3.706$, $p = .054$, estimate = 0.091, *SE* = 0.047. The number of passes did not significantly differ between Study 2 and Study 3, $\chi^2(1) = 2.016$, $p = .156$.

However, children's general willingness to include confounds the effects for the number of passes since we coded non-includers with 0 in both behaviors (see Study 2, for more details). When analyzing the number of passes for includers only (*n* = 235), condition, $\chi^2(2) = 0.147$, $p = .929$, and age, $\chi^2(1) = 0.061$, $p = .806$, did not have a significant impact on children's inclusion behavior, suggesting, that children's general willingness to include drives the effects found for their number of passes. Includers did not differ significantly in their number of passes between Study 2 and Study 3, $\chi^2(1) = 0.728$, $p = .394$.

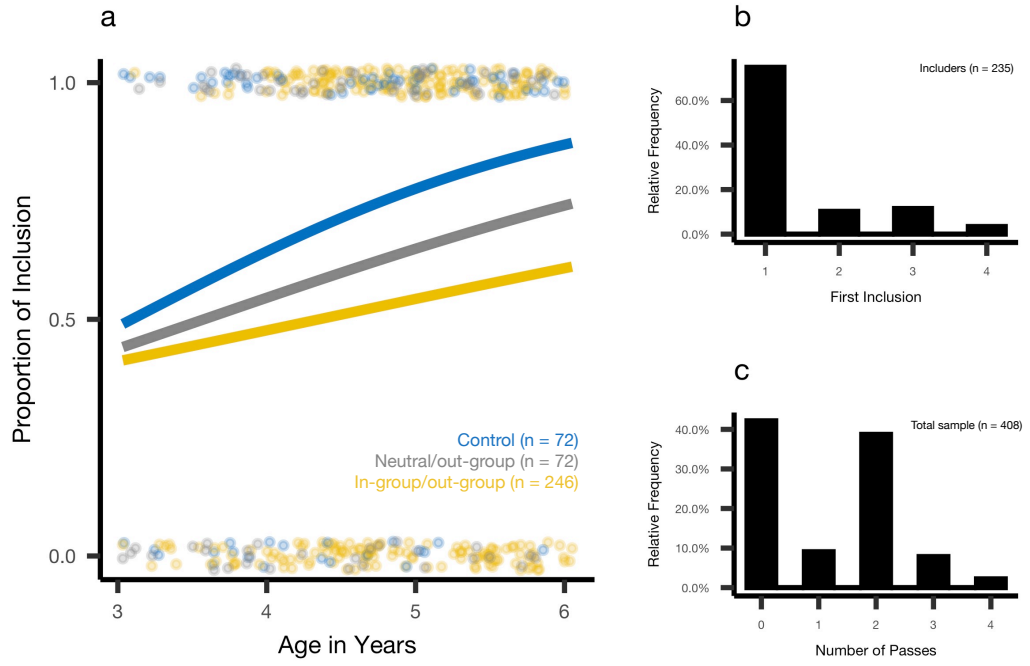

Figure 9. Panels show (a) the fitted proportion of children's general inclusion across age and conditions, (b) the frequencies of the moment of first inclusion, and (c) the number of passes to the approaching puppet for the merged data of Study 2 and Study 3.

In this merged data set, condition (ps > .13) and age (ps > .11) did not significantly affect children's moment of first inclusion and directives. Also, these behaviors did not significantly differ between Study 2 and Study 3 (ps > .23). In all three conditions, children preferred the initiator puppet to pass the ball to the approaching puppet as compared to themselves (total sample: $t(407) = 7.015$, $p < .001$; in-group/out-group condition: $t(263) = 3.918$, $p < .001$; neutral/out-group condition: $t(71) = 5.630$, $p < .001$; control condition: $t(71) = 4.181$, $p < .001$). This inclusive tendency was independent of children's previous social inclusion (includers: $t(234) = 6.592$, $p < .001$; non-includers: $t(172) = 3.199$, $p = .002$).

The majority of the children either play two passes to the approaching puppet (39%) or neglected to pass (42%, see Figure 9c). Further, most children who were willing to include the approaching puppet did so immediately in the first rally (75%; see Figure 9b).

The results of the merged analysis suggest that children's general inclusion (i.e., including the approaching puppet at least once) increases throughout preschool age. Besides, different intergroup scenarios influence children's general inclusion. All other behaviors—number of passes, moment of first inclusion, and directives—are stable over preschool age and not significantly affected by different intergroup scenarios. Descriptive results indicate that if children were willing to include the approaching puppet, they mostly did so with their first pass. Furthermore, children were inclusive in their directives across conditions and independent of this strategy.

GENERAL DISCUSSION

Answers for Four Questions

The three studies of the current dissertation aimed to answer four questions. In the following, the conclusions for each question are summarized. Hereafter, the findings are critically discussed.

How Do Cooperative, Competitive, and Solitary Contexts Influence Preschoolers' Prosocial Behaviors Toward Third-Parties?

In Study 1, 4- to 6-year-old children shared more stickers with third-parties after playing a cooperative as compared to a competitive game. The sharing rates in both conditions did not substantially differ from a context in which dyads played a solitary game parallelly. In Study 1, children's social inclusion behavior was not affected by the different forms of social interdependence. Most children were inclusive, raising the question of whether a ceiling effect hindered the detection of an effect of the cooperative, competitive, and solitary context.

In Study 3, 4- to 6-year-old children again played a cooperative, competitive, or solitary game. Here, we assessed children's subsequent sharing with a third-party in-group and out-group member. Also, we examined children's social inclusion of an out-group member into an in-group interaction. In deviation from Study 1, we could not detect an effect of cooperation and competition on children's sharing. That is, the different forms of social interdependence did not significantly influence children's sharing behavior toward third-parties. In line with Study 1, Study 3 did not find evidence for a link between the different forms of social interdependence and children's social inclusion of a third-party.

Concerning children's sharing behavior, Study 1 and Study 3 offered contradicting results. In Study 1, children shared more stickers after playing a cooperative as compared to a competitive game. This effect was not present in Study 3. Two perspectives on the data might explain this inconsistency: a *false-positive-perspective* and a *methods-perspective*.

The false-positive-perspective states that Study 1's finding for children sharing should be conceived as a false-positive result. Following this perspective, social interdependence does not affect children's prosocial behavior toward third-parties.

The merged analysis of Study 1 and Study 3 gives the first argument in favor of the false-positive-perspective, given that the effect of the different forms of social interdependence was not present in a data set containing the sharing behavior of both Study 1 and Study 3.

The second argument is related to the number of observations in Study 1 ($N = 89$) and Study 3 ($N = 137$). The sample size of Study 3 was larger than of Study 1 and, thus, the likelihood to detect a true-positive finding was higher in Study 3 due to its higher statistical power. The power analysis for Study 1 suggested a sample size of about 130 participants. Due to personnel and time constraints, we decided to test 96 children only. In Study 3, we nearly tested the sample size suggested by a power analysis ($N = 142$). Thus, if the effect of Study 1 was a true-positive finding, the likelihood of a replication in Study 3 should have been relatively high due to Study 3's higher statistical power. Still, we did not find the predicted effect in Study 3.

However, one should consider that we preregistered both studies and predetermined their sample size, coding, predictors, and statistical analyses before starting data collection. Thereby, we minimized the degrees of freedom in our analyses and, consequently, the opportunities for data dredging (Nosek et al., 2018). In both studies, the appearance of significant effects due to exhaustive search for these (i.e., *p*-hacking) can be ruled out almost completely (Forstmeier et al., 2017). Thus, Study 1 and Study 3 do not differ in their likelihood to reveal a false-positive result (Simmons et al., 2011). Furthermore, Study 1's result on children's sharing entirely agrees with our predictions derived from Social Interdependence Theory. That is, we did not find a meaningless pattern to be significant, but we found a pattern matching our preregistered predictions.

The final argument in favor of the false-positive-perspective is that, in Study 1, the three forms of social interdependence did not affect children's free play with their *previous* co-players. This finding is in contrast to a plethora of evidence suggesting that social interdependence affects children's subsequent prosociality toward their previous interaction partners (e.g., Bay-Hinitz et al., 1994; Corbit, 2019; Garaigordobil & Berrueco, 2007; Grineski, 1991; Hamann et al., 2011; Lozada et al., 2014; Melis et al., 2013; Orlick et al., 1978; Orlick & Foley, 1979; Pappert et al., 2017; Plötner et al., 2015; Rogers et al., 1981). The missing effect in children's free play questions whether the different forms of social interdependences affected children's psychological orientation (and prosociality) in their subsequent interactions at all.

Another perspective on the results for children's sharing could be that Study 1's result is a true-positive finding and Study 3's result is a true-negative finding, and that differences in the procedures caused this pattern of results. Two arguments make this methods-perspective plausible.

First, we used different games to create the social interdependences in Study 1 and Study 3. Study 1's game was highly interactive, and children needed to coordinate their actions with their co-players in order to succeed. In Study 3, we experimentally created the same relation of goals as in Study 1 but reduced the coordinative demands. That is, children did not need to consider their co-players' actions to increase their chances of winning in Study 3. Hence, the cooperation and competition created in Study 1 and Study 3 had the same relations of goals between co-players but vastly differed in their coordinative demands, which might result in differing intensities of social interdependence. In line with this argument, most of the previous studies that investigated the effects of cooperation and

competition on children's prosocial behavior used games demanding coordination between players (Battistich et al., 1989; Bay-Hinitz et al., 1994; Corbit, 2019; Finlinson et al., 2000; Garaigordobil & Berrueco, 2007; Hamann et al., 2011; Lozada et al., 2014; Melis et al., 2013; Plötner et al., 2015; Street et al., 2004; Zan & Hildebrandt, 2003; but see Pappert et al., 2017).

An additional descriptive hint supporting this argument stems from the studies' dropouts. In Study 1, seven dyads decided to quit the competitive version of the game, whereas only three dyads in the cooperative and one dyad in the solitary condition did so. In Study 3, only one dyad decided to stop the competitive game as compared to three dyads in the solitary and none in the cooperative condition. This information is merely descriptive but might indicate that the competition in Study 1 created a greater conflict and was more intense as compared to the competition in Study 3. This could be explained by the differences in the demand for coordination and interactivity of players in the two different games. Thus, due to the high demand for coordination, the experience of the competition and cooperation in Study 1 might have been more intense as compared to Study 3 and, consequently, maximized the behavioral effects in Study 1.

The second argument for the methods-perspective is related to differences between the dictator games used in Study 1 and Study 3. In Study 1, children received 10 stickers in one dictator game, while they received 5 stickers in two consecutive dictator games during Study 3. The merged data analysis revealed that children shared fewer stickers in Study 3 as compared to Study 1. This finding suggests that the assessment by two consecutive dictator games might have lowered children's willingness to share as compared to an assessment in a single dictator game. The split in two endowments might have increased the value of the resource since only fewer stickers have been available in each sharing decision (John et al., 2018). Therefore, the costs of sharing were higher in Study 3. However, high- and low-costly sharing develop differently throughout middle childhood (e.g., Blake & Rand, 2010; House et al., 2013) and are differently affected by intergroup competition (Zhu et al., 2015). The dictator game procedures of Study 1 and Study 3 might have a different sensitivity to detect the effect of social interdependence on children's sharing since the costs of sharing differed. However, Pappert and colleagues (2017) found that competition only reduces children's costly, and not non-costly, sharing with a third-party. According to this finding, one would expect a stronger effect of competition in Study 3 as compared to Study 1 since the costs of sharing were higher in this study.

So far, I discussed the results for children's sharing. For children's social inclusion behavior, the results of Study 1 and Study 3 agree very well since children's social inclusion of third-parties did not differ after playing a game with a cooperative, competitive, or solitary context in both studies. Thus, the elicitation of a cooperative orientation (i.e., through a cooperative game) does not promote preschoolers' social inclusion of third-parties as compared to a competitive or solitary orientation. Likewise, competition does not lower the willingness to include others as compared to solitary activities.

Following the false-positive-perspective, one could conclude that there is no effect of social interdependence on preschoolers' prosociality. That is, socially interdependent peer interactions do not affect any form of preschoolers' prosociality directed toward third-parties. However, this might be a too simplified explanation. The mixed results for children's sharing and social inclusion might be explained by the multifaceted fashion of prosociality (Eisenberg et al., 2015). Prosociality can be expressed in different unrelated behaviors

(Dunfield, 2014) and can have different underlying motivations (Paulus, 2014). Thus, interventions might selectively affect different prosocial behaviors. That is, a cooperative context might only promote children's sharing but not social inclusion.

The different effects for children's sharing and social inclusion might also be explained by the measurement characteristics of the paradigms that we used here to assess these behaviors. It might be that the finer graduation in the dictator game (0 to 10 or 0 to 5 stickers, respectively) was more suitable to detect the small effects of the forms of social interdependence as compared to the rather broad graduation in the social inclusion task (inclusion vs. non-inclusion).

Besides, the dictator game and the social inclusion task might be affected by different motivations. The dictator game is a straightforward task assessing children's willingness to share. The task is relatively simple regarding the involvement of the recipient (i.e., absent, non-interactive peer). Thus, the dictator game assesses children's prosocial motivation relative directly. The social inclusion task is socially more complex than the dictator game. Here, children directly interact with puppets with a different hierarchical position. The initiator puppet, as compared to the approaching puppet, has a higher position in the tossing-game since she explains the game and mentions that the game would belong to her. In our social inclusion paradigm, the initiator puppet thinks aloud to whom to pass the ball and decides to overgo the desire of the approaching puppet. Hierarchical concerns might bring different prosocial motivations into play. Promoted prosociality might increase children's willingness to include the approaching puppet due to fairness expectations denoting equal participation. However, given the initiator puppet's higher position in the hierarchy of players, it might be reasonable that the initiator puppet has the right to decide who is allowed to participate in the game. By neglecting to include the approaching puppet, children might express prosociality driven by respect for ownership (Elenbaas, 2019; Kanngiesser et al., 2019, 2020).

Furthermore, children's behavior in the social inclusion paradigm might also depend on their social initiative-taking. That is, children need to be both willing (prosocial motivation) and confident (initiative-taking motivation) to invite the approaching puppet into the ongoing ball-tossing game. Thus, children's inclusion behavior might also be inhibited by their social shyness (Coplan et al., 2004). This idea is corroborated by the high inclusion rates in children's directives. When the initiator puppet explicitly asked children to whom she should pass the ball, children were very likely to include the approaching puppet (see *Merged Analyses*). This finding stresses children's high inclusive attitude documented in previous studies (Killen, Rutland, et al., 2013). The explicit question of the initiator puppet (i.e., "Tell me, to whom shall I pass the ball? To *Name of approaching puppet*? Or to you?") might reduce demands on social initiative-taking since it scaffolds the inclusion of the approaching puppet. The different forms of social interdependence might have affected children's prosocial motivation, but not their social shyness and confidence to take the social initiative. It might be that, in addition to a promotion of children's prosocial motivation, children's social shyness needs to be reduced in order to increase their likelihood to include the approaching puppet (e.g., by social skill trainings; Beidel et al., 2000; Gallagher et al., 2004).

Thus, the social interdependence of the game might have affected children's prosocial motivation (e.g., their fairness concerns). However, the complex social situation of the inclusion task might not target a specific prosocial behavior and might be confounded by

other motivations such as shyness. Nevertheless, independently of these potential explanations and the unclear results on children's sharing behavior, it appears that cooperation and competition do not influence children's social inclusion of third-parties.

A sideline in this first question was whether cooperative contexts promote or competitive contexts lower prosociality. The only effect one can refer to in this aspect is Study 1's finding on children sharing with a third-party. Here, sharing after playing a cooperative as compared to a competitive game significantly promoted children's sharing. However, none of the sharing rates in these two conditions differed from the sharing rate in the solitary condition. Thus, we cannot conclude whether cooperation promotes or competition lowers prosocial behavior in children. Our result suggests that the promotive and lowering effect seem to be present at the same time, which would be in line with our predictions derived from Social Interdependence Theory (Deutsch, 1949a, 2012) and empirical evidence stemming from adult participants (Johnson & Johnson, 2011).

Based on Study 1 and Study 3, there is no clear consensus on whether the false-positive-perspective or the methods-perspective is more valid to explain the detected pattern of results. In sum, our findings indicate that cooperative, competitive, and independent relations of goals do not influence preschoolers' social inclusion behavior of third-parties. For children's sharing with third-parties, results are mixed. Here, our results suggest that cooperative or competitive goal relations do not affect children's sharing behavior per se. These effects might only occur after socially interdependent interactions characterized by a high demand for coordination.

How Do Outcome and Engagement Impact the Effects of Social Interdependence?

Study 1's results for the effect of the interaction's outcome (i.e., winning or losing the game) on children's prosocial behaviors were mixed. The outcome of the game predicted children's social inclusion behavior, but not their sharing behavior. Children who lost more rounds when playing the game were more likely to include the approaching puppet faster. This finding agrees with studies suggesting that negative feelings can elicit affiliative motivations (e.g., Over & Carpenter, 2009; Song et al., 2015), which might be expressed by a faster inclusion of the approaching puppet.

However, this finding disagrees with studies suggesting that children's prosocial behavior after cooperation and competition is unaffected by its outcome (e.g., Zhu, Guan, & Li, 2015), and that children's positive feelings increase their willingness to act prosocially (Aknin et al., 2018). Further, Over and her colleagues (Over & Carpenter, 2009; Song et al., 2015) investigated the effect of third-party ostracism on children's affiliative motivation, which elicits a specific negative feeling (i.e., social pain) since exclusion constitutes a particular threat for humans' need to belong (Over, 2016). It seems reasonable that only the particular threat of ostracism, and not negative feelings per se (e.g., anger after losing a game), actuate affiliative motives. Also, one should consider that the most children included the approaching puppet immediately when given a chance to and that the measurement characteristics of Study 1's social inclusion task appeared questionable. A replication of this finding with Study 2's modified version of the social inclusion task might be useful to confirm Study 1's finding.

For children's sharing, Study 1 did not reveal an effect of the gaming outcome. Here, the social interdependence of the interaction had a stronger impact on children's sharing than the game's outcome. This finding agrees with positions claiming that the impact of

the context of interactions (i.e., their social interdependence) trumps the interaction's outcome on subsequent prosocial behaviors (Robitaille, 2013).

In Study 3, we experimentally controlled the outcome of the game in order to keep its dynamic more consistent across dyads. In this study, we included children's engagement (i.e., their physical activity) as a predictor for their subsequent prosocial behaviors. We did not find an interaction between children's engagement in the game and the respective context. However, it might be that children's physical engagement does not correspond with their psychological engagement. Children's psychological engagement in the game might be expressed in different behaviors. Other indicators might be the intensity of children's emotional reactions to the result of the game or verbal utterances while playing. In Study 3, children's physical engagement increased with age, suggesting that this behavior might be related to children's motoric skills. However, even children with low motoric skills might be actively engaged in a cooperative or competitive game without having the capacity to translate this engagement into higher performance. Therefore, the number of rotations might not be the best proxy for children's psychological engagement. Further, one has to consider that the different forms of social interdependence did not affect children's prosocial behavior in Study 3. This null result substantially impedes the detection of a moderating effect of children's engagement while playing.

In summary, our results suggest that the outcome of interactions and children's physical engagement within these interactions do not affect their subsequent prosocial behavior. The social interdependence of an interaction might be of primary importance in this nexus.

How Do Cooperative, Competitive, and Solitary Contexts Affect Prosociality in Intergroup Contexts?

In Study 3, we could not detect an impact of the cooperative, competitive, and solitary context on children's prosocial behavior in an intergroup context. Similar to Spielman (2000), we did not find an in-group bias in children's sharing after a neutral (i.e., solitary) context. By clearly separating the solitary and cooperative context, we could extend Spielman's results by showing that cooperation does not affect children's in-group bias in a third-party context. However, we could not replicate Spielman's finding that competition would increase children's in-group bias. Importantly, all children passed the comprehension check for the minimal group manipulation in Study 3.

This evidence does not neglect the importance of competition and cooperation on young children's intergroup behavior. Between-group competition can increase young children's in-group bias substantially (e.g., Abrams et al., 2015; Majolo & Maréchal, 2017; Zhu et al., 2015). Our data suggest that cooperation and competition do not influence children's intergroup behavior in a third-party context. Thus, it appears that cooperation and competition need to be present in the immediate intergroup context to influence children's in-group bias. If existent, Spielman's spillover effect of competition seems to be small and seems to occur only immediately after the elicitation of the competitive orientation.

How Does Social Inclusion Develop Throughout Preschool Age and How Do Groups Influence Social Inclusion?

One goal of this thesis was the development of an interactive paradigm to assess preschoolers' social inclusion behavior. Study 1's paradigm was a promising approach to find an appropriate procedure. However, this version of the paradigm did not reveal ideal

measurement characteristics since we observed a ceiling effect with children being highly inclusive. Study 2 aimed to modify and extend this paradigm by assessing how different intergroup scenarios affect children's social inclusion. Here, one scenario, in which an out-group puppet approaches an in-group interaction, appeared to be useful for Study 3 since inclusion rates were relatively low and thereby allowed the assessment of interindividual variation in young children's social inclusion behavior. This in-group/out-group scenario was used in Study 3, in which the different forms of social interdependence did not affect children's social inclusion behavior. As such, we followed an iterative approach of introducing and improving a novel paradigm based on its measurement characteristics.

Study 2 and Study 3 offered different results for the development of children's social inclusion throughout preschool age and the impact of intergroup contexts on their social inclusion. While Study 2 suggested that children's general willingness to include others increases from age 3 to 6, Study 3 found this behavior to be stable between ages 4 to 6. Further, in Study 2, children's directives were consistently inclusive across age. In contrast, children's directives became more exclusive with increasing age in Study 3.

The merged analysis corroborates the conclusions drawn in Study 2: Children's general willingness to include others increases between the ages of 3 to 6. This developmental trajectory might be explained by children's growing capacity to manage and coordinate play with their peers (Barbu et al., 2011; Parten, 1932). Throughout preschool age, children become competent coordinators, skilled mind-readers, and sensitive empathizers (for overviews, see Eisenberg et al., 2015; Tomasello, 2019; Wellman, Cross, & Watson, 2001). The development of these capacities seems plausible to explain children's increasing inclusiveness.

Further, the different intergroup scenarios affected children's general inclusion. In addition to Study 2, the merged analysis revealed that children's general inclusion differed not only between the control condition and the in-group/out-group condition but also between the neutral/out-group condition and the in-group/out-group condition. Children's inclusion rates were similar when an out-group member approached an interaction with a puppet having no group membership and a control condition without any groups. Thus, mere out-group membership of others does not lower children's social inclusion. It seems that children are less likely to include out-group members who approach *in-group* interactions and that the presence of in-group members is crucial for the occurrence of this effect. This finding of the merged analysis extends Study 2's results and supports the idea that in-group favoritism, as compared to out-group derogation, drives preschoolers' in-group bias primarily (Buttelmann & Böhm, 2014). Children's derogation of out-group members appears to emerge after preschool age.

However, the exact proximate mechanism of children's reduced willingness to include approaching out-group members into an in-group interaction is still unclear. It might be that children merely like in-group members more than out-group members and consequently pass the ball preferentially to these. Another mechanism might be children's adherence to an established norm of the in-group member, which seems to emerge from around age 4 (e.g., Nesdale, 2011). In our paradigm, the in-group member thinks aloud to whom she should pass the ball and decides to pass it to the child and not to the approaching out-group puppet. This decision might establish an implicit norm (i.e., the in-group does not pass to out-group members), which might have led to an exclusive attitude. With our paradigm, these mechanisms—mere liking or norm adherence—cannot be distinguished.

Importantly, the lowering effect of the intergroup context on children's inclusion behavior was present from age 3. This finding shows that arbitrary groups established via the color of clothing items can affect *preschoolers'* prosocial behavior. The presence of this effect among young preschoolers has been debated in past research (Aboud, 1988; Dunham et al., 2011; Dunham & Emory, 2014; Fawcett & Markson, 2010; Plötner et al., 2015; Richter, Over, et al., 2016). Two procedural aspects might best explain this finding on children's in-group bias in a minimal group context: First, in our paradigm, children decided whether to include others into their own activities. Such a scenario better resembles children's everyday experiences as compared to, for example, behavioral attribution to fictive prosocial and antisocial behaviors (Dunham et al., 2011). Second, our paradigm was mutually interactive. That is, the ball-tossing game lasted for several rounds, and children were part of an immediate ongoing interaction. The repeated interactions might change children's expectations of others' behaviors since excluded others may protest, and loyalty toward in-group members may be threatened in case of inclusion. Such expectations are present from early development already (e.g., Chalik, Rivera, and Rhodes 2014; Rhodes 2012). Thus, interactive paradigms might be more suitable to detect children's early sensitivity for arbitrary intergroup contexts than paradigms based on fictive peer contacts.

The descriptive results of the merged analysis offer additional insights into children's strategies for their social inclusion. The relative frequencies of the moment of the first inclusion and the number of passes indicate that the majority of children used one out of two strategies: *Non-includers* did not pass to the approaching puppet over all four passes and only played with the initiator puppet. In contrast, *alternating includers* passed the ball to the approaching puppet immediately in the first rally and alternated their passes between both puppets resulting in two passes to each puppet. The non-includer approach frequently occurred in the scenario in which an out-group member approaches an in-group interaction, while children were more likely to include alternately in the other two scenarios.

Finally, the merged analysis revealed that children's directives for their co-players are predominantly inclusive. Again, this finding agrees with the results of Study 2 and with studies suggesting a generally inclusive attitude in young children (Cooley et al., 2019; Killen, Rutland, et al., 2013; Scholes et al., 2017). It seems that the exclusive in-group norm suppresses children's inclusive attitude (as indicated by their directives) since the different intergroup contexts affected their general inclusion (see also Nesdale, 2011; Nesdale & Dalton, 2011). When giving a chance, children revised their in-group norm of exclusion and preferred to include the approaching puppet.

In sum, we find that children's willingness to include others in ongoing interactions increases throughout preschool age. Further, arbitrary intergroup contexts influence this behavior from age 3, indicating their early sensitivity for conventional groups.

Constraints on Generality

Cultural Constraints

As mentioned in the *General Introduction*, this dissertation and the vast majority of the cited studies investigated the social behaviors of children from an urban Western background.

Our results should not be generalized outside such contexts (Henrich et al., 2010). The current findings apply to German, or possibly other Western populations.

Children's behavior in and after cooperative and competitive interactions with peers varies substantially across cultural contexts. For example, children from a contemporary hunter-gatherer population in rural Namibia were found to be less likely to seek cooperative contexts and expressed less positive affect when cooperating as compared to children from a German city (Stengelin et al., under review). Among the same community, children were equally likely to deceive their peers in a cooperative and competitive context (Stengelin et al., 2020), which is in contrast to children from Western societies (Reyes-Jaquez & Echols, 2015; Stengelin et al., 2018). Corbit and colleagues (2017) found that working cooperatively as compared to solitarily promoted children's fairness measured by their rejections of unequal resource distributions from around age 7. In the same study, the authors found the same effect in children from rural India, but later in development (i.e., around age 11). When being in a competitive context, Anglo-American children behaved more competitively than Mexican, Mexican-American, and Afro-American children (Kagan & Madsen, 1971, 1972; Madsen & Shapira, 1970). Children growing up in Israeli kibbutzim behaved more cooperatively in a cooperative task than children from Israeli or American urban contexts (Shapira & Madsen, 1969, 1974). Dyads of 6 to 10-year-old siblings from Mexican Indigenous backgrounds showed more sophisticated cooperation than dyads from a middle-class European American background (Alcalá et al., 2018). Similarly, children from Mexican Mayan backgrounds orchestrated their actions more cooperatively in a construction task as compared to children from European American backgrounds (Mejía-Arauz et al., 2007). Western schooling (Madsen, 1971) and urban environments (Butler & Ruzany, 1993) appear to increase children's competitiveness. Besides, ethnographical work suggests that cultural contexts significantly differ in the cooperativeness and competitiveness of their social structure (Mead, 1937). Thus, it appears that cooperation and competition are omnipresent dimensions of human interactions, but children's social behaviors in and after such respective interactions substantially differ across cultural populations.

Further, children's prosociality differs substantially between cultural contexts. As mentioned earlier, merit-based sharing is common among children from Western, individualistic populations (Schäfer et al., 2015) and emerges earlier in ontogeny as compared to collectivistic populations (Huppert et al., 2018). Across cultures, children adopt their sharing behavior to adult norms (House et al., 2019), which results in considerable variation across societies (House et al., 2019; House, Silk, et al., 2013; Ibbotson, 2014; Schäfer et al., 2015). Thus, children from other cultural populations might show different sharing rates in the solitary condition, which may change the significance of the effect of cooperation and competition.

Also, children's reactions to social exclusion differ between individualistic and collectivistic populations (Over & Uskul, 2016; Uskul & Over, 2014, 2017). That is, children from individualistic as compared to collectivistic populations perceive third-party exclusion as more severe and, consequently, show stronger affiliative responses afterward. This buffering effect might also influence children's behavior in the social inclusion task. The initiator puppet excludes the approaching puppet, which might generally increase children's likelihood to include the approaching puppet in individualistic cultural contexts. In an ongoing project, we investigate children's inclusion behavior in the in-group/out-group condition of Study 2's social inclusion task across diverse populations (see osf.io/c53t7/, for a

project description). In line with the outlined prediction, preliminary results indicate higher inclusion rates among children from an individualistic population (New Zealand) as compared to two collectivistic populations (India and Cyprus). Again, one can assume that children's baseline behavior systematically differs across populations, which may change the effects of cooperation and competition.

This thesis investigated the effects of cooperative, competitive, and solitary contexts on preschool children growing up in an urban German community. This particular cultural context can be conceived as a proxy for Western urban contexts more generally (Nielsen et al., 2017). Adults in such contexts commonly reinforce cooperative behaviors in their children (Brownell et al., 2006; Keller, 2007). At the same time, they also want their children to master competition successfully (Deutsch, 1993). Consequently, we predicted that children from this cultural context might show an early sensitivity for cooperation and competition, leading to pronounced reactions within and after cooperative and competitive peer interactions. As such, this context appeared suitable to find our predictions derived from Social Interdependence Theory. However, we did not find consistent effects of cooperative and competitive relations of goals on children's prosociality toward third-parties in this cultural context. Thus, our mixed pattern of results in children from a suitable cultural context questions Social Interdependence Theory. More thorough investigations might be needed to revise and adopt Social Interdependence Theory (see *Future Research and Implications*). While the current study population may, thus, have been ideal for the aims of the current dissertation, it has to be noted that it far from being representative for other cultural contexts.

Methodological Constraints

All three studies have individual limitations that have been discussed in the respective chapter. Here, we discuss two further limitations that have not been mentioned before but might be of relevance for understanding the current dissertation as a whole. First, children interacted with fictive absent peers and puppets when we assessed their sharing behavior and social inclusion behavior. Whether these methods can be generalized to natural peer interactions seems questionable. In particular, the attention of a peer while sharing, which seems to be more prevalent in everyday life, might influence children's sharing behavior due to reputational concerns (e.g., Engelmann & Rapp, 2018; McAuliffe et al., 2020).

Second, we used puppets that were operated by an adult experimenter as interaction partners in the social inclusion paradigms. This procedure allows for the experimental control of the interaction. However, children's social inclusion behavior might substantially change when directly interacting with peers or adults in the ball-tossing game. Many studies used puppets to encourage children's protesting behavior (e.g., Schmidt et al., 2012, 2019) since these are assumed to depict an interaction partner at eye level as compared to adults. It might be that children are less inclusive if an adult establishes the exclusive in-group norm.

Further, it might be that children's in-group bias decreases when interacting with peers instead of puppets. For example, Richter (2014) did not observe an in-group bias in 2- and 5-year-olds' peer interactions when using natural observations in a minimal group context.

Finally, the different results of Study 1 and Study 2 show how minor procedural modifications can change children's behavior in the social inclusion task. Hence, it seems plausible that the detected effects of intergroup contexts only occur under specific conditions.

Thus, one should be careful when generalizing the results of the current thesis to different or modified measures of children's prosocial behavior.

Future Research and Implications

Dimensions of Interdependence

Study 1 and Study 3 revealed contrary findings of the effect of cooperation and competition on children's sharing with third-parties. Notably, this mixed pattern occurred in a study population which was suitable for our research questions since cooperation and competition are stressed from early on in child development in urban Western communities (see *Cultural Constraints*). What do these contrary findings imply for Social Interdependence Theory? Depending on the outlined false-positive-perspective or methods-perspective, the implications are different.

The false-positive-perspective suggests that socially interdependent interactions only influence prosocial behavior between previous interaction partners. Cooperation and competition do not create a lens changing the perception of social interactions and prosocial behavior toward others more generally. If an intervention aims to promote prosocial behavior between individuals (or groups), the particularly involved parties need to interact with one another in order to promote prosocial behaviors and improve their social relationships.

From the methods-perspective, these mixed findings might have more optimistic implications. Social Interdependence Theory mainly focuses on how the relation of goals influences prosocial behavior and does not consider other dimensions of interdependence (Deutsch, 2012). Likewise, past research often ignored different dimensions of social interdependence. For example, most previous research on the effects of cooperation and competition on children's prosocial behavior used games with a high demand of coordination (Battistich et al., 1989; Bay-Hinitz et al., 1994; Corbit, 2019; Finlinson et al., 2000; Garaigordobil & Berrueco, 2007; Lozada et al., 2014; Street et al., 2004; Zan & Hildebrandt, 2003), but did not consider coordination as a necessary condition for their effects. Furthermore, in a recent study by Li and colleagues (2019), children played a cooperative or competitive game with an experimenter, after which their visual perspective-taking was measured. The results suggest that children's perspective-taking increases after playing the cooperative as compared to the competitive version of the game. However, the cooperative version of the game was coordinative, while opponents' actions were independent in the competitive version. This procedure exemplarily illustrates that many researchers treat social interdependence as a unidimensional construct with the relationship of goals being the critical aspect influencing social behavior.

However, other dimensions of interdependence, such as coordination, hierarchy, or expectations about future interdependence, might also shape the experience of social interactions (Gerpott et al., 2018; Kelley et al., 2003). It seems plausible that all these dimensions of interdependence influence prosocial behaviors in (and possibly after) interactions. For example, future interactions with the receiver of their donation substantially influenced children's sharing (Leimgruber, 2018). In line with this approach, children's social

cognition (e.g., visual perspective-taking) seems to depend on both the goal structure of an interaction and its demand for coordination (see Li et al., 2019, for a discussion).

Young children's collective intentionality—the capacity to coordinate psychological states on a group-level—is still weak and consolidates throughout preschool age (Tomasello, 2019). It might be that their sharing with third-parties is only affected after highly coordinative cooperation and competition. Accordingly, the experience of the different forms of social interdependence was stronger in Study 1 as compared to Study 3, which might have resulted in different effects on children's sharing. Similarly, there is strong evidence that collaboration—a highly coordinated form of cooperation—influences children's sharing and triggers a sense of fairness (Corbit et al., 2017; Hamann et al., 2011; Melis et al., 2013; Ulber et al., 2017).

Understanding interdependence as a construct consisting of diverse, continuous dimensions might be an interesting starting point for future research. To my knowledge, no previous study investigated the interplay of cooperation and coordination systematically. The different findings of Study 1 and Study 3 suggest that coordination might intensify (or even enable) the effects of cooperation and competition in preschool children. The investigation of the influence of peer interactions with different relations of goals (cooperation vs. competition) and degree of coordination (high vs. low) on preschooler's prosocial behaviors might be a fruitful starting point for this endeavor. Another idea might be that different positions in a hierarchy change the influence of cooperation and competition since these get along with different responsibilities and self-efficacy during these interactions. Having more responsibility in a cooperative task might increase a sense of commitment and, consequently, the elicited cooperative orientation. Thus, we should try to understand how preschoolers understand social interdependence and which exact dimensions of interdependence shape their social behavior.

Cultural Variation

Future research might investigate how cooperation and competition affect subsequent prosocial behavior in children from populations with diverse cultural backgrounds. As listed above, children from diverse contexts differ substantially in their behavior within cooperative and competitive contexts. It would be interesting to see how these differences shape children's prosocial behavior in subsequent interactions. It might be that children growing up in populations valuing competitiveness (such as Western societies; see Deutsch, 1993) are more impacted by competition as compared to populations valuing autonomy, such as many hunter-gatherer societies (Hewlett, 2016). However, an opposite reaction might also be possible. WEIRD children who are exposed to competition relatively often might learn that behavior within competitive settings is mostly not relevant for subsequent encounters (e.g., playing a competitive game). In contrast, children who have relatively little experience with competitive interactions might be more affected by these since this form of social interdependence is relatively rare in their everyday life and, therefore, stands out in its significance. Investigations with participants from more diverse cultural populations could explore these open questions and help us to understand more about the universality underlying children's reactions to cooperation and competition.

Besides between-cultural variation, within-cultural variation might be interesting for future research. Within and across the three studies of this dissertation, we found a considerable variation of children's prosocial behavior, although children came from the same

population (Leipzig, Germany). For example, children shared more in Study 1 as compared to Study 3, and children were more inclusive in Study 2 as compared to Study 3 (see *Merged Analyses*). Further, some children shared all stickers of their endowment, while others did not share any stickers. This pattern agrees well with previous findings suggesting substantial variation in adults' prosocial behavior within a single city (Lamba & Mace, 2011; Nettle et al., 2011). One should refrain from considering this variation as unsystematic noise, but might instead address and investigate it more carefully within future studies (Kline et al., 2018).

First, one might try to determine relevant predictors on a societal level in order to understand within-population variation. In this regard, one could use parental personality traits to explain children's prosocial behavior after cooperation and competition, since, particularly in Western cultural contexts, parents are important interaction partners for young children (Keller, 2007, 2018). Frameworks of human personality assume agency (e.g., competitiveness and assertiveness) and communion (e.g., cooperativeness and warmth) to be basic trait dimensions for judgments of the self and others (Abele & Wojciszke, 2007; Gebauer et al., 2013). Parental judgments on these two dimensions might be a promising predictor for children's behavior within and after cooperative and competitive contexts. That is, for example, children of highly competitive parents might react more strongly to a competitive context than children from less competitive parents.

Second, we could use within-population variation to test universal hypotheses derived from evolutionary theory or investigations that have been conducted across cultures. For example, Falk and colleagues (2014) found a stronger in-group bias in a minimal group context in adults from an individualistic Western population (United States) as compared to adults from a collectivistic non-Western population (Japan). The authors concluded that adults from Western populations focus more on intergroup competition as compared to adults from some non-Western populations. This relation might also account for children's interindividual variation within populations. That is, children growing up in more collectivistic households should show less in-group bias than children from less collectivistic households.

Importantly, culture does not equate with countries or ethnic groups (Keller & Kärtner, 2013). Investigating variation at multiple levels (e.g., country, city, family) can help us to better understand the impact of ecological and societal factors on human development (Lamba & Mace, 2012). Within-population variation can both generate and validate hypotheses of culturally-informed psychological research.

Promoting and Understanding Social Inclusion

Most of the children used one out of two strategies in our social inclusion paradigm: Non-includers neglected to pass the ball to the approaching puppet, while includers included the approaching puppet immediately in the first rally and alternated their passes between the two puppets. The non-including strategy mostly occurred if an out-group member approached an in-group interaction (see *Study 2*). Thus, the immediate moment in which the new puppet approached the interaction seems to be crucial, since children either chose the inclusive or non-inclusive strategy and maintained this during the subsequent interaction. Interventions aiming to promote children's social inclusion might, therefore, focus on such moments (e.g., an unknown child comes to a daycare group and joins the free play). In particular, the salience of groups might be reduced in first contact situations (e.g., by

stressing a broader common group identity), cooperation between the groups might be stressed, or educators might encourage children to behave inclusively. The results of the current thesis hint to the importance of the first contact between peers for their upcoming inclusion behavior, and educators might specifically supervise these moments.

In Study 2, we tried to learn more about the mechanisms underlying children's social inclusion behavior in intergroup scenarios (i.e., in-group favoritism and out-group derogation). Our results suggest an earlier emergence of in-group favoritism, but the proximate mechanisms of this bias are still unclear: Do children merely like their in-group members more than out-group members? Do children feel a stronger commitment to norms established by their in-group members? These are two mechanisms that might explain the effect of intergroup contexts on children's social inclusion behavior. Exploring these mechanisms is a promising area for future research to design efficient interventions promoting social inclusion in young children.

Furthermore, it might be interesting to investigate what own norms children establish in our social inclusion paradigm. That is, how do children behave if they hold the ball when the out-group member arrives? In this scenario, children could establish an own in-group norm, which might reveal exciting insights into their prospective expectations of intergroup interactions. Also, one could investigate how different characteristics of interaction partners influence children's social inclusion behavior. Here, we only investigated the impact of group membership. Other characteristics of peers, such as their competence in playing a game or interpersonal warmth, might also shape children's social inclusion decisions. The paradigm might also have even more ecological validity when examining the influence of such characteristics since these might occur in children's everyday life more often.

Finally, Study 2 and Study 3 revealed different results on the development of preschoolers' social inclusion behavior, although children were recruited from the same database of participants. This finding, again, stresses the need to study variation within populations. In particular, parental socialization goals (Giner Torréns & Kärtner, 2017; Köster et al., 2016; Spinrad & Gal, 2018), parental group orientations and political attitudes (Duriez & Soenens, 2009), as well as parents' cultural values on individualism and collectivism (Tamm, 2019) might be promising predictors in this enterprise.

Conclusions

Social interdependence is an essential part of human interactions. Despite its omnipresence, we are far from understanding the effects of social interdependence on young children's social behaviors. This dissertation aimed to unravel the consequences of cooperation and competition for upcoming interactions with uninvolved third-parties. Our results suggest that cooperative and competitive peer interactions can influence children's sharing with third-parties, but that this effect only occurs under specific conditions. These results stress the complexity underlying social interdependence and its effects on young children's prosocial behaviors. Further, our findings underline that the interplay of diverse dimensions of social interdependence should be considered when trying to predict children's prosocial behavior. Hopefully, the current dissertation will prompt future research investigating social interdependence and its manifold relations to young children's social behaviors.

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Toppe, T., Hardecker S., & Haun, D.B.M. (2019). Playing a Cooperative Game Promotes Preschoolers' Sharing with Third-Parties, but Not Social Inclusion. *PLoS ONE,* 14, no. 8: e0221092. https://doi.org/10.1371/journal.pone.0221092.

Toppe, T., Hardecker S., and Haun, D.B.M. (2020). Social Inclusion Increases Over Early Childhood and Is Influenced by Others' Group Membership. *Developmental Psychology*, 56, (2), 324–35. https://doi.org/10.1037/dev0000873.

Scientific Presentations and Conference Contributions

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Toppe, T. & Kaiser, M. (2019). *Variation of intergroup behavior and identity—the impact of culture, peers and parents, and ideas for interventions*. Symposium organized at the Gemeinsame Tagung der Fachgruppen Entwicklungspsychologie und Pädagogische Psychologie, Leipzig, Germany.

Toppe, T. (2019). *Playing a cooperative game promotes preschoolers' sharing with third-parties, but not social inclusion*. Paper presented at the Gemeinsame Tagung der Fachgruppen Entwicklungspsychologie und Pädagogische Psychologie, Leipzig, Germany.

Toppe, T., Kaiser, M., Zerres, F., Hardecker, S., & Haun, D.B.M. (2019). *How do micro-level contexts influence children's social inclusion of out-group members?*. Poster presented at 3rd Annual ESLR Workshop 2019, Leipzig, Germany.

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Toppe, T., Hardecker, S., & Haun, D.B.M. (2018). *Social inclusion in preschoolers.* Poster presented at Social Science Poster Night, Leipzig, Germany.

Toppe, T., Hardecker, S., & Haun, D.B.M. (2018). *Social inclusion in preschoolers.* Poster presented at Understanding Social Relationships, Gottingen, Germany.

Toppe, T., Hardecker, S., & Haun, D.B.M. (2018). *Effects of games on sharing and social inclusion in preschoolers.* Poster presented at Budapest CEU Conference on Cognitive Development, Budapest, Hungary.

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DECLARATION OF AUTHORSHIP

Hiermit versichere ich, Theo Maria Santiago Lorenzo Toppe, geboren am 17.04.1990 in Gelsenkirchen, das Folgende:

Ich versichere, dass die vorliegende Arbeit ohne unzulässige Hilfe und ohne Benutzung anderer als der angegebenen Hilfsmittel angefertigt wurde und, dass die aus fremden Quellen direkt oder indirekt übernommenen Gedanken in der Arbeit als solche kenntlich gemacht worden sind.

Bei Auswahl und Auswertung des Materials sowie der Herstellung der Manuskripte für die einzelnen Studien erhielt ich Unterstützung von Prof. Dr. Daniel Haun (Max-Planck-Institut für evolutionäre Anthropologie, Leipzig), Prof. Dr. Susanne Hardecker (SRH Hochschule für Gesundheit, Gera/Max-Planck-Institut für evolutionäre Anthropologie, Leipzig) und M.Sc. Franca Zerres (Universität Leipzig). Ich versichere, dass außer den oben genannten Personen keine weiteren an der geistigen Herstellung der Arbeit beteiligt waren. Dritte Personen haben von mir weder unmittelbar noch mittelbar geldwerte Leistungen für Arbeiten enthalten, die im Zusammenhang mit dem Inhalt der vorgelegten Dissertation stehen.

Ich versichere, dass die vorliegende Arbeit in gleicher oder ähnlicher Form keiner anderen wissenschaftlichen Einrichtung zum Zwecke einer Promotion oder eines anderen Prüfungsverfahrens vorgelegt wurde. Ich habe zu keinem früheren Zeitpunkt erfolglose Promotionsversuche unternommen.

Leipzig, 07. April 2020

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Nachweis über Anteile der Co-Autorinnen, Theo Maria Santiago Lorenzo Toppe
Effects of Cooperation and Competition on Preschoolers' Prosociality Toward Third Parties

Titel:	Playing a Cooperative Game Promotes Preschoolers' Sharing with Third-Parties, But Not Social Inclusion
Journal:	PLoS ONE
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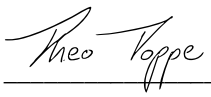

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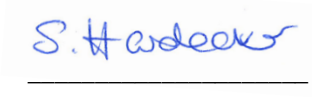

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Titel:	Social Inclusion Increases Over Early Childhood and Is Influenced by Others' Group Membership
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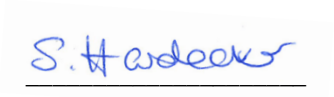

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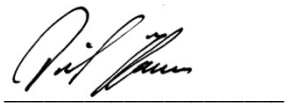

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Titel:	The Influence of Cooperation and Competition on Preschoolers' Prosociality Toward In-Group and Out-Group Members
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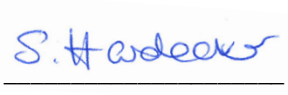

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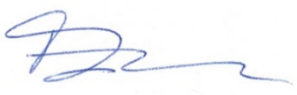

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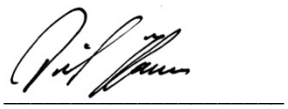

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