Group Membership and Imitation:

How Function Matters

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This dissertation is based on five manuscripts (see citation below). To warrant a smooth reading, the respective passages are not marked in the text, and following the practice of these articles, I employ "we" instead of "I" for the entire work. In addition, both numbers of figures/tables and citations were consecutively referred over the whole dissertation.

Krieger, A. A. R., Möller, C., Zmyj, N., & Aschersleben, G. (2016). Tom is not more likely to imitate Lisa than Ying: The influence of a model's race indicated by physical appearance on children's imitation. *Frontiers in Psychology, 7*. doi: 10.3389/fpsyg.2016.00972

Krieger, A. A. R., & Aschersleben, G. (2017). *Does the cue for the model's group membership affect the in-group bias in preschoolers?* Manuscript submitted for publication.

Krieger, A. A. R., Zmyj, N., Li, S., Möller, C., & Aschersleben, G. (2017). *A cross-cultural investigation of the in-group bias and its stability in preschoolers' imitative behavior.* Manuscript submitted for publication.

Krieger, A. A. R., Zmyj, N., & Aschersleben, G. (2017). *Ingroup bias and affiliative imitation in preschoolers.* Manuscript submitted for publication.

Krieger, A.A.R., Buttelmann, D., & Aschersleben, G. (2017). *Selective suppression of overimitation for in-group over out-group members in 6-year-olds.* Manuscript submitted for publication.

Table of contents

List of Figures

List of Tables

List of Abbreviations

η^2 ..... Eta square as effect size for a one-way ANOVA

ANOVA ..... analysis of variance

cf. ..... compare

Cohens *d* ..... effect size for a *t*-Test

e.g. ..... for example

df ..... degrees of freedom

F ..... test statistic from *F*-distribution

M ..... mean

mm ..... millimeter

ms ..... milliseconds

n ..... number of participants

ng ..... number of German participants

nc ..... Number of Chinese participants

p ..... probability of significance given that null hypothesis is true

r ..... Pearson Product-Moment Correlation Coefficient

s ..... seconds

SD ..... standard deviation

SE ..... standard error

t ..... test statistic from *t*-distribution

χ^2 ..... test statistic for χ^2 distribution

Abstract

For half a century, Germany is changing towards a multicultural society with children and adults of various cultures living together and learning from each other. This dissertation set out to investigate whether the cultural group membership indicated by the physical appearance of a German and Chinese model influences the acquisition of novel knowledge, assessed by imitation, from the age of three to six years. Previous research showed that infants and children preferred and preferably learned from people of their in-group, i.e. people who shared the same cultural background. However, this so-called in-group bias mainly applied for linguistic in-group models before the age of three years regarding imitation and after the age of five years regarding preference. Since three-year-olds enter kindergarten where they are confronted with foreign- and same-race children and adults, the question arose how cultural group membership influences the acquisition of novel knowledge from the age of three onwards. Since imitation is an effective mechanism for cultural learning, we investigated different influences on the connection between group membership and imitation and preferences in this work. In doing so, we experimentally manipulated the age of children, the cue for group membership, the cultural background of participants, the type of presented actions and a common underlying mechanism of group membership and imitation. The first study investigated whether the cultural group membership indicated by the model's physical appearance influences the imitational performance of four-year-old German children. The second study investigated the influence of three different cues for cultural group membership on the connection between group membership and imitation and preference in six-year-old children. Group membership was either indicated by the model's physical appearance or by labels of the model's home country or by language. The third study investigated whether the influence of group membership on imitation and preference differs in dependence of culture by testing three- to four-year-olds in Germany and China. We also observed whether group membership influences immediate and deferred imitation differently by testing before and after a one-week delay. The fourth study concentrated on the need to affiliate and its influence of the connection between group membership and imitation and preference. To experimentally manipulate the need to affiliate, one group of three- to four-year-old children observed third-party ostracism whereas another group did not. The fifth study investigated whether the relevance of presented actions influences the connection between group membership and imitation and preference by testing six-year-old children. Results

revealed that group membership influences children's preference since all children preferred their in-group model. Regarding imitation, results revealed that group membership is influencing imitation in dependence of the function of imitation that is predominant in children. If the cognitive function is predominant (i.e. children imitate to acquire novel knowledge), group membership did not influences children's imitation. If the social function is predominant (i.e. children imitate to affiliate with their in-group), group membership influences children's imitation as they oriented their behavior towards the in-group model. The results of the current dissertation entail important implications for the social-cognitive development of children especially growing up in a multicultural society.

Deutsche Zusammenfassung

Seit einem halben Jahrhundert wandelt sich Deutschland zu einer multikulturellen Gesellschaft, in der Kinder und Erwachsene verschiedener Kulturen zusammenleben und voneinander lernen. Diese Dissertation widmete sich der Fragestellung, ob die durch das physische Erscheinungsbild eines deutschen und chinesischen Modells gekennzeichnete kulturelle Gruppenzugehörigkeit den Erwerb von neuem, durch Imitation gemessenem Wissen, im Alter von drei bis sechs Jahren beeinflusst. Frühere Untersuchungen haben gezeigt, dass Säuglinge und Kinder Menschen aus ihrer Eigengruppe, d.h. Menschen mit gleichem kulturellem Hintergrund, präferieren und es zudem vorziehen, von ihnen zu lernen. Diese sogenannte Eigengruppenbevorzugung wurde jedoch vor allem für sprachliche Gruppenmodelle vor dem Alter von drei Jahren in Bezug auf Imitation und nach dem Alter von fünf Jahren in Bezug auf Präferenz nachgewiesen. Da Kinder im Alter von drei Jahren im Kindergarten betreut werden, wo sie mit Kindern und Erwachsenen aus der eignen und fremden Kulturen konfrontiert werden, stellt sich die Frage, wie die Zugehörigkeit zu einer kulturellen Gruppe den Erwerb von neuem Wissen ab dem dritten Lebensjahr beeinflusst. Da Imitation ein wirksamer Mechanismus für kulturelles Lernen ist, fokussierten wir uns auf verschiedene Einflüsse auf den Zusammenhang zwischen Gruppenzugehörigkeit und Imitation sowie Präferenzen in dieser Arbeit. Dabei manipulierten wir experimentell das Alter der Kinder, den Hinweisreiz auf die Gruppenzugehörigkeit, den kulturellen Hintergrund der getesteten Kinder, die Relevanz der präsentierten Aktionen sowie einen gemeinsamen Mechanismus der Gruppenzugehörigkeit und Imitation. Die erste Studie untersuchte, ob die durch das physische Erscheinungsbild des Modells angegebene kulturelle Gruppenzugehörigkeit Einfluss auf die Imitationsleistung vierjähriger deutscher Kinder hat. Die zweite Studie untersuchte den Einfluss von drei verschiedenen Hinweisreizen zur kulturellen Gruppenzugehörigkeit auf den Zusammenhang zwischen Gruppenzugehörigkeit und Imitation sowie Präferenz bei sechs-jährigen Kindern. Die Gruppenzugehörigkeit wurde dabei entweder durch die physische Erscheinung des Models oder durch Labels, die sich auf das Heimatland des Models bezogen, oder durch die Sprache der Modelle kenntlich gemacht. In der dritten Studie wurde untersucht, ob sich der Einfluss der Gruppenzugehörigkeit auf Imitation und Präferenz in Abhängigkeit von der Kultur unterscheidet. Dafür wurden Drei- bis Vier-jährige Kinder in Deutschland und China getestet. Es wurde sich außerdem dafür interessiert, ob die Gruppenzugehörigkeit die sofortige und verzögerte Imitation unterschiedlich beeinflusst. Dafür wurden die Kinder vor und nach einer einwöchigen Verzögerung getestet. Die vierte Studie

konzentrierte sich auf das grundlegende Bedürfnis sich zugehörig zu fühlen und dessen Einfluss auf den Zusammenhang zwischen Gruppenmitgliedschaft und Imitation sowie Präferenz. Um diese Bedürfnis experimentell zu manipulieren, beobachtete eine Gruppe von Drei- bis Vierjährigen Kindern eine Ausgrenzung durch Dritte, während eine andere Gruppe Kontrollvideos sah, in der keine Ausgrenzung stattfand. Die fünfte Studie untersuchte, ob die Relevanz der präsentierten Handlungen den Zusammenhang zwischen Gruppenzugehörigkeit und Imitation sowie Präferenz von 6-jährigen Kindern beeinflusst. Die Ergebnisse ergaben, dass die Gruppenzugehörigkeit die Präferenz der Kinder beeinflusst, da alle Kinder das Model ihrer Eigengruppe bevorzugten. Bezüglich der Imitation legen die Ergebnisse nahe, dass Gruppenzugehörigkeit das Imitationsverhalten in Abhängigkeit von der Funktion der Imitation beeinflusst, die bei Kindern vorherrschend ist. Wenn die kognitive Funktion vorherrschend ist (d.h. Kinder imitieren, um sich neues Wissen anzueignen), hat die Gruppenzugehörigkeit keinen Einfluss auf die Imitation von Kindern. Wenn die soziale Funktion vorherrschend ist (d.h. Kinder imitieren, um sich ihrer Gruppe anzuschließen), beeinflusst die Gruppenzugehörigkeit die kindliche Imitation, da Kinder ihr Verhalten am Gruppenmodell ausrichten. Die Ergebnisse der aktuellen Dissertation haben wichtige Implikationen für die sozial-kognitive Entwicklung von Kindern, insbesondere für das Aufwachsen in einer multikulturellen Gesellschaft.

A General Introduction

Political news of the last years increasingly report an enrichment of countries all over the word including Germany by foreign cultures (Eisenmenger, Pötzsch, & Sommer, 2006). Hence, German society more and more consists of different groups with different origins living together, who differ in appearance and language. Although all individuals belong to one country and society, it is a well-established psychological finding, that individuals do not perceive themselves as one society, but rather make distinctions between groups based on the cultural origin of their members, among other things (e.g., Aronson, Wilson, & Akert, 2008).

This differentiation into multiple cultural groups results in the perception of groups we belong to, so-called in-groups, and groups, we do not belong to, so-called out-groups, which in turn influence behavior. For example, the so-called in-group bias describes the tendency to prefer the in-group over the out-group, which results in positive behavior towards the in-group and negative behavior towards the out-group (Aronson et al., 2008). This in-group bias occurs over the entire life span (Buttelmann, Zmyj, Daum, & Carpenter, 2013; Howard, Henderson, Carrazza, & Woodward, 2015; Strabac & Listhaug 2008). However, research concerning the age group from three years is scarce. This is surprising as at this age, children are entering kindergartens, in which children are increasingly confronted with foreign cultures and different groups. Children acquire therefore, novel knowledge of both children and care givers of their in- and out-group.

One prominent and effective mechanism for cultural learning and knowledge acquisition is imitation (Whiten, 2005). Notably, imitation is influenced by both cognitive factors such as the function of imitation and social factors, such as the cultural group membership of the model that previously presented novel actions (Over & Carpenter, 2009; Uzgiris, 1981). The cultural group membership of a model is, among others, recognizable in his or her physical appearance, which provide cultural norms and values (Kinzler & Spelke, 2011). Chinese' physical appearance, for example, differs

compared to German's, and represents a culture that is orientated towards other values. The focus in Germany, for example, is on the individual and his or her own goals, whereas in China the well-being of the group is more important than the well-being of the individual (Hofstede, 1980).

In order to obtain assumptions of how the development of Germany towards a multicultural society might affect children's cultural learning, this dissertation investigates the influence of group membership, indicated by the physical appearance of a German and a Chinese model, on cultural learning, which is assessed through imitation, from an age of three years.

The introduction is therefore divided into four sections. The first part concentrates on group membership by summarizing theories, why groups are that important to humans. In addition, the in-group bias and its occurrence over the life span will be examined in more detail. The second section summarizes the development of imitation within infancy and childhood and provides an overview of existing theories concerning imitation. In addition, different functions of imitation are distinguished. The third section focuses on the connection of culture with group membership and imitation and provides an explanation of why the culture of Germany is contrasted to China's culture within this dissertation. The fourth section summarizes the aim of the dissertation and gives an outlook on the five studies and their research questions.

1 Group membership

Europe and Germany in particular has been affected by constant change of society for half a century. Since 1950, a swaying outward migration, i. e. the migration of the population across the country's border, has been observed. In the past, for example, political measures such as the recruitment of foreign workers around 1955 led to a steady change in immigration and emigration (see Figure 1; Statistisches Bundesamt, 2006). Especially in recent years there has been a steady increase in immigration, due to the high level of immigration of foreigners, including those seeking protection,

in 2015 and 2016, which has resulted in a population with a migration background reaching a new peak of 18,6 million people in 2016 (Destatis.de, 2018). A result of this increasing migration is the integration of people of different origins, with different languages and appearance within Germany. In 2015, for example, the German national soccer team consisted of Jérôme Boateng, whose father is Ghanaer, Sami Khedira, who is also a Tunisian citizen, Mesut Özil, whose grandparents came from the Black Sea coast, and Miroslav Klose, born in Poland (Giersberg, 2006). However, if the prerequisite of the national team is that all members have German's nationality, why are the players still differentiated according to their country of origin?

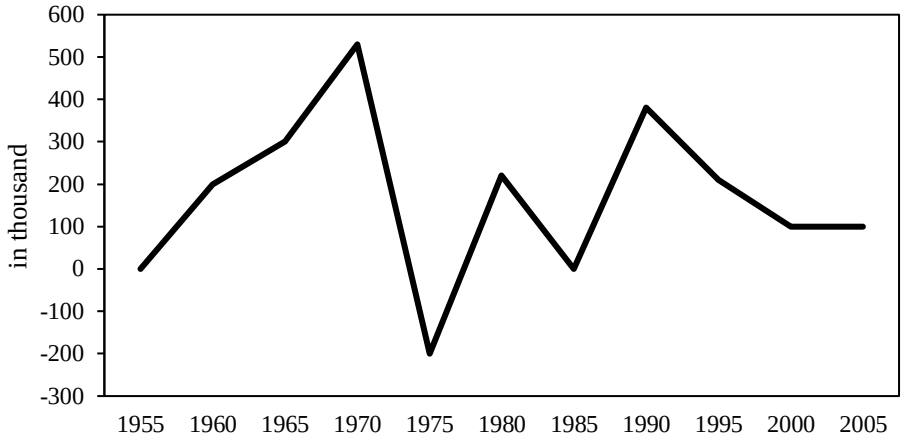


Figure 1. Illustration of the difference between emigration and immigration in the last century in Germany (adapted by Statistisches Bundesamt, 2006)

1.1 Why do we classify into groups?

Before we answer this question, we first have to understand why the need for group membership is a fundamental human need that is present in all cultures and societies. In ancient times the attachment to other people represented an evolutionary advantage necessary for survival (Baumeister & Leary, 1995). It was easier, for example, to farm or hunt in groups to ensure survival. Further, potential partners were introduced through groups and the education and care for children were assured. The evolutionary advantage of living in groups can be seen today, for example,

since nearly all cultures showed an inner motivation to establish relationships with other people and to prevent the dissolution of these relationships (Gardner, Pickett, & Brewer, 2000; Manstead, 1997). Furthermore, the perception of the world is considerably easier when individual people are grouped together (Lippmann, 1922). That is because a group consisting of two or more individuals is formed by social categorization processes and is based on common characteristics, i. e. age, gender or culture (Aronson et al., 2008). Based on these characteristics, group membership arises because individuals are interacting with each other over a certain time, pursue a common goal and perceive each other as one group (Schaefer, 1999).

As a consequence, groups have a certain homogeneity on which stereotypes are built. In turn, stereotypes lead to the assessment of a person's character based on his or her group membership. Therefore, less attention has to be paid to the person's behavior. Social groups and the resulting stereotypes therefore lead to a lower amount of information that has to be processed, since the behavior of the individual is not taken into account, and stereotypes increase knowledge about a person (see e.g. Sherman, Lee, Bessenoff, & Frost, 1998). Therefore, groups not only represent an evolutionary advantage in that they have secured our survival, but they also facilitate the social perception of other people.

However, do certain character traits lead to a suitable group or does the group membership determine, what character traits develop? According to the *Social Identity Theory* (SIT; Tajfel & Turner, 1979), a person's identity is the sum of his or her groups. One's own identity is therefore, defined by the characteristics of the groups to which someone belongs. This is supported, for example, by the finding that criticism of a group leaded to a decrease of the positive judgement of the self-concept of the participant who was assigned to that group (Gollwitzer, 1987; Gollwitzer, 1986; Gollwitzer & Wicklund, 1985). The *Uncertainty-Identity Theory* (Hogg, 2000; Hogg, 2007), a further development of SIT, explains the classification into groups by focusing on avoidance of uncertainty. Similar to the idea that group

membership simplifies the perception of the world (Lippmann, 1922), it is assumed that members of the groups to which we belong impart behavioral examples and norms that provide security and orientation in an insecure world. A number of experiments focusing on task uncertainty has supported this theory (Grieve & Hogg, 1999; Mulin & Hogg, 1999).

Taking together these ideas, groups offer protection, they provide information about their members, making them easier to understand and they are an essential part of a person's identity. Thus, the question, why the German national team subdivides players according to their country of origin, can be answered as follows: It is in the nature of human beings to think in terms of group membership.

1.2 The in-group bias: How does classifying groups influence behavior?

Since groups and group membership are an essential part in everyday life, it is reasonable that it influences behavior. One important consequence resulting from the need to belong to groups is the distinction between in-groups – referring to the group to which an individual belongs – , and out-groups – referring to a group to whom an individual does not belong (Brown, 2002) – on the basis of a variety of characteristics, for example age, gender or ethnicity (Aronson et al., 2008; Kinzler, Shutts, DeJesus, & Spelke, 2009). The distinction between the in- and out-group leads to the so-called *in-group-out-group* effect, also called *in-group bias*. This bias refers to the systematic tendency of each person to evaluate their own social groups and their members more positively than members of another social group (Aronson et al., 2008). The more positive evaluation of in-groups is expressed in a cognitive as well as behavioral in-group preference and out-group devaluation (Hewstone, Rubin, & Willis, 2002). The Social Identity Theory (Tajfel & Turner, 1979), explains this effect, for example, by the positive valuation of the identity, through an appreciation of the in-group by which the identity is defined, and a devaluation of the out-group.

Therefore, a positive intergroup social comparison (i.e. a superiority of the in-group), is achieved through the behavior of attributing positive characteristics to the in-group, but negative characteristics to the out-group.

Hence, the in-group bias guaranteed the creation and maintenance of a positive identity. This explanation has been supported by the finding that individuals cognitively devaluate a foreign group via stereotyping and behavioral discrimination processes, while cognitively revaluing the in-group by positive attitudes and affiliative behavior (Hewstone et al., 2002). To achieve in-group advantages in monetary outcomes adolescences even sacrificed personal gain and were more discriminatory as well as less fair towards the out-group (Turner, Brown, & Tajfel, 1979). The assumption that the need of a positive evaluation of the identity leads to a favor of the in-group should, according to the Uncertainty-Identity Theory, become especially apparent in uncertain situations, as self-uncertainty is a central motivation for identification with groups (Hogg, 2000; Hogg, 2007). Previous research found evidence supporting this assumption by showing an increase in in-group favor in situation with the societal concern of uncertainty avoidance (Fischer & Derham, 2016). These results are also interesting in terms of evolutionary approaches. The distribution of limited resources in favor of the in-group ensured, for example, the survival of the group (Baumeister & Leary, 1995).

However, even in today's society, the in-group bias can have significantly real-world implications. Studies have shown, for example, that social conditions such as the increase in unemployment, a potential precursor of experienced uncertainty, correlated with increased prejudice against Muslims in Europe (Strabac & Listhaug 2008).

In addition, the in-group bias does not only influence adults' and adolescence's opinion and behavior (Strabac & Listhaug, 2008; Turner et al., 1979). Children and even infants as well show the tendency to favor the in-group over an out-group (Bar-Haim, Ziv, Lamy, & Hodes, 2006; Buttelmann,

et al., 2013; Howard et al., 2015; Sangrigoli & De Schonen, 2004b). More specifically, the in-group bias is to be regarded as very stable and robust, replicable and consistent (Bettencourt, Charlton, Dorr, & Hume, 2001; Buhl 1999; Mullen, Brown, & Smith, 1992) and can be found from infancy to adulthood (Buttelmann et al., 2013; Howard et al. 2015; Strabac & Listhaug, 2008; Turner et al., 1979) as well as across different cultures (Fischer & Derham, 2016; Karp, Jin, Yamagishi, & Shinotsuka, 1993).

Connecting the current structural change of German society towards a multicultural society, as outlined above, to the stable and robust tendency of the in-group bias, it is apparent that the influence of cultural group membership is of great scientific interest. In this work, the focus lays on infancy and childhood since most individuals are the first time confronted with other groups and both the mechanisms and effects of a resulting in-group bias are still poorly understood. The in-group bias across infancy and childhood will be discussed in more detail below.

1.3 The in-group bias in infancy and early childhood

To investigate the influence of group membership in early infancy and childhood, the question arises how to indicate group membership and how to measure its influence on behavior. Traditionally, group membership is mainly indicated by age, gender and culture, and consequently, infants or children are either confronted with models of the same age and gender or with models of a different age and gender. To indicate cultural group membership, multiple approaches are used, which will be described more closely in the following section along with key findings about the in-group bias in infancy and childhood.

One approach is the habituation-dishabituation paradigm to discriminate between own-race and other-race faces (Bar-Haim et el., 2003; Katz & Downey, 2002; Sangrigoli & DeSchonen, 2004b). This paradigm is used to investigate infants' ability to discriminate between stimuli or different classes. For this purpose, infants are shown a series of stimuli until they

have become habituated. If a new stimulus (or a new stimulus class) is presented, which infants perceive as deviating, an orientation reaction occurs. This, for example, can be seen among other things in infants' behavior in an increased duration of infants' gaze of the stimulus material perceived as new.

The habituation-dishabituation paradigm can either be used to investigate whether infants are able to discriminate between single stimuli or to test their ability to discriminate between multiple stimuli, like different groups of people. Thus, infants' looking times indicate their behavioral reaction towards people with different group memberships. To indicate group membership, multiple studies used physical appearance by presenting photographs of White and Black people. Results revealed, that already three-month-old infants discriminate between photographs of people of their in-group and people of their out-group since they had longer looking times observing pictures of White people after the habituation phase (Bar-Haim et al., 2003; Sangrigoli & DeSchonen, 2004b). This result was also found for six-month-old infants (Katz & Downey, 2002; cited in Katz, 2003). According to the so-called *contact hypothesis* (Brigham & Malpass, 1985), the in-group bias in children's looking times is explained by infants' and children's greater expertise in recognizing own-race faces since they are confronted with them more often (Brigham & Barkowitz, 1978; Brigham & Malpass, 1985; Gauthier & Nelson, 2001; Malpass & Kravitz, 1969). This assumption was supported by findings showing that training and confrontation reduce or eliminate the bias in infants as well as in children (Elliott, Wills, & Goldstein, 1973; Goldstein & Chance, 1985; Lavrakas, Buri, & Mayzner, 1976; Li, Dunning, & Malpass, 1998; Sangrigoli & DeSchonen, 2004b).

Another approach to investigate the in-group bias is the imitation paradigm, which is mainly used between the age of 14-months and three years (e.g. Butelmann et al., 2013). In this paradigm, participants are confronted with either an in- or an out-group member presenting novel actions within a demonstrations phase. During the subsequent imitation phase, participants

are able to interact with the same objects as the models within the demonstration phase and correctly imitated action steps indicate children's learned behavior. Hence, this paradigm is used to compare whether novel actions have been copied more frequently or have been better learned by the presentation of an in-group or an out-group model. In addition, it is compared whether children adopt preferences of the in-group or the out-group model more often.

By using gender and age as a cue for group membership, previous research showed that 14-month-old infants imitated same-aged infants more frequently than older children or adults (Zmyj, Daum, Prinz, Nielsen, & Aschersleben, 2012) and three-year-old children tend to imitate preferences for activities and objects from children of the same gender (Shutts, Banaji, & Spelke, 2010). Between the ages of 14-months and three years only a few studies investigate a cultural in-group bias. Here, language was mainly used as a cue for group membership. Results revealed, that 14-month-old infants imitated actions of the in-group more often after a live presentation of linguistic in- and out-group models (Buttelmann et al., 2013). The same result was found for 19-month-old and three-year-old children for video presentations of linguistic in- and out-group models (Howard et al., 2015). One influencing explanation for the in-group bias in imitation is that imitation is an important mechanism for the faithful transmission of cultural knowledge across groups and generations (Hopper, Flynn, Wood, & Whiten, 2010; Whiten, 2005). Thus, children are imitating members of their in-group more frequently to get in contact with them to acquire novel behavior and knowledge that is relevant to them (Over & Carpenter, 2009).

Regarding the ages between three and four years, however, studies are scarce that investigated the cultural in-group bias. Only one study showed that four- but not five-year-olds did not show any behavior that contrasted with the behavior of an out-group (Oostenbroeck & Over, 2015). At the age of five-years, however, many studies exist investigating the in-group bias by using language or accent to indicate group membership. To measure its influence on children's behavior various forms of a preferences paradigm

were used. Children were confronted with different models presented on video or on photographs that were coupled with voice records. Subsequent, children were asked for their preference towards a model by asking, for example, for a friendship choice. Results revealed, that children at the age of five- to six-years preferred members of their cultural in-group (Kinzler, Dupoux, & Spelke, 2007; Kinzler et al., 2009; Kinzler & Spelke, 2011). As outlined above, the in-group bias is a robust effect that influences behavior from infancy to childhood. However, studies that are covering the age range from three years are scarce. This is particularly surprising in terms of a cultural in-group bias, as three-year-old children attend kindergarten. In comparison to home care or small groups of childminders before the age of three years, children are very likely to be confronted with people of a foreign culture within kindergarten. Although, there are studies starting at the age of five years that document an in-group bias for preference, it is questionable whether *preference* for a toy or a certain person can be used to make statements about how the in-group bias influences children's cultural learning. As mentioned before, the imitation paradigm would be more appropriate as *imitation* is an important mechanism for the transfer of cultural knowledge (Hopper et al., 2010; Whiten, 2005).

In order to be able to make statements about how the current structural change of German society towards a multicultural society could affect the learning of today's children, the investigation of group membership in connection with imitation seems promising. The age group of three to six years in particular should be taken into account, as contact with foreign cultures increases at this age. In addition, the question arises which cue is appropriate to indicate group membership. Results of one study that compared the influence of the physical appearance and accent revealed that five-year-old children used accent but not physical appearance to guide their social preferences if these two cues were contrasted to each other (Kinzler et al., 2009). Authors assumed that, based on an evolutionary approach, social groups in ancient times likely differed in accent, but not in

race. Children therefore may be predisposed to rely primarily on accent to guide their social preferences towards unknown individuals.

However, in a multicultural society, during a walk through the city, for example, children first of all perceive a person's physical appearance before they hear them speak. The physical appearance is therefore a cue that is close to the children's everyday life. Nevertheless, a comparison of the two cues is also necessary, since linguistic interaction is normal within kindergarten.

Hence, the aim of this dissertation is to investigate the influence of group membership, which is to be indicated primarily based on a person's physical appearance, on the cultural learning of children from the age of three years. Since children's cultural learning is to be assessed through imitation, the second major section of the introduction deals in more detail with the construct of imitation. The description of theoretical approaches and different functions of imitation is intended to show similarities between group membership and imitation on which research questions of the five studies of this dissertation will then be derived.

2 Infant's and children's imitation

Imitation is an effective mechanism for interacting with others and acquiring new behaviors (Uzgiris, 1981). Therefore, it is especially important for preverbal infants and young children to get in contact with their caregivers. However, different constructs of imitation exists that have to be separated from each other to clarify what is meant by imitation. Furthermore, infants are not in a condition to show imitation in a fully developed form directly after birth. In the course of their infancy and childhood, they process various stages until the ability to imitate is fully developed (e.g. Piaget, 1962). Further, various theories exist trying to explain what cognitive and social mechanisms are associated with imitation. Thus, these aspects of imitation will be discussed in the following section.

2.1 What is imitation and what is not?

Although imitation has proved to be an important mechanism in the transmission of cultural knowledge (Hopper et al., 2010; Whiten, 2005), there is no universally accepted definition of this construct. For the current work though, the construct "imitation" must first be defined and differentiated from related constructs based on existing definitions.

A first and very broad definition described imitation as an ability to learn from observation and to perform the observed action afterwards (Thorndike, 1898). Previous research has remained largely true to this assumption that imitation consisted of copying behaviors previously presented by other people (Barr, Dowden, & Hayne, 1996; Byrne & Russon, 1998; Ray & Heyes, 2011).

Over time, however, this definition became extended. One important extension included by the *novelty* of the observed and copied behavior (Byrne & Russon, 1998), taking up considerations from Meltzoff (1988b). Behavior and actions were only considered as novel if they met one of six different criteria: the imitator's behavior 1) has never been perceived before, 2) has never been shown before, 3) has not been present in infants' daily repertoire of behavior, 4) has never been imitated before, 5) has never been shown with a certain object or if 6) is not spontaneously shown in free play. Thus, imitation was not only the pure copying of a behavior (Thorndike, 1898), but the copied behavior had to be novel in terms of the described criteria (Byrne & Russon, 1998).

Another influencing extension was made by Tomasello (1999) by including the model's *intention*. Thus, behavior was understood as imitation only if the imitator chooses the same means based on the similar intention and thereby achieves the same goal as another person, the so-called model. This is illustrated by an example: A basketball player is observed throwing a ball into a basketball hoop with his left hand. To imitate the presented behavior correctly, the observer had to use his or her left hand (means) to throw the ball (intention) within the basket (goal). Thus, imitation consisted of the

copying of the model's novel behavior including the same means, intentions and goals (Elsner, 2004).

Based on the definition by Tomasello (1999), related constructs can be derived which, however, are not included by the term "imitation" as they not include the model's intention. If the imitator, for example, only copied the model's means but not its goal, the behavior is called *mimicry* but not imitation. Thus, the intention of the model is irrelevant because the means are not used to achieve the goal. If the imitator, however, achieves the same goal as the model but used different means, then it is called *emulation*. Through emulation, observing another person teaches the imitator how to use an object. However, the imitator does not use this knowledge to copy the model's intention, but to pursue own goals and thus own intentions.

A further distinction to imitation is the concept of *overimitation* and describes the tendency to imitate actions that are not necessary to achieve the same goal as the model and therefore causally irrelevant (e.g. Lyon, Young, & Keil, 2007). Thus, the imitator's intention is not to achieve the same goal as the model, but rather the imitation of the model itself (Over & Carpenter, 2009).

Since there is no universally accepted definition of the term "imitation" and in order to include any behavior that can be understood as imitation, a broader definition of imitation is used for the present dissertation, which is also common in current research (e.g. Elsner, 2004). Imitation is understood as reproducing any novel behavior, more precisely, any novel action that has been presented by another person, a so-called model. The novelty value of the action is considered as fulfilled if that action has never been performed with the objects used within the studies of the dissertation and if it has never been imitated before.

Since this can only be assumed, but not verified, it is also to be controlled experimentally by establishing a baseline within the studies that the actions are not shown spontaneously in free play. By including novelty of the actions, experimentally tested by a baseline, it can be assumed that

participants understand the actions as culturally relevant knowledge since they are presented by two models which differ in their culture. Hence, imitation is used to test whether children copy and learn relevant behavior.

2.2 How does the ability to imitate develop?

The development of the ability to imitate is summarized briefly from infancy to adulthood based on Piaget's *Cognitive Theory* (1962) by classifying milestones of this ability into children's development. This theory is critically examined on the basis of current research. In this way, the level of development of the ability of imitation from the age of three years can be evaluated in a well-founded way, which helps to better understand the influence of group membership on imitation at this age.

Substantial imitation abilities extend over the first years of infancy and childhood. However, it remains unclear whether imitation is a more innate or learned ability (Morgan, 1896; McDougall, 1908). An innate ability is evidenced by findings showing that newborns as young as 12-21 days of age (Meltzoff & Moore, 1977) and even newborns that were only a few minutes old have the ability to copy gestures, e.g. stretching out the tongue (Reissland, 1988).

Representatives of the opinion that imitation is a learned ability, interpreted this behavior less than imitation but rather as a reflex-like matching, which is triggered by observing the very same behavior decreasing with age (Ainsfeld, 1991). This, for example, promotes the social interaction that is important in infancy (Ainsfeld, 1991). However, the reflex-like matching is assumed to disappears after a certain time and has to be learned again later, similar to the grasp reflex consisting of flexion-adduction of the fingers and elicited by a contact stimulus to the palm, that emerges between the 1st – 3rd month of life (Twitchell, 1965). Current findings speak in favor of the latter position, as they could show that behaviors such as e.g. the stretching out of the tongue, were not shown more frequently than on random level of newborns aged from one to nine weeks.

They explained the contradictory findings of Meltzoff and Moore (1977), for example, by errors in the experimental setup (Oostenbroek et al., 2016). This research question remains unanswered to this day and thus, it is still a highly discussed research question today.

Table 1. The development of the ability to imitate based on Piaget's (1962) Social-Cognitive Theory (adapted from Elsner, 2004).

Phase	Age	Ability to imitate	Example
I	1. month	Absence of imitation	Reflex-like matching of behavior
II	1.-4. months	Sporadic imitation	Simple gestures with hands
III	4.-8. months	Systematic imitation	Familiar and visible gestures, like clapping
IV	8.-12. months	Systematic imitation	Familiar and invisible gestures, like facial expressions
V	12.-18. months	Systematic imitation	Unfamiliar and invisible gestures, like pulling the ear
VI	18.-24. months	Delayed imitation	Imitation based on mental representations

A representative of the opinion that imitation is an ability learned is Jean Piaget whose Cognitive Theory (Piaget, 1962) had a significant impact on the conception of the development of imitation. He postulated six consecutive developmental stages in which imitation behavior is learned within infants' first two years of life. The different stages are illustrated within Table 1 and summarize the development from the preparation of imitation through reflexes in the first few months of life to the ability to delayed imitation in the absence of a model at the age of two years.

However, Piaget's Cognitive Theory (1962) was criticized, among other aspects, because he did not include important developmental steps, like the ability to imitate rationally (Damm, Petermann, & Petermann, 2011) describing that infants selectively regulate their imitational behavior depending on their anticipation of effects and goals. If the pressing of a button, for example, was followed by a sound, 9-month-old infants rather imitated this action than if there was no effect (Hauf & Aschersleben, 2008). Multiple research found evidence that this selectively regulation develops during the first and second year of life (Gergely, Bekkering, & Király, 2002;

Schwier, Van Maanen, Carpenter, & Tomasello, 2006; Zmyj, Daum, & Aschersleben, 2009).

Based on this selectivity, authors assumed imitation to be a selective process and not a simple repetition of previously learned behavior (Gergely et al., 2002). This selectivity is also reflected in the influence of group membership on imitation. Infants therefore imitated the behavior of an in-group model more frequently compared to actions of an out-group model (Buttelmann et al., 2013; Howard et al., 2015).

A further critical point of the Cognitive Theory (Piaget, 1962) refers to the indications of the infant's age, as they were no longer applicable according to today's knowledge. Barr et al. (1996) showed, for example, that children imitated actions after a delay of 24 hours at the age of six months if they had enough time to interact with the object. This finding was replicated for delayed imitation within 9-month-old infants (Meltzoff, 1988a) and for 14- and 16- months- old infants even with a delay of two or four months (Meltzoff, 1995). In addition, Klein and Meltzoff (1999), who tested twelfe-month-olds after a delay of three minutes, one and four weeks, showed that the imitational performance declined within the first week and then stabilized at the same level after four weeks. Thus, infants were able to imitate after delay but with reductions between sessions.

However, at the age of two- years, children were able to imitate after a delay of 24 hours without any significant reduction in imitational performance (Meltzoff, 1985). Furthermore, the same result was found for three- and four-year-old children (Simpson & Riggs, 2011). Based on this research, it can be assumed, that delayed imitation seems to be a continuous and age-related developmental process that occurs at the age of six months, and thus, much earlier than it was postulated by Piaget's Cognitive Theory (1962).

More interestingly, this process continues as imitational skills improve until children are able to perform delayed imitation at different levels of delay without reduction in their performance at the age of three- and four-years

(Hayne, 2004; Hayne, Boniface, & Barr, 2000; Richmond & Nelson, 2007). This can be explained, for example, by the development of cognitive resources that enable children to store familiar information better then less familiar information (Case, 1985). In contrast to Piaget's (1962) assumption, the development of the ability to copy others continues into adulthood. Adults, for example, showed nonconscious mimicry of behavior of posture and movements of others in adults (Chartrand & Bargh, 1999). However, research investigating adults' compared to children's imitational performance provide contradictory results. Research that compared over all imitational performance of children and adults found evidence showing less imitational performance of adults (Horowitz, 2003). Though, when presenting novel actions for multiple times (Custance, Prato-Previde, Spiezio, Rigamonti, & Poli, 2006) or using irrelevant actions (McGuigan, Makinson, & Whiten, 2011), adults showed higher imitation scores compared to four- and five-year-old children. Even though there are only a few studies on imitation in adulthood, we can assume on the basis of motor and cognitive developmental processes that the ability to imitate is refined and improved even after childhood. Thus, motoric abilities, for example, improve steadily until young adulthood, but decrease again after a maximum point and then stagnate until the age of 65 - 69 years and then decreases again (Willimczik, Voelcker-Rehage, & Wiertz, 2006). The same applies to cognitive abilities (Lindenberger & Kray, 2005). Since imitation includes both motor and cognitive abilities, it can be assumed that the ability to imitate also improves steadily until adulthood.

To sum up, it can be assumed that the development of the ability to imitate extends from birth to adulthood. Substantial imitation abilities, however, develop over the first years of infancy and childhood. To investigate the influence of group membership on imitation it is therefore advisable to focus on an age of three years. At the age of three years, children are able to imitate selectively (Gergely et al., 2002; Schwier et al., 2006; Zmyj et al., 2009) and have more developed cognitive resources compared to infancy (Case, 1985). Hence, some explanations the increased imitation of one

model can be ruled out for the age of three years, for example infants' underdeveloped cognitive resources (Buttelmann et al., 2013). Further explanations for the connection between group membership and imitation can be found in theories that explain why we are able to imitate. These are described in the next section.

2.3 What makes us imitators?

Similar to the theoretical approaches of group membership including both social, as well as cognitive factors as a reason for affiliative behavior towards groups, these two aspects are also important for imitation. While Piaget (1962) focused mainly on the cognitive aspect, Bandura's *Social Cognitive Theory* (1986), the well-known theory of imitation, integrates both cognitive and social reasons for imitation. The basic principle of this theory is learning by observation of other people's behavior and its consequences. Bandura (1986) postulates two phases, the so-called acquisition and performance.

The acquisition consists of directing attention to the relevant stimulus, e. g. a novel behavior, and of storing the observed behavior by the retention of the observed action in infants' memory in symbolic form. Hence, both attention and storing is influenced by the model's, i. e. whether the model is presented live or on video, and observer's characteristics, e. g. cognitive abilities, and by the similarity between observer and model. During the second postulated phase of performance, the observed concepts for one's own behavior are applied. In this so-called motoric reproduction process, which takes place on a cognitive level, already known reaction components are combined into new patterns. Thus, the symbolic form of the action is converted in an appropriate action. Further, motivational factors are considered in the last phase, the execution phase. In this final step, the combination of affirmation type, for example external reinforcement or self-confirmation, as well as individual factors such as preferences, determines which behavior of the model is finally imitated.

Evidence for this theory can be found in multiple experiments showing that four-year-old children imitated previously presented aggressive behavior less if the model was punished for aggressive behavior. However, if the children were rewarded for imitating aggressive behavior, all children of the experiment imitated equally frequent (Bandura, 1965). Thus, authors assumed that reinforcement is not necessary for learning new behaviors, but that the expectation of reinforcement plays an essential role in performance (Bandura, 1965).

In his Social Cognitive Theory, Bandura (1965) postulates three central aspects, that are also reflected in other theories that explain imitation itself as well as factors influencing imitation. The first central aspect is the differentiation between perception of an action and performance and their presentation in symbolic form within memory. This aspect is included within the *Common Coding* approach (Prinz, 1990) that claims that observation of an action leads to a sensory code of the event which processes to an event code. This event code activates an action code which is available within representation of the event code and enables the automatically translation of the sensory code to a motor code. This motor code leads to an action of the organism respectively a response to the event. Thus, both perception and performance of an action are presented together on a common representation.

On a neuronal level, the so-called *mirror neurons* are supporting the idea of a common representation. These neurons were first found in the macaques' brain within the pre-motor cortex. Studies with primates showed that mirror neurons fired both when the monkey itself showed a specific action, and when he observed the experimenter performing that action (Rizzolatti, Fadiga, Gallese, & Fogassi, 1996).

More interestingly, there is evidence for mirror neurons in the human brain as well (Iacoboni, Molnar-Suakacs, Gallese, Buccino, Mazziotta, & Rizzolatti, 2005). By using imaging techniques, for example, evidence was found on neuronal level showing a reaction of mirror neurons already in six-month-

old infants (Nyström, 2008; Shimada & Hiraki, 2006) as well as on a behavioral level showing that observation is sufficient to imitate successfully (e.g. Abravanel, 1991). Thus, the Common Coding approach (Prinz, 1990) offers an explanatory model that can be used to explain imitation through a common representation of observation and performance – aspects, which were already integrated within Bandura's Social Cognitive Theory (1965).

A second central aspect of this theory is the influence of the model's characteristics which affect children's attention. The importance of the model is also reflected in the *Natural Pedagogy* (Csibra & Gergely, 2009) that focuses on social factors that trigger imitative behavior. Natural Pedagogy is a communication system that enables rapid and efficient social learning about cultural knowledge by reacting particularly sensitively to so-called ostensive cues. Ostensive cues signalize an opportunity for communication and at the same time identify the addressees of this communication, for example, with a direct gaze which lead to mutual eye contact with the addressee (Farroni, Csibra, Simion, & Johnson, 2006). In doing so, ostensive cues refer to expectations within the addressees (Csibra & Volein, 2009). Further, in an ostensive context, the information provided by a model is understood as rather generic than individualistic (Egyed, Király, Krekó, Kupán, & Gergely, 2007). Thus, within an ostensive context, infants expect to receive generalizable knowledge instead of learning about the 'here-and-now' (Csibra & Gergely, 2009). If a behavior is therefore supported by ostensive cues, infants assumed its importance and value for his or her own social and cultural repertoire of behavior. If infants however did not perceive himself or herself as the addressee, it is unlikely that he or she would pay attention to the presented behavior to imitate it afterwards. The use of ostensive cues is therefore particularly useful in terms of cultural learning. When investigating the influence of model's group membership on imitation these cues must be used consistently across both models to control their influence on this relationship.

The third central aspect of Bandura's Social Cognitive Theory (1986) implied that imitation is influenced by cognitive aspects that are consistent over time, such as the cognitive ability of children. Additionally, social characteristics of the situation (i.e. aspects that can vary from one situation to another), such as the subsequent reaction to a model's behavior, are important for imitation (Bandura, 1965). This idea is also reflected in the so-called "cultural transmission biases" (Boyd & Richerson, 1985; Rendell, Fogarty, Hoppitt, Morgan, Webster, & Laland., 2011). This assumes that cultural transmission is influenced by, both characteristics of the model, i. e. characteristics that remain the stable over time, (Buttelmann et al., 2013; Cook & Smothergill, 1973; Garrett & Cunningham, 1974; Zmyj, Buttelmann, Carpenter, & Daum, 2010; see Wood, Kendal, & Flynn, 2013, for a review) as well as by the situation, i. e. aspects that can vary over time. What does it mean when this theory is applied to the aim of the dissertation – or more specifically, to indicate group membership by the model's physical appearance and investigate its influence on imitation?

Following these assumptions, it is very likely that the physical appearance of the model, which is stable over time, as well as varying aspects of the situation, such as available resources (Buttelmann et al., 2013), have an influence on the cultural learning of children. Since imitation is an important mechanism for cultural transmission (Hopper et al., 2010; Whiten, 2005), children's imitative performance should vary in dependence of both the social respectively varying aspects as well as the cognitive respectively stable aspects.

Based on these theories of imitation, influencing factors on imitation, such as ostensive cues (Csibra & Gergely, 2009), can be identified and thus be considered in the conceptualization of studies and interpretations of results. Furthermore, the differentiation according to social and cognitive aspects provides explanations for possible differences in imitation behavior caused by the model's cultural group membership. The distinction between social and cognitive aspects is, however, not only reflected in theories of

imitation but also in the function of imitation. The following section briefly examines this aspect and explains its relevance for the dissertation.

2.4 Why do we imitate?

Uzgiris (1981) postulated that infants and children are imitating for both cognitive and social functions. The cognitive function serves to acquire novel behavior and skills. This is in line with Piaget (1975) who considered the ability to imitate to be an opportunity for children's exploration of the environment, which promotes their development of knowledge and cognitive abilities. Imitation leads to changes in existing memory structures; the so-called accommodation processes (Piaget, 1975). Hence, the ability to imitate enables the acquisition of cognitive knowledge and skills (Elsner, 2004). This assumption is supported by findings showing that infants acquired one or two new behaviors through imitation every day (e.g. Barr & Hayne, 2003).

However, children did not imitate automatically and uncontrollably, but actively and selectively depending on whether imitation of a model or behavior promoted their cognitive development (Meltzoff & Williamson, 2010). Fourteen-month-old infants, for example, imitated models that were more competent, more frequently than incompetent models (Zmyj et al., 2010). By contrast, the social function of imitation contributes to the development of social and communication skills such as play behavior, shared attention and language (Rogers & Pennington, 1991). Sixteen and 29-month-olds, for example, included affective gestures of others in their own social and communicative repertoire (Kuczynski, Zahn-Waxler, & Radke-Yarrow, 1987). Furthermore, 12- and 18-month-olds preferred to imitate human rather than mechanical models (Slaughter & Corbett, 2007) and socially desirable compared to socially undesirable actions (Repacholi, Meltzoff & Olsen, 2008).

The social function of imitation is further reflected given the fact that imitation promotes the development of empathy (Iacoboni, 2009) and the

ability to attribute mental states, the so-called Theory of Mind (Meltzoff & Decety, 2003). One explanation for the social function of imitation is the human basic need to belong to others. This basic need is reflected in the construct of affiliation and describes any social approach of a person that allows the creation and maintenance of positive affective relationships with others (Baumeister & Leary, 1995; Leroy, Christophe, Delelis, Corbeil, & Nandrino, 2011; Youngleson, 1973). From birth, infants have mechanisms, for example preverbal screaming or crying, to express their need for closeness and care (Berk, 2011). As their motor and cognitive abilities grow, children use behaviors such as physical approach (Stewart, 1983), or eye contact (Robson, Pedersen, & Moss, 1969). Imitation is therefore as well a very effective mechanism for taking up social interactions with others (Uzgiris, 1981). Thus, it is assumed that children show imitative behavior to affiliate with others to satisfy their need to belong (e. g. Over & Carpenter, 2009).

However, if children imitate in order to acquire novel behavior *and* affiliate with others (Uzgiris, 1981), the question arises under which circumstances one of the two functions is prioritized for imitation? In cognitively less demanding situations, for example, when a model performed a one-piece, rather than a complex, multipart action, children focused on imitating the model rather than on the model's action, as they focused on in complex situations. Thus, imitation served to convey a similarity and a shared understanding between children and model, enabling the creation of a social interaction between them (Uzgiris, 1981). However, not only the complexity but also the familiarity of an action influences the function of imitation. Fourteen-month-old infants imitated a familiar action more frequently after the presentation of peers whereas unfamiliar actions were imitated more frequently after they were presented by adults. The imitation of familiar actions therefore, promoted the affiliation with peers and thus, infants imitated based on the social function of imitation. However, if they perceived the opportunity to promote their knowledge by imitating and

learning a novel action of older children or adults, infants imitated based on the cognitive function of imitation (Zmyj et al., 2012).

If we transfer the two functions to the cultural context of the dissertation, several considerations can be derived from it: On the one hand, the preferential imitation of a model does not allow any conclusion regarding the underlying function of the imitation. This is also supported by the fact that children are not necessarily aware of the current predominant function of their imitation (Zmyj, 2009). On the other hand, the function of imitation could influence the connection between group membership and imitation. As described above, imitation is influenced both by stable, invariable characteristics, such as the appearance of a model, as well as by variable characteristics of the situation. These include the function of imitation. If children therefore have the primary goal of acquiring new knowledge in one situation and the affiliation with others in another situation, the imitation behavior could be different. For this reason, the function of imitation must be taken into account when conceptualizing the studies and interpreting the results.

Before exactly this conceptualization is elaborated in the outline of this dissertation, the last open question is to be answered beforehand. Until now, it has been summarized that cultural group membership will be indicated by the model's physical appearance. Further, imitation is used to measure children's cultural learning. However, it has not yet been clarified which two cultures are appropriate for this purpose.

3 Group membership, imitation and culture

As outlined above, the physical appearance was used before within studies investigating the influence of group membership on behavior in infancy. Well-negotiable differences were used, such as a White and a Black skin color (see e. g. Bar-Haim et al., 2003). Since the targeted age group in this dissertation is further developed regarding their cognitive structures (Case, 1985), it can be assumed that less pronounced differences in appearance

are as well appropriate to indicate a culture group membership. Thus, the selection of two cultures can be determined less by the implementation, i. e. the appearance of the models, than by differences in the culture itself. The definition of culture that this dissertation is based on both aspects, (1) the culture of the group and (2) the physical appearance, which is associated with the culture.

Culture refers to a group of people who share a certain system of rules and habits that guide people's coexistence and behavior (Helman, 1984). The concept of culture is further extended by the concept of race. Thus, it also includes the physical appearance as well as the country of origin of the members of this group (Gannett, 2013). Hofstede (1980) has defined different categories according to which the system of rules and habits that guide people's coexistence and behavior can be divided into, like the differentiation between individualistic and collectivistic cultures. *Individualistic cultures,* for example, tend to be independent of others and to decide on their own. Western societies are often individualistically oriented cultures. *Collectivist cultures*, in contrast, consider the group as more important than the individual. This is shown, for example, by the fact that the need for harmony is particularly pronounced and conflicts are avoided. This collectivist orientation is often found in Asian countries. As summarized at the beginning of the dissertation, the transition to a multicultural society is currently taking place in Europe and especially in Germany. For this reason, a German model is chosen as the representative of an individualistically and western-oriented country. Based on previous literature, China was chosen as an appropriate model of a collectivist and non-Western culture (Fiske, Kitayama, Markus, & Nisbett, 1998; Markus & Kitayama ,1991; Nisbett, Peng, Choi, & Norenzayan, 2001; Triandis, 1972, 1995; Wang, 2004). These models also differ noticeably in their physical appearance and are therefore appropriate to indicate group membership of two different cultures without the use of language.

Another advantage of selecting China as a contrast to Germany is that previous studies have shown that a collectivist culture influences children’s

imitational behavior in another way than individualistic cultures. Thus, Chinese and American preschoolers do not differ in imitating an inefficient action after a model had previously presented it. However, if a group of models presents the inefficient action as a consens, Chinese preschoolers imitate them more often than American children (DiYanni, Corriveau, Kurkul, Nasrini, & Nini, 2015; Corriveau, DiYanni, Clegg, Min, Chin, & Nasrini, 2017). This could be due to the fact that the group itself is more important in collectivist cultures than in individualistic cultures. Thus, if a group does not behave in a self-worthy manner, members of individualistic cultures reject them more easily. In collective cultures, however, the group is supported even if this leads to individual costs (Triandis, Bontempo, Villareal, Asai, & Lucca, 1988). Accordingly, the influence of group membership on imitation in both cultures could be different. Since group membership is more important in collectivist cultures, Chinese children might imitate the actions of a Chinese model more often than German children might imitate those of a German model.

This dissertation therefore selects a German and a Chinese model to indicate group membership based on the model's physical appearance. Interesting research questions can be provided by this combination. These questions can be further investigates in the context of group membership and imitation. The specific research questions of this dissertation and the conceptual design of the studies are summarized within the next section.

4 Outline of the dissertation

The preceding review of the existing literature has provided evidence that children's imitation is influence by the model's group membership. However, several open questions arose. First, group membership was increasingly indicated by language. In a multicultural society, children are confronted with people from other cultures without necessarily hearing their language but perceive their physical appearance. Second, studies investigating group membership often chose groups with the same cultural

background. Especially with regard to cultural learning, however, the culture of the group should be included as an influencing factor. Third, research investigating the influence of group membership on cultural learning at the age of three years is scarce. However, this age should be of particular interest, as children of this age are exposed to other cultures more often due to the change to new care situations that include larger groups. Fourth, the studies that tested three-year-old children investigated the influence of group membership on preferences for models. Preference, however, does not provide information on children's cultural learning. In contrast, as imitation has been proven to be a valid instrument to measure culture learning (Whiten, 2005), the dissertation aims to investigate the influence of group membership indicated by the physical appearance of a Chinese and German model on cultural learning, which will be assessed through *imitation*, from the age of three years on.

To investigate these influences, five studies were conducted. In the **first study**, we investigated whether the model's group membership influences children's imitational performance. Since there is evidence for an influence of group membership on preference at the age of four years (Kinzler, Corriveaux, & Harris, 2011), we investigated whether four-year-old children were influenced by the model's physical appearance and thus, measured their imitational performance after observing an in-group, thus Caucasian, and an out-group, thus Asian, model. In the **second study**, we focused on the comparison between the influence of language versus physical appearance as well as the labeling of model's home country as a cue for group membership. By orientated on previous literature, the age range was extended to six-year-olds (e. g. Buttelmann & Böhm, 2014). In the **third study**, we aimed to answer the research question of whether culture has an impact on the influence of group membership on imitation. For this purpose, three- and four-year-old children were tested in China and Germany. We were also interested in long-term effects of group membership on cultural learning and therefore tested children before and after a one-week delay. The **fourth study** was based on the research

question which underlying mechanism influences the connection between group membership on imitation by orientating on the fact that both group membership and imitation are attributed to the human need to affiliate with others (Baumeister & Leary, 1995; Over & Carpenter, 2009). For this reason, we strengthened the need to affiliate by confronting children with third-party ostracism. By testing three- to four-year-old children with third-party-ostracism, we are able to enlarge the field of research that concentrated on first-party-ostracism within five- to six-year-old children (Watson-Jones et al., 2016). The **fifth study** aimed to answer the research question how the relevance of action affects the cultural learning through different group members. We oriented on previous literature and adapted a design by Hoehl, Zettersten. Schleihauf, Grätz, & Pauen (2014) which was extended by including the model's group membership. Thus, six-year-old children's imitational performance of relevant and irrelevant actions was compared in dependence of the model that had previously presented these actions.

B Study 1: Krieger, Möller, Zmyj, & Aschersleben, 2016

Tom Is Not More Likely to Imitate Lisa Than Ying: The Influence of a Model's Race Indicated by Physical Appearance on Children's Imitation

1 Introduction

Adults differentiate between individuals who belong to their own group (i.e., people with the same race) and individuals who belong to a different group (i.e., people with another racial background). As a consequence, social interaction between individuals is influenced by this discrimination in such ways that either benevolent behavior (i.e., helping each other), or malevolent behavior (i.e., social isolation) can occur (Fiske, 1992; Ruys, Spears, Gordijn, & Vries, 2007; Trötschel, Hüffmeier, & Loschelder, 2010). Thus, it is important to learn more about the origins of this effect and to investigate the differentiation between in-group and out-group members in children. It has been shown that preschoolers are able to differentiate between in-group and out-group members when spoken language was used as a cue for group membership (Kinzler et al., 2009)). In this study, it has been shown that other-race children were chosen to be friends with but only when they had the same accent as the participants indicating the important role of language (Kinzler et al., 2009). Moreover, group membership has been reported to influence children's effort to distinguish from out-group members. Five-year-olds were randomly assigned to one of two groups (i.e. the yellow group) and observed members of another group (i.e., the green group) presenting an action. Compared to a third neutral group, children produced more contrasting actions than actions, which matched those of the out-group (Oostenbroek & Over, 2015). Even infants are able to differentiate between in-group and out-group members. Already by the age of three months, infants not only preferred faces of their own race over faces of another race, but also showed an improved recognition of faces of their own race (Bar-Haim et al., 2006; Sangrigoli & De Schonen,

2004b). Furthermore, 10-months-old infants selectively preferred toys that were offered by an in-group member speaking their language without an accent compared to toys, which were offered by an out-group member, who had an unfamiliar accent (Kinzler et al., 2007). Similarly, 14-month-old children imitated actions of a model that spoke their language more often than actions of a model talking in a foreign language (Buttelmann et al., 2013). A similar effect was also found in three-year-old children. They imitated the actions of a linguistic in-group model more often than the actions of a linguistic out-group model (Howard et al., 2015). Thus, there is ample evidence that language is an important factor influencing the in-group-out-group effect. It is yet unclear whether children show the same selectivity in their behavior when language is not available as a cue for group membership.

Imitative behavior is not only influenced by a model's group membership but also by the presentation mode. When infants observe an action, they imitate less action steps when they observed a model on TV as compared to when they observed a real-life model (Barr & Hayne, 1999). This so-called video deficit effect (Anderson & Pempek, 2005) has been documented in a variety of studies. Research has shown that up to the age of three years children imitated more actions in live presentation than in video presentation conditions. Two-year-olds had difficulties to draw information from a video presentation to adapt their behavior in reality accordingly (Schmitt & Anderson, 2002). However, from three years onwards children learn from video and live presentations likewise, and thus do not show the video deficit anymore (Howard et al., 2015; Troseth & Deloache, 1998; Troseth, Saylor, & Archer, 2006, for an exception see Reiß, Becker, & Krist, 2014).

The aim of the present study was to investigate whether group membership indicated by physical appearance of the model influences four-year-olds' imitative behavior. For that, we constructed four novel tasks with different three-step actions. Both a Chinese and a German model presented these novel actions, which children could imitate afterwards. Additionally, we

also investigated the role of the presentation mode. In the video condition, German preschoolers observed a German and a Chinese model that presented novel, manual actions on objects in two blocks. In the first block, children saw either the German or the Chinese model presenting the actions. In the second block, children watched the other model presenting the same actions again. After each action, children were allowed to play with the objects. In the live condition, children observed only the German model in both the first and the second block.

We expected children to imitate the in-group model more likely than the out-group model. No difference between live and video presentation was expected because at the age of four children should have overcome the video deficit. Finally, we expected that children imitated more target actions after the second than after the first presentation.

2 Method

2.1 Participants

The final sample consisted of 48 German children (*M* = 4;5 (years; months); range = 3;9-5;0). Additional four children were tested but not included in the final sample due to procedural errors. Children were randomly assigned to two experimental groups (live presentation, *n* = 24; video presentation, *n* = 24). Parents were recruited by telephone from a list of families who had earlier expressed interest in volunteering for research on child development. They received a recompense for travel expenses and children were given a small gift and a certificate for participating. This have been conducted in accordance with ethical guidelines and received ethical clearance by the ethics committee of the medical association of Saarland University.

2.2 Material

There were four manual tasks. Each task consisted of three wooden building bricks, which were purpose-built (see Figure 2). The first task, named the bridge, consisted of one blue block [9 cm (length) x 4.5 cm (width) x 4.5 cm (height)], one red rectangular prism (6 x 10 x 4.5 cm) and one blue ball (diameter = 3.3 cm). The red prism and the blue block had yellow millings on each side. The second task, called the bookend, consisted of a red L-shaped object (6 x 7 x 10.5 cm), a yellow flat building brick (1.5 x 11.5 x 5.9 cm) and a blue rectangular prism (4.5 x 9 x 4.5 cm). The third task, named the rod, was made up of a rod colored half blue and half yellow (length = 11.6 cm; diameter = 3.2 cm) and two balls of different color (blue/yellow; diameter = 3.3 cm). Additionally, there was a red squared block (6 x 7.6 x 6 cm) consisting of two brick-formed identical parts, which were hold together by a magnet. In the middle of the squared side of the block there was hole (diameter = 1.4). The fourth task, called box, contained of a blue box (7.3 x 6 x 6 cm), a yellow stick (8 cm; diameter = 1.2 cm), and a red bar (10 x 2.2 x 2.2 cm) with a nub (diameter = 1.5 cm) and two holes under the nub (diameter = 1.3 cm). The blue box had six holes in the side walls (diameter = 1.6 cm) and a flap, which was provided with repelling magnets. Thus, a bit pressure was needed to close it.

For the bridge, the model tipped over the blue block on its left side. Then, one edge of the red rectangular prism was placed on one edge of the blue block. Finally, the blue ball was placed on one of the upper yellow millings (see Figure 2). For the bookend, the model put the L-shaped red object in an upright position. Then, the yellow flat building brick was leaned on the longer side of the L-shaped object. Finally, the blue rectangular prism was leaned on the yellow flat building brick with the longer side of the right angle. For the rod, the model put together the two parts of the red squared block with the round opening. Then, she rotated the rod with a 180° turn and positioned it within the round opening of the red squared block. Finally, the blue ball was positioned on top of the rod. For the box, the first step was to put the yellow stick into the opening of the box, which the model was

facing directly. Then, the model closed the box, which flapped because of the repelling magnets. Finally, she pushed the red bar on the yellow stick and used it to close the lid of the box.

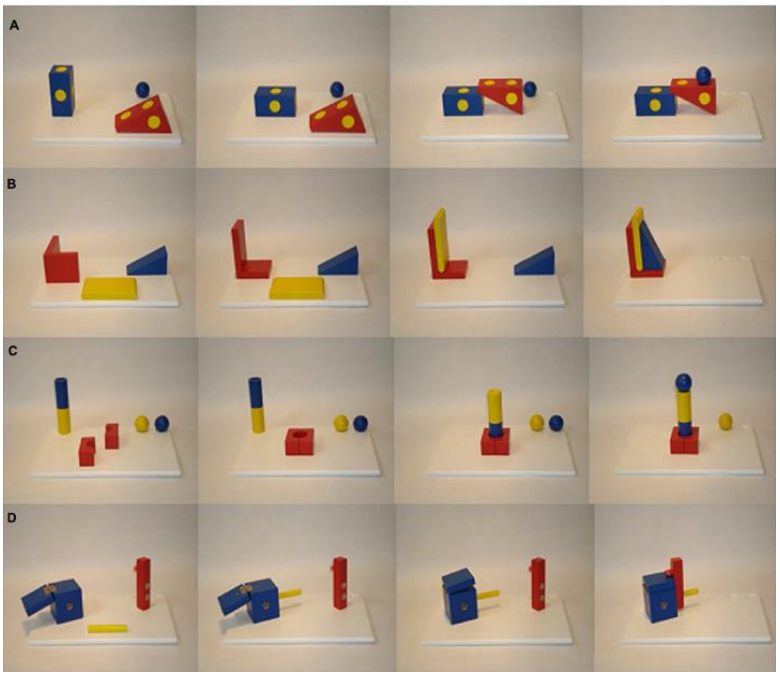


Figure 2. Three-step-action sequence of the four tasks. Starting position and the subsequent three action steps of the bridge (A), the bookend (B), the rod (C) and the box (D).

Two female adult models with different cultural background (Chinese vs. German) demonstrated the manual tasks (see Figure 3). Both models were comparable in terms of age (31 years vs. 25 years), hair and eye color, but differed in culture-specific features (facial proportions and eye relief). In two prestudies, one with students, one with children, we checked whether the models differed in other than culture-specific features. When students (N=59) rated several characteristics of the models (e.g., sympathy), no difference was obtained except that the German model was rated more sociable than the Chinese model. Four-year-old children (N=17) answered questions about sympathy and similarity of the models; no significant differences between the two models were obtained.

Figure 3. Photographs of the German (right) and the Chinese (left) model which were used during the questionnaire pilot study

2.3 Design

There were two blocks, each consisting of the presentation of the four different tasks being presented in counterbalanced order across participants. The German model presented the tasks in the live condition, whereas in the video condition the tasks were presented by the German and the Chinese model, one block with the German and one block with the Chinese model. The order of the models was counterbalanced across participants. Between the tasks, children were given the possibility to play with the objects. Thus, the influence of the model's race (Chinese vs. German model) was tested in a within-subject design in the video condition. The influence of the presentation mode was tested in a between-subject design (live vs. video; German model). To check the pure factor repetition without an influence of the models race, we analyzed this factor in the live condition (German model only; 1st vs. 2nd block).

2.4 Procedure

Children sat on a high chair at a table (74 x 103 x 82 cm) in front of a blue covered wall with an opening (60 cm length) in the middle of it, comparable to a "puppet theater". The opening could be closed by a curtain. In the live condition, children saw the German model performing the manual actions through this opening. In the video condition, a monitor (24", 50/60 Hz) was positioned exactly into the opening. All aspects of the live demonstration

were closely matched to the video demonstration (i.e., the velocity and amplitude of the actions, the duration of the demonstration). If the infant looked away from the model, the experimenter who was standing on the side during the presentations reminded the child to look back to the model and focused the child's attention back to the demonstration. Both the video and the live condition followed the same general procedure. An experimenter welcomed the parent and the child. While the parent waited in an extra room and filled in questionnaires concerning some background information of the child (e.g., age, noticeable problems) the child was led to a separate room and the experimenter instructed the child ("Soon you will see a friend of mine, who is playing with different toys"). First, a bell rang in order to draw the children's attention to the closed curtain. Then, the curtain opened and the model looked directly at the child for four to five seconds. Then, the model looked at the first object and performed the manual action with it. After performing the three steps each task consisted of, the model looked towards the child again. Then, the curtain closed again. Note, that the model didn't talk at all, thus, no language was involved. The experimenter gave the identical objects to the child with a neutral instruction ("Now it is your turn to play with the toys!"). Children were allowed to play with the objects for 30 s, starting when the child touched the first object. The child was told to ring the bell, which was positioned next to it, whenever she/he finished playing with the objects. The experimenter removed the objects after 30 seconds or after the child rang the bell, and the presentation of the next task started. After the first block, the second block started immediately without a delay in between. When children had completed both blocks, they could choose a toy as a reward and were then brought back to their parents. Each session was videotaped by a camera (Canon Legria FS200E) directed frontally at the child, and a second camera (Canon Legria FS406) recorded the child and the model from behind.

2.5 Data analysis

Children's behavior was coded from the videotapes. First, latency was coded as the time between the time when the experimenter had placed the objects in front of the child and the child's first touch of an object. Additionally, we coded the number of imitated steps. A step was coded as imitated when children performed the same movement with the same object as the model had demonstrated at any point during the response period. Children could receive a score from 0 to 3 in every single task leading to a sum score ranging from 0 to 12 for each block. Furthermore, we coded the time children spent looking at the video and the live presentation to check for any differences of children's attention. No significant difference could be found concerning looking time (Wilcoxon text: z = -1.48; p = .138). 60% of the videos were coded by a second independent rater. Interrater agreement was κ = .81, p < .001. Results are illustrated within Figure 4.

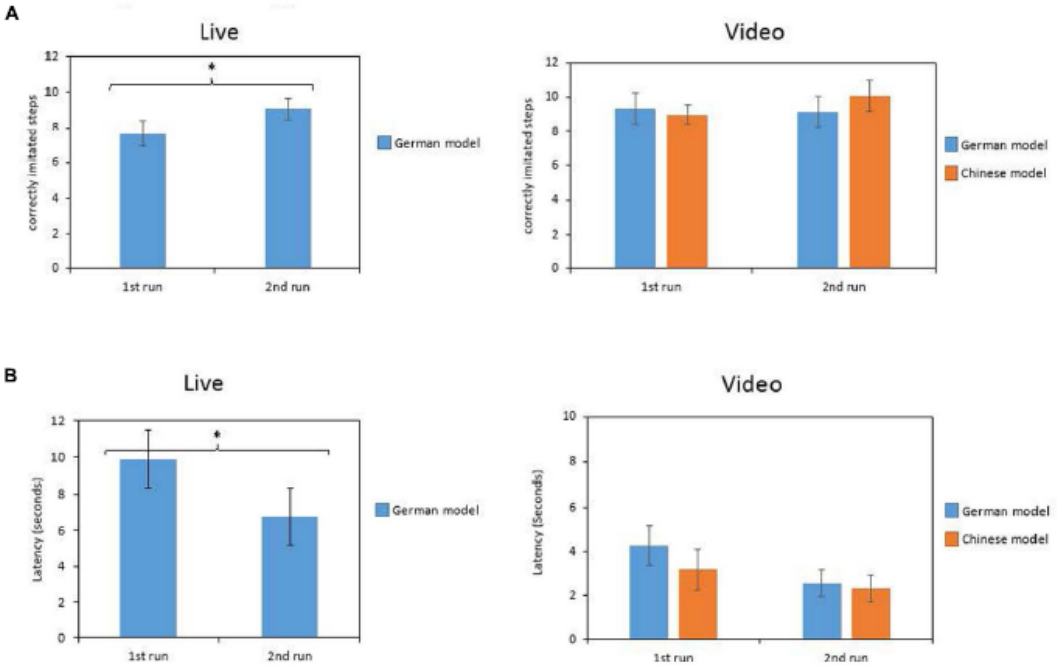


Figure 4. Number of correctly imitated steps (A) and latency (B) in the live and the video presentation depending on the run (1st and 2nd) and on the race of the model (German vs. Chinese; video presentation only). *p > 0.05

3 Results

In-group-out-group effect. In order to investigate whether there are differences between the two models concerning latency and number of imitated steps a dependent-sample t-test was calculated. Results revealed that children did not imitate more action steps when observing the in-group model (M = 9.25, SD = 32.71) compared to the out-group model (M = 9.54, SD = 27.81), $t(23) = 0.71$, p = .484. Similar results were found for latency. Children did not start to play faster with the objects after having watched the German model performing the action as compared to the Chinese model, $t(23) = -1.62$, p = .119. To control for order effects, two repeated analyses of variance with model (Chinese vs. German) and order (1st vs. 2nd block) were calculated. For the number of imitated steps results revealed no significant effects neither for model [$F(1,11) = 0.60$, p = .455] nor for order [$F(1,11) = 1.10$, p = .317] nor for the model x order interaction [$F(1,11) = 0.25$, p = .630]. Similarly, for the latency results revealed no significant effects neither for order [$F(1,11) = 1.48$, p = .249] nor for model [F(1,11) = 1.48, p = .249] nor for the model x order interaction [$F(1,11) = 0.20$, p = .663].

Presentation mode. Infant's imitation performance did not differ as a function of the presentation form. No significant difference was found neither for the number of imitated steps (live: M = 8.38, SD = 3.32, video: M = 9.54, SD = 2.65, $t(46) = -1.17$, p = .185) nor for the latency (live: M = 7.67, SD = 5.28, video: M = 7.20, SD = 4.49, $t(45) = .46$, p = .748).

Repetition effect. To test the pure repetition effect, paired t-tests comparing the values obtained in the first and the second block in the live condition were computed. There were significant differences in the number of imitated steps ($t(23) = -3.29$, p = .003). Children copied less steps in the first block (M = 7.67, SD = 3.45) compared to the second block (M = 9.08, SD = 2.99). Furthermore, mean latency also differed significantly ($t(21) = 2.32$, p = .030). In the first block, children started to play later with the objects than in the second block (1st: M = 9.90, SD = 5.45, 2nd: M = 6.77, SD = 5.52)

4 Discussion

The aim of the present study was to investigate the influence of the model's group membership indicated by physical appearance on four-year-olds' imitative behavior. The results showed that children did not imitate more action steps after having observed the German model compared to the Chinese model. Similarly, they did not differ in latency to the first touch. At first view, this is not in line with prior research showing that children take the model's group membership into account when they imitate others (e.g., Buttelmann et al., 2013; Howard et al., 2015). We will discuss possible explanations below. As expected, there were no differences between live and video presentation concerning the imitation performance of the children. This result conformed to prior research, which showed that the video deficit occurs up to the age of three years (Howard et al., 2015; Troseth, Saylor, & Archer, 2006). Finally, children imitated more steps after the second presentation than after the first presentation and started faster playing with the objects. This result is well in line with prior research that confirmed that children's imitative behavior benefits from multiple presentations (e.g., Barr et al., 1996).

In-group-out-group effect. Concerning the in-group-out-group effect, there are different possible explanations for why the finding contrasted to prior findings. First, the age of the children could be responsible for these diverging results. Various studies showed that by the age of five but not four years children take the race into account when dealing with imitation and drawing inferences (Hirschfeld & Gelman, 1997; Oostenbroek & Over, 2015). Similarly, at the age of three years children do not seem to comprise the race to guide their behavior or their preferences. For example, Shutts and colleagues (2010) found, that three- to four-year-old children did not use racial information of the models to guide their own preferences for novel items. Furthermore, Kircher and Furby (1971) did not find evidence for three-year-old children but for four to five-year-olds to use race-based information to build preferences. For infants, research also found evidence

that there is a preference towards the in-group, which influenced, for example, the eye movements in three and ten-month-old children (Bar-Haim et al., 2006; Sangrigoli & De Schonen, 2004b). However, these were looking time studies and thus can only be compared to results obtained in imitation studies to a very limited amount. Concering preschool children, there might be a developmental process concerning the awareness of differences between groups and the active use of this information for decisions, like preferences and imitational behavior. Whereas five-year-old children seem to take into account the race of the model, three-year-olds don't. Concerning the age of four years, results are less clear. Thus, the age of the children might be one reason for the fact, that we did not find evidence for an in-group-out-group effect in the present study.

Another possible explanation is that pure physical appearance as a cue is not sufficient to highlight differences in race. Studies investigating how children draw inferences about psychological properties found that children did not use physical appearance but verbal labels about the models' race (Diesendruck & haLevi, 2006). Furthermore, many studies, which investigated in-group-out-group effects on imitation used language as a marker for group membership (Buttelmann et al., 2013, Howard et al., 2015; Kinzler et al., 2011; Kinzler et al., 2007). In contrast, we neither used any labels for the models nor did the models speak a word during the sessions. Physical appearance associated with a model's race might not be salient enough to be perceived by children as a cue for group membership (Diesendruck & HaLevi, 2006). In line with this argument, Shutts and colleagues (2010) observed that a model's age and gender is more important than a model's race when three-year-olds choose between objects, which were presented by models differing in age, gender and race. In the present study, we tried to keep these factors constant in order to analyze the genuine effect of physical appearance.

In sum, it might well be that the influence of the models race on children at different ages is moderated by language. That is, language might offer more salient information about the model's race than physical appearance

enabling younger children to encode the race of the model. Thus, the age of the children, the role of language and, most importantly, their interplay should be analyzed in more detail in further studies.

Presentation mode. Concerning the presentation mode, our study showed no evidence for the video deficit (Anderson & Pempek, 2005), children's imitation performance did not differ as a function of the presentation mode. The lack of this effect cannot be attributed to differences in the details of the live and video demonstration as the models were well trained to act standardized. Furthermore, we arranged the context of the videos exactly in the same way as it was during the live condition. The lack of the video deficit can, however, be attributed to children's increasing capacity to similarly process information from videos and real life as prior studies had shown. These studies found evidence that infant's ability to copy actions after a live presentation was superior to their ability to imitate these actions presented on video (Barr & Hayne, 1999). However, Barr and Hayne (1999) showed that even 18-month-old infants are able to imitate after a video presentation as good as after a live presentation. The authors noted that for these results the viewing condition was extremely sterile, the tasks were very easy and the test phase occurred directly after the demonstration. However, in general findings show that children overcome the video deficit by the age of four (Howard et al., 2015; Troseth & Deloache, 1998; Troseth et al., 2006).

Repetition effect. The present study revealed that the imitational performance of four-year-old children benefit from multiple presentations. This is well in line with previous research that found evidence that double exposure to pictures or drawings improve the imitational behavior of 24-month-old children (Simcock & DeLoache, 2007).

C Study 2: Krieger & Aschersleben, 2018

Does the cue for the model's group membership affect the in-group bias in preschoolers?

1 Introduction

Observing and imitating are important instruments for infants and children to better experience their world (Legare & Nielson, 2015). Indeed, the ability to engage in flexible imitation develops early in ontogeny (e.g. Barr et al., 1996; Meltzoff, 1988; Tomasello et al., 2005) and is one of the main instruments for transmission of cultural knowledge across individuals and groups (Hopper et al., 2010). However, various factors influence the fact, which elements of knowledge are transferred and learned through imitation. One important aspect is the model's group membership (Kolling et al., 2016; Krieger et al., 2018; Wood et al., 2013). Already 14-month-old children imitated a linguistic in-group model more faithfully than an out-group model (Buttelmann et al., 2013). This so-called in-group bias in imitation could also be demonstrated for older children. By using linguistic in-group and out-group models, Howard et al. (2015) showed that 19-month-olds and three-year-old children selectively imitated the actions demonstrated by the in-group model (Howard et al., 2015). Thus, in infancy and early childhood children seem to consider the model's group membership when learning novel actions. However, when it comes to older children, results are not so clear. For example, when physical appearance was used as a cue for group membership, four-year-olds did not show higher imitation scores for an in-group model (Krieger et al., 2016). After being confronted with both third-party and first-party ostracism, though, four-year-olds tend to imitate the in-group model more frequently than the out-group model (Krieger et al., 2018; Watson-Jones et al., 2016) suggesting that the need to affiliate increases in-group imitation. Thus, results suggest that the occurrence of the in-group bias in imitation is influenced by various factors, among others, the age of the participants (Buttemann et al., 2013;

Howard et al., 2015; Krieger et al., 2016), the need to affiliate (Krieger et al., 2018b; Watson-Jones et al., 2016), and the cues given about group-membership (Buttelmann et al., 2013, Howard et al., 2015; Krieger et al., 2016). Up to now, there is no study investigating the influence of different cues for group membership on the in-group bias within one single study. Thus, one aim of the present study was to analyze children's imitational behavior in three conditions that differed in the information about group membership given to the children.

In addition to imitation, children's *preference* for one of the models is often used as indicator to study the in-group bias. Here, previous research showed that five-year-olds exhibit a preference for models that shared children's ethnicity (Aboud, 2003; Kinzler & Spelke, 2011; Powlishta, Serbin, Doyle, & White, 1994). Moreover, children weighted different cues for group membership, like accent and physical appearance, differently (Kinzler et al., 2009). Five-year-old children revealed an in-group bias in preference both when accent or race was used as a cue for group membership. However, when accent was pitted against race, children privilege information of accent over information of the model's physical appearance to guide their social preferences. This latter effect can be explained by evolutionary accounts claiming that throughout cognitive evolution, language has served as a more valid predictor of group membership than physical appearance (Henrich & Henrich, 2007).

The current study investigated the influence of different cues for group membership on the in-group bias in imitation and preference in six-year-old children. Children were randomly assigned to one of three groups with the cues given about the models' race (German vs. Chinese) differing between groups. In one group, the physical appearance was the only available indicator for the models' race (appearance group). In the second group, the experimenter labeled the models by naming the home country (Germany, China; label group). In the third group, both models introduced themselves within a short video sequence and thereby talked in their mother tongue (language group). Subsequently, all children watched the

identical videos of both the German and the Chinese model silently demonstrating manual actions on novel objects before they were allowed to play with the same objects. Finally, children were asked for a preference for one of the models.

Based on previous studies, we expect no in-group bias in the appearance group (Krieger et al., 2016). However, since this is the first study examining the influence of labeling or language on the in-group bias in imitation in preschoolers, no further hypothesis for children's imitational performance could be derived from literature. For preference, an in-group bias was expected in each of the three conditions, since previous research revealed an influence of the model's physical appearance as well as the model's accent on children's preference (Kinzler et al., 2011).

2 Method

2.1 Participants

The final sample consisted of 48 German children [25 girls and 23 boys; *M* = 6;54 (years;months); range = 6;1 - 7;0]. Additional 10 children were tested but had to be excluded from the final analyses because of technical errors during testing. Children were randomly assigned to three experimental groups (appearance group, label group, language group). The current study was conducted in a university lab in a medium-sized German city. Participants were recruited from a database of parents who had expressed willingness to volunteer for research on child development. Children were given a small gift for participating and parents received a recompense for travel expenses. The study was conducted in accordance with the ethical guidelines and received ethical clearance by the local ethics committee at the Saarland University.

2.2 Material

The testing material consisted of four sets of different colored wooden building bricks and were called *shot put, magnets, rotating disc* and *the box.* For a closer description see Figure 5 and Appendix 1.

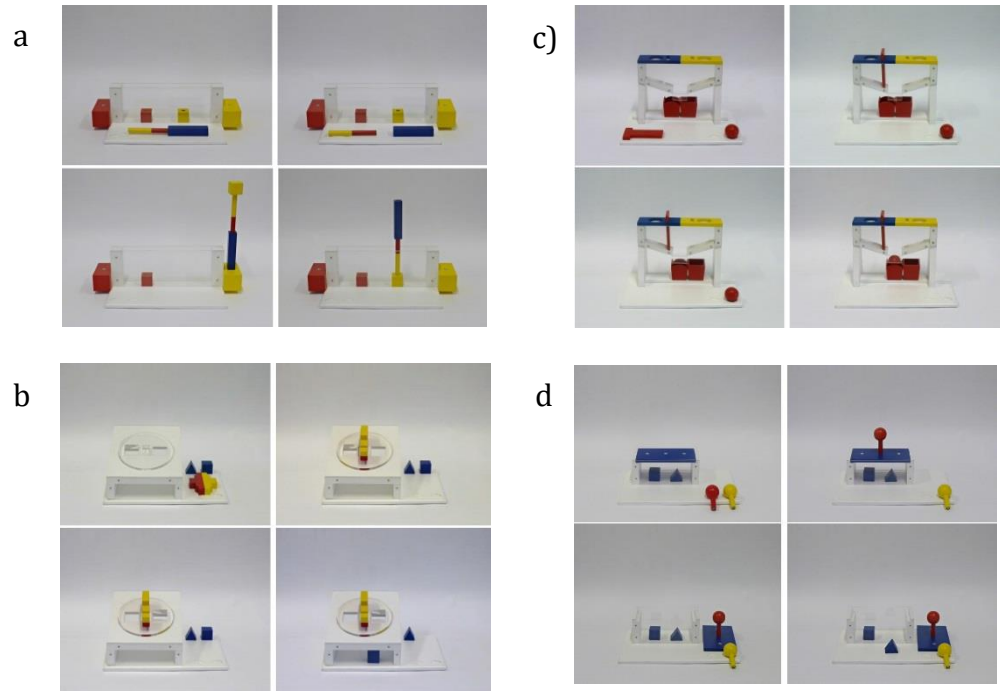


Figure 5. Illustration are the starting position and three action steps *magnets* (a), *shot put* (b), *rotating disc* (c) and *the box* (d).

For each set of objects a three-step action was designed. For *shot put,* the model placed the red T-shaped chipcard within the rectangular slot on the blue side. Then, the model pushed over the container and finally, threw the ball within the opening on the yellow upper side of the clear plastic apparatus. For *magnets,* the model placed the stick with its red side on the opening of the blue stick. Then, the stick was placed on the yellow box within the transparent plastic container. Finally, the blue stick with the stick in it and the yellow box on top it were placed on top of the yellow wooden side part. For *rotating disc,* the model put the chipcard within the rectangular opening of the transparent plastic disc. Then, the model rotated the disc, so that the opening of the transparent plastic disc was placed on top of the opening of the container. Finally, the model threw the blue box through both openings. For *the box,* the model placed the red ball affixed on

a red stick on the middle magnet of the upper blue flat which closed the box. Then, the model lifted the upper blue flat and placed it on the right side of the box. Finally, the model took out the blue pyramid and placed it in front of the transparent plastic box (see Figure 5).

Two female adult models who differed in race (German and Chinese) presented the novel actions on the set of objects. Both models were comparable in age (21 years and 22 years), but differed in race-specific features, for example facial proportions. The models were rated concerning several characteristics in a pilot study with students (n = 86). Results revealed that the German model was rated as more self-confident, more motivated to lead and more assertive whereas the Chinese model was rated as more high-performing. These results match known stereotypes of both cultures (Johnson, 1996).

Furthermore, each time children were manipulating the objects a bell was given to them with the instruction to ring it when they finished playing. The session was videotaped by a camera (Canon Legria FS200E), which was directed on children's hands and was placed next to the them.

2.3 Procedure

Children were randomly assigned to one of three groups (appearance group, label group, language group) and were brought to a separate room, which was equipped with a table and two chairs. After the child sat down, the female experimenter introduced the following procedure: In a first run, a model (either the German or the Chinese model, counterbalanced between participants) performed novel actions on each set of objects successively in four videos. After each video, the children received the set of objects ("Now it is your time to play with the objects") and were allowed to play with the objects for a maximum of 30 seconds or until they rang the bell. After children had seen the first set of four videos, the second run started, and children were presented with four videos, in which the other model (German or Chinese) they had not seen before performed the actions.

Again, children were allowed to play with the objects after each single video. The way the experimenter introduced the models to the children was manipulated between groups. In the appearance group, models were introduced as two friends of the experimenter. In the label group, models were introduced as either a German friend that lives nearby in the same country as the participant, or as a Chinese friend, that lives in a country very far away. Finally, in the language group, each model introduced themselves in in their mother tongue (German or Chinese) in a short video, which was played before the start of the first and second run ("Hello, my name is Lisa/Eli. I brought some new toys. I'm looking forward to show you how I play with them."). At the end of the session, children were shown two photographs of the models and they had to decide with which model they would rather share their toys with. Afterwards, they received a small gift for participation. Then, they were brought back to their parents.

2.4 Coding and analyses

Children's performance was coded from video tapes. First, imitated action steps were coded. Participants could reach a score from 0 to 3 within each set of objects resulting in a score from 0 to 12 for both the German and the Chinese model. Second, preference towards the German model was coded with 1, preference towards the Chinese model was coded with 0.

3 Results

On average, children imitated M = 8.29 (SD = 2.28) action steps. The mean values separated for condition and model can be seen in Table 2. A 2x3 ANOVA with the between-subject factors order (German model first, Chinese model first) and group (appearance group, label group, language group) indicated no significant effect of order nor any interaction involving this factor ($p > .20$).

Table 2. Mean number of imitated action steps for each condition and model.

	Mean number of imitated action steps		
Condition	*n*	*M*	(*SD*)
Appearance Group			
German Model	16	7.88	(2.44)
Chinese Model	16	7.81	(2.16)
Label Group			
German Model	16	8.78	(2.52)
Chinese Model	16	8.87	(2.24)
Language Group			
German Model	16	8.50	(2.44)
Chinese Model	16	7.75	(2.16)

A mixed ANOVA with the within-subject factor model (German model, Chinese model) and the between-subject factor group (appearance group, label group, language group) was calculated for the number of imitated action steps. Neither any main effect nor the interaction did reached significance level ($p > .20$).

To investigate preference towards the models, we conducted four chi square tests. The overall sample revealed a clear preference towards the German model ($n = 38$) compared to the Chinese model [$n = 8$; $\chi^2(1) = 19.57$; $p < .001$], whereas two children did not answer the preference question. The in-group preference was mirrored in the results obtained for each group separately (appearance group: $n_G = 13$; $n_C = 3$; $\chi^2(1) = 6.25$; $p = .012$; label group: $n_G = 11$; $n_C = 3$; $\chi^2(1) = 4.57$; $p = .033$; language group: $n_G = 14$; $n_C = 2$; $\chi^2(1) = 9.00$; $p = .003$).

4 Discussion

The present study investigated the influence of different cues for the model's group membership on imitational performance in six-year-old children as well as their preference for one of the models. Model's group membership was indicated either by the model's physical appearance, or by labels about the model's home country or by model's language. Results revealed that group membership did not influence children's imitative performance. More importantly, this finding was independent of the cue

given for group membership. Thus, children of each group imitated the in-group model to a similar extent as the out-group model. Second, results revealed an in-group bias for children's preference. Again, this result was not modulated by the cue for the model's group membership. Children of each group clearly preferred the in-group model.

Regarding children's preference, results are in line with previous research. As outlined in the introduction, five-year-olds preferred linguistic in-group models when being asked for a friendship choice (e.g., see Kinzler et al., 2009). In addition, participants showed in-group favoritism from the age of five years onwards when positive and negative attitudes towards White and Black children were assessed (Aboud, 2003). The results obtained in the present study suggest that children use any available cue for group membership to guide their social preferences. A possible explanation for this effect might be the evolutionary advantage of belonging to groups (Baumeister & Leary, 1995). Groups were ensuring survival in ancient times and still satisfy our need to belong (Baumeister & Leary, 1995). Thus, the awareness of and the differentiation between in- and out-groups is very important especially to children who are not able to care for themselves. It is therefore efficient for them to use any cue for group membership. Further, groups have a certain homogeneity and group members are often similar to each other (Tajfel & Turner, 1979). Since we as adults prefer people who are similar to us (e.g., see Bakagiannis & Tarrant), it is more than reasonable that children's preference is influenced by group membership.

Although in the present study children showed a clear preference for the in-group model, this preference did not influence their imitative behavior; they did not imitate the in-group model more faithfully than the out-group model in any of the groups. Regarding the model's physical appearance, this is in line with previous research showing that physical appearance of a model did not affect the imitational performance of four-year-old children (Krieger et al., 2016). However, results obtained in the language group challenges previous research showing that three-year-old children imitate

their linguistic in-group model more frequently than the out-group model (Howard et al., 2015). These at first view contradictory results might be explained by the differences between the two studies. Howard et al. (2015) presented both relevant actions (i.e., necessary to obtain a given goal) as well as irrelevant actions (i.e., not necessary to obtain a given goal) to the children and the in-group bias was obtained for the irrelevant actions, but not for the relevant actions. On the contrary, in the present study, all action steps were relevant. Previous research showed that children imitated causally irrelevant actions to affiliate with the model (Keupp, Behne, & Rakoczy, 2013), suggesting that the function imitation has in a specific situation might have an influence. Uzgiris (1981) suggested that imitation serves both a cognitive and a social function. The cognitive function serves to acquire novel behavior and skills whereas the social function contributes to the development of social and communication skills, like the affiliation with others. This leads to the assumption that the social function of imitation was predominant in the study by Howard et al. (2015) when children imitated the irrelevant actions because they wanted to affiliate with the model, especially with the in-group model. In contrast to that, the cognitive function is assumed to be predominant when relevant actions were imitated. Moreover, in the current study, both the in-group and the out-group model used ostensive cues as they looked towards the children before presenting novel actions. Ostensive cues signalize an opportunity for the acquisition of knowledge, which triggers the cognitive function of imitation (Csibra & Gergely, 2009). In sum, we assume that children of the present study as well as children in the Howard et al. (2015) study when imitating relevant actions did not differ in their imitative behavior between the in-group and the out-group model to guarantee a maximum growth of knowledge (Keupp et al., 2013).

With regard to the question if the cue for group membership affects the in-group bias in imitation, we postulate the following: If the cognitive function of imitation is predominant, group membership is irrelevant since children imitate to acquire novel knowledge. As a consequence, the cues given for

the model's group membership do not affect imitative behavior. However, if the social function is predominant, any cue for group membership might be used to indicate group membership. As research shows, children use both language (Howard et al., 2015) and the model's physical appearance (Krieger et al., 2018a, 2018b; Watson-Jones et al., 2016) as a cue for group membership to decide which model they follow.

This conclusion contains important implications for the influence of cultural diversity and the acquisition of knowledge in children. Children are confronted with peers and adults who differ in their cultural background within kindergarten and school. These contexts serve the acquisition of novel knowledge and thus, are supposed to trigger the cognitive function of imitation. Based on the results obtained by the current study, we assume that children are learning through observation of both same- *and* foreign-race peers and adults that they do not distinguish between them in learning situations.

D Study 3: Krieger, Zmyj, Li, Möller, & Aschersleben, 2018

A Cross-Cultural Investigation of the In-Group Bias and its Stability in Preschoolers' Imitative Behavior

1 Introduction

When growing up, infants and children are reliant on the acquisition of action knowledge. One fast and efficient way of action acquisition is imitation. Imitative performance depends on a variety of factors (Wood et al., 2013) with the model's and children's group membership being a critical factor (Buttelmann et al., 2013; Kollinget al., 2016; Krieger et al., 2018). There is a large body of research investigating the influence of the so-called in-group bias in imitation. The term 'in-group bias' describes the tendency to identify with one group (in-group), which is then contrasted to other groups (out-groups) resulting in a preference for in-group members and/or enhanced imitation of actions shown by in-group members (Hewstone et al, 2002). Recent research showed that infants and children imitate linguistic in-group models more frequently and more closely compared to linguistic out-group models (Buttelmann et al., 2013; Howard et al., 2015). When physical appearance was used as a cue for group membership, studies failed to show an in-group bias in imitation (Krieger et al., 2016). The fact, that language is more salient and socially more important than pure physical appearance and therefore, provides more cultural information, might be one explanation for inconsistent results. Moreover, familiarity with people with physical appearance of foreign races might be a relevant factor. Within an enriched racial society out-group members are part of everyday life and might thus become in-group members.

However, until now research on the influence of the in-group bias in imitation focused on western cultures (Buttelmann et al., 2013; Kolling et al., 2016; Krieger et al., 2016; Oostenbroek & Over, 2015) and even imitation itself was investigated by only a handful of studies in non-Western

cultures (e.g., Berl & Hewlett, 2015; Callaghan et al., 2011; Goertz et al., 2011; Lieven & Stoll, 2013; Wang, Fu, Zimmer, & Aschersleben, 2012). There is evidence that imitation is an universal ability not influenced by culture (Callaghan, Moll, Rakoczy, Warneken, Liszkowski, Behne, Tomasello, & Collins, 2011; Graf, Borchert, Lamm, Goertz, Kolling, Fassbender, & Keller, 2014; Lieven & Stoll, 2013; Wang, Fu, Zimmer, & Aschersleben, 2012). German and Chinese children, for example, showed a cross-cultural stability for higher imitative performance when observing familiar compared to unfamiliar actions and when observing simple compared to complex actions (Wang et al., 2012). The same study investigated the kind of error children made when imitating actions. Again, children of both cultures showed the same pattern of results: More means errors (related to the action steps to reach a specific goal) were made when simple actions were imitated, whereas more end errors (related to the action outcome) were made when complex actions were imitated. However, there are also results that are not in line with the idea of a cross-cultural stability in imitation. Six- and 9-month-old Cameroonian Nso and German infants demonstrate memory for novel, action-based events by imitating actions after delays with a puppet-like testing material that was familiar to all participants (Goertz, Lamm, Graf, Kolling, Knopf, & Keller, 2011; Graf et al., 2014). In a further study with 18-month-olds, however, German infants showed a higher imitation rate than Cameroonian Nso infants. Results revealed that immediate imitation varied across groups whereas both groups showed comparable deferred imitation performance but only if Cameroonian Nso infants manipulated the objects for an additional time (Borchert, Lamm, Graf, & Knopf, 2013). Thus, delay and the opportunity of immediate imitation seems to influence children's imitational performance in different ways in dependence of the cultural background. However, this is one hint for the modulating influence of culture; confirming and characterizing universality in imitation research requires additional collection of cross-cultural comparisons.

Aside from the model's race, studies focusing on the influence of social cues on imitation also revealed differences between cultures. Three- to five-year old Caucasian American and Chinese American children imitated a single model who used an inefficient tool to solve a task at similar rates (Corriveau et al., 2017). However, when a group of models presented the same inefficient action (giving the impression that the choice of action is rational), Chinese American children showed more imitation compared to the Caucasian American children. The authors suggested, that Chinese American children weighted the social cue of group consensus more compared to the task-specific cue of the inefficient action whereas the Caucasian American children focused on the task (Corriveau et al., 2017). Further, Chinese second graders endorsed the same choice as a model whereas American children's choices were independent of the model's choice (Chu, 1979). Thus, conformity might be more important to Chinese children than it is for American children. In accordance to that, recent research showed that individuals from collectivistic cultures were more likely to orient themselves to a majority whereas individuals from individualistic culture were not (Clegg & Legare, 2016; Corriveau & Harris, 2010; DiYanni et al., 2015). In conclusion, children's imitation and preference seemed to differ in dependence of social cues across cultures. However, no study up to now investigated how children are influenced by the social cue of group membership by comparing different cultures. In addition, the in-group bias has been tested in different ways. Children's imitation is a prominent non-verbal measure of the in-group bias, but verbal measures have used as well. In research with preschoolers and children, some studies also used verbal report, for example, with whom of the models the children wanted to be friends (Kinzler et al., 2009; Shutts et al., 2010) revealing an influence of group membership on participant's preference. Hence, children preferred the same objects or activities that were preferred by models of the same age, gender (Shutts et al., 2010) or language and accent (Kinzler et al., 2009). Thus, using both verbal, like preference towards one model, and non-verbal measures, like imitation, give a fuller picture of children's in-group bias.

The present study investigated whether immediate imitation, deferred imitation and preference are influenced by the model's group membership within different cultures. A group of Chinese children was tested because they provide a perfect non-Western comparison. Important social influences on children's development like societal expectations, parental practices and folk psychology differ significantly between Chinese and Western cultures (Nisbett et al., 2001; Wang, 2004). By replicating previous research, German children's imitative behavior was expected not to differ between in-group and out-group models concerning immediate imitation (Krieger et al., 2016; Krieger et al., 2018). However, as Chinese children are more reliant on conformity (Chu, 1979; Corriveau et al., 2017) they were expected to imitate their in-group model more frequently than their out-group model. Concerning preference, both the German and the Chinese children were expected to prefer their in-group model as there is evidence for an in-group bias in preference within both Western and non-Western culture (Chu, 1979; Kinzler et al., 2007; Kinzler & Spelke, 2011; Kinzler et al., 2009). Concerning deferred imitation, recent research reported an influence of the cultural background, at least in infants (Goertz et al., 2011; Graf et al., 2014), Thus, the current study investigated the influence of a one-week delay to compare both the German and Chinese children's deferred imitational performance. Since this was the first study investigating long-term effects of the model's group membership on imitation, the present study was only exploratory in this respect. Furthermore, to control for differences between samples due to the opportunity to imitate immediately (Borchert et al., 2013), children were randomly assigned to two different groups. Half of the children were allowed to play with the objects directly after presentation and after a one-week delay (practice group). The other half of children played with the objects only after a one-week delay (no-practice group).

2 Method

2.1 Participants

The final sample consisted of 84 German [42 girls and 42 boys; *M* = 3;10 (years;months); range = 3;0-4;9] and 83 Chinese children [42 girls and 41 boys; *M* = 3;9; range = 3;1-4;9]. Within the German sample, additional 15 children were tested but had to be excluded from the final analyses because they did not participate in the deferred imitation phase (*n* = 10) or due to technical errors during the sessions (*n* = 5). Within the Chinese sample, additional 16 children were tested but had to be excluded from the final analyses because they did not participate in the deferred imitation phase. Both German and Chinese children were randomly assigned to one of two experimental groups (German sample: no-practice group, *n* = 42; practice group, *n* = 42; Chinese sample: no-practice group, *n* = 41; practice group, *n* = 42). In Germany, children lived in a medium-sized German city and were tested either in a separate room in their kindergartens (*n* = 37, 6 kindergartens) or in a university lab (*n* = 47). In China, all children were tested in Beijing in one kindergarten. When tested at the university lab, children received a small gift and parents received a recompense for travel expenses. For testing in the kindergarten, the recompense was the usual compensation for participation for both countries.

2.2 Material and stimuli

The testing material consisted of four sets of three colored wooden building bricks, which were identical to the material used in Krieger et al. (2016). For each set of bricks, two different three-step actions were designed, one action was identical to the one used in the former study (Krieger et al., 2016), a second action was designed that was comparable in complexity. The four sets of objects were called the bridge, the bookend, the rod and the box (for closer descriptions see Krieger et al., 2016). For example, the bridge task consisted of one red rectangular prism [6cm (length) x 10cm (width) x

4.5cm (height)], one blue block (9 cm x 4.5cm x 4.5 cm), and one blue ball [3.3 cm (diameter)]. The red prism and the blue block had yellow millings on each side. First, the model tipped over the blue block on its left side. Then, one edge of the red rectangular prism was placed on one edge of the blue block. Finally, the blue ball was placed on one of the upper yellow millings. For the alternative action, the model first straightened up the red rectangular prism. Then, the blue block was lifted on its right side. Finally, the blue ball was placed on the upper yellow milling of the blue block (see Figure 6). Two female adults (a German or a Chinese model) demonstrated the actions on video. Videos were presented on a Laptop (15,6´´) that was placed in front of the children. The duration of each video sequence was approximately 30 s (*M* = 30.19 s; Range = 27-33 s). The models were 22 and 21 years old, respectively. Models differed in their physical appearance. That is, they showed race-specific features in hair and eye color, eye relief, and facial proportions. In a pilot study, 86 students were asked to rate the models on several characteristics. Results revealed no difference in sympathy, kind of relationships, friendliness, and arrogance. However, the German model was rated as more self-confident, more assertive and more motivated to lead. The Chinese model was rated as more high-performing than the German model. These results match known stereotypes of both cultures (Johnson, 1996). Furthermore, a bell was given to children each time they were manipulating the objects with the instruction to ring the bell when they finished playing. Each session was videotaped by a camera (Canon Legria FS200E), which was placed next to the children and was directed on their hands.

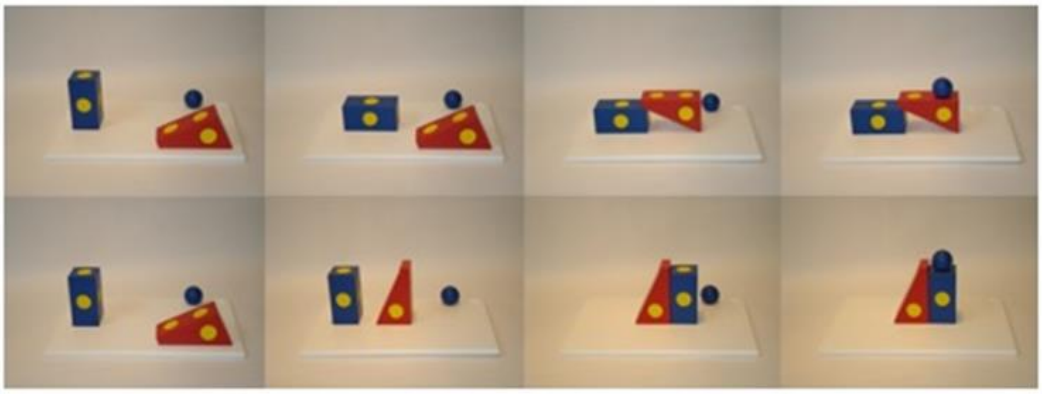
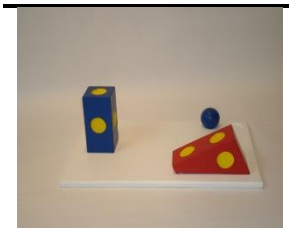
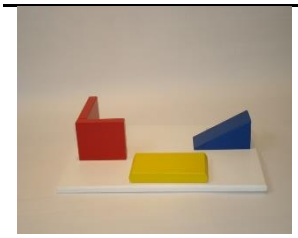
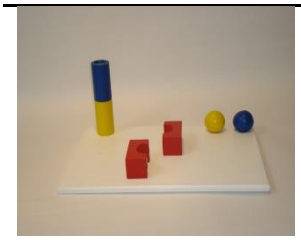
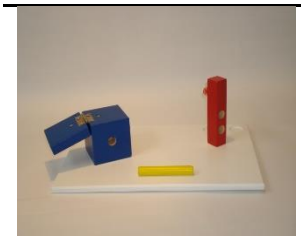


Figure 6. Illustrated are the starting position and the subsequent three action steps of the bridge for both action A and action B.

2.3 Design and procedure

Children of both samples were tested in a separate room, which was equipped with a table and two chairs – one for the experimenter and one for the participant. The imitation task consisted of a baseline phase, a demonstration phase, an immediate imitation phase, and a delayed imitation phase. The preference task consisted of a question that the children were asked after the delayed imitation phase ended. The children (German and Chinese sample) were presented with the imitation and the preference task. Half of the children in each sample participated in the immediate imitation phase (practice group), the other half of the children did not (no-practice group). During the baseline phase, children were presented with each of the four sets of objects on a white activity board, which was positioned in front of the children. In the demonstration phase, participants watched both action sets belonging to one set that were presented consecutively, one action set being presented by the German model, the other one being presented by the Chinese model. If the child looked away during the video presentation, the experimenter who was sitting next to the child reminded the child to watch the videos closely and focused the child's attention back to the screen. All videos followed the same general procedure. First, a bell rang to focus child's attention to the closed curtain presented on the laptop. Then, the curtain opened and the model looked directly at the child for approximately 5 s. After that, the model

Table 3. Action steps performed with each set of action. The picture illustrates the starting position from participants' view

Item		Target action	
		Action set A	Action set B
		The bridge	
	Stepp 1	Tip over the blue block on its left side	Tip over the red rectangular prism on the short side
	Stepp 2	Place one edge of the red rectangular prism on one edge of the blue block	Place the blue block beneath the long vertical side of the red prims
	Stepp 3	Place the blue ball on one of the upper yellow millings	Place the blue ball on the upper yellow milling of the blue block
		The bookend	
	Stepp 1	Put the L-shaped red object in an upright position	Put the blue rectangular prism in a flat position
	Stepp 2	Lean the yellow building brick on the longer side of the L-shaped object	Place the L-shaped red object beneath the blue prism with the short side at the short side of the prism and with the long side in 45° to the longest side of the prism
	Stepp 3	Lean the blue rectangular prism on the yellow flat building brick with the longer side of the right angle	Put the yellow building brick in horizontal position on the top of the blue prism
		The rod	
	Stepp 1	Put together the two parts of the red squared block with the round opening	Put together the two parts of the red squared block with the round opening and bring it in an upright position
	Stepp 2	Rotate the rod with a 180° turn and position it within the round opening of the red squared block	stick the rod through the round opening of the red squared block
	Stepp 3	Position the blue ball on top of the rod	Position the blue ball right and the yellow ball left of the red squared block
		The box	
	Stepp 1	Put the yellow stick into the opening of the box	Close the box and rotate it with a 180° turn
	Stepp 2	Close the box (repelling magnets)	Put the yellow stick into the opening of the box
	Stepp 3	Push the red bar on the yellow stick and use it to close the lid of the box	Push the red bar on the yellow stick

Item		Target action
		Action set B
	Stepp 1	Close the box and rotate it with a 180° turn
	Stepp 2	Put the red bar into the opening of the box
	Stepp 3	Put the yellow stick through the opening of the red bar

looked at the first object and performed the three-step action set with all three objects. Finally, the model looked back to the child and the curtain closed. Then, the second video was presented directly after the first one and followed the same procedure. Note that two pairs of action sets (action set A, action set B) that both models presented counterbalanced across participants were videotaped for each set of objects (see Table 3). Further, four different orders of set of objects that were balanced across participants were used.

Children in the practice group participated in an immediate imitation phase and in the deferred imitation phase. In the immediate imitation phase, children were given the set of objects they had seen in the preceding two video sequences and instructed them to play with the objects. Thirty seconds after the child's first touch of the objects or when the child rang a bell and signalized that he or she finished playing, objects were removed and the next pair of videos was presented. Children in the no-practice group participated only in the deferred imitation phase. Instead of participating in the immediate imitation phase, these children had a look at a picture book for thirty seconds after watching each pair of videos. When children had completed the four sets of objects, they were allowed to choose a toy as a reward and were told that they play together again after a one-week delay. Then, they were brought back to their parents or to their playgroup, respectively. After one week, children were tested in the same room as before and were asked if they remember the last session. Then, children were presented the objects with a neutral instruction ("Now again, it is your turn to play!") in the same order as during baseline phase and the immediate imitation phase. The preference task started after children finished playing with the four sets of objects. The experimenter presented a photograph of both models and asked the child, with which model he or she would like to share his or her toys with. Finally, children could choose a toy and were brought back to their parents or to their playgroup.

2.4 Coding and analyses

Children's behavior was coded from videotapes. The time when the experimenter had placed the last object in front of the child until the child's first touch of an object was coded as latency. Furthermore, mean number of imitated action steps was calculated for each action set. A step was coded as imitated when children performed the same movement with the same object as the model had demonstrated. Children could reach a score from 0 to 3 for each set of objects. As there were two action sets within each set of objects, a score from 0 to 24 could be reached for each of the three different phases (baseline, immediate imitation, deferred imitation). In addition, preference towards the models was coded and a chi square test within the German and Chinese sample was calculated. The influence of the model's race and the influence of the delay on imitation performance was tested within the practice group in a mixed 2 (German model, Chinese model) x 2 (immediate imitation phase, deferred imitation phase) x 2 (German sample, Chinese sample) ANOVA with model and session as within and sample as between factor with number of imitated steps and latency as dependent variable. The influence of the model's race on deferred imitation was tested between the no-practice and the practice group in a mixed 2 (German model, Chinese model) x 2 (no-practice group, practice group) x 2 (German sample, Chinese sample) ANOVA with model as within subject and group and sample as between subject factor. Again, imitated steps and latency as dependent variable were used. A second independent rater coded 25% of the videos. Interrater agreement was $\kappa = .94$, $p < .001$ for imitated steps, $\kappa = .88$, $p < .001$ for latency and $\kappa = .99$, $p < .001$ for preference.

3 Results

To test for differences in the baseline phase, two ANOVAs with the between-subject factors sample (German sample, Chinese sample) and group (no-practice group, practice group) were calculated for latency and number of "imitated" action steps. Descriptive data are presented in Table 4. For

Table 4. Descriptive data separated for time of measurements and sample

	Mean Score of Imitated Action Steps				Mean Score of Latency			
		German Sample		Chinese Sample		German Sample		Chinese Sample
Time of Measurement	*n*	*M* (*SD*)	*n*	*M* (*SD*)	*n*	*M* (*SD*)	*n*	*M* (*SD*)
Baseline	84	4.33 (2.18)	83	4.15 (2.00)	73	6.06 (2.93)	83	7.38 (3.91)
Immediate Imitation					41	3.60 (1.83)	39	4.59 (1.33)
German Model	42	4.41 (2.00)	39	4.28 (3.07)				
Chinese Model	42	4.19 (2.09)	39	4.10 (2.53)				
Deferred Imitation					82	3.68 (2.29)	80	4.43 (1.17)
German Model	82	2.71 (1.72)	83	3.76 (2.12)				
Chinese Model	82	3.42 (2.17)	83	2.47 (1.55)				

latency results revealed no significant main effect or interaction (all *p*-values > .20). Similarly, for the number of imitated action steps, neither a significant main effect nor a significant interaction was obtained (all p-values > .50). Thus, the four groups did not differ in their baseline level in the beginning of the immediate imitation phase.

To investigate children's preference towards the German or the Chinese model a chi square test was calculated [$\chi^2(1) = 61.71$, $p < .001$]. It revealed a clear preference for Chinese children towards the Chinese model (NchineseModel = 67, NGermanModel = 16), whereas the German children preferred the German model (NChineseModel = 15, NGermanModel = 64).

To analyze effects of immediate compared to deferred imitation, two analyses of variance for the practice group were calculated, one for latency and one for mean number of imitated action steps. First, a mixed ANOVA for the number of imitated action steps with the within-subject factor session (immediate imitation phase, deferred imitation phase) and model (German model, Chinese model) and between-subject factor sample (German sample, Chinese sample) was calculated. Results revealed a significant main effect of session [$F(1,79) = 64.47$, $p < .001$, $\eta^2 = 0.45$]. Children imitated

more action steps during the immediate (M = 4.25, SD = 2.42) compared to the deferred imitation phase (M = 3.12, SD = 2.01, see Figure 7). No significant effect was found of model [$F(1,79) = 1.16$, $p = .284$, $\eta^2 = 0.01$] or sample [$F(1,79) = 0.01$, $p = .949$, $\eta^2 = 0.00$] nor of any interaction ($p > .20$). As second analysis, a similar mixed ANOVA for the independent variable latency was calculated with the within-subject factor session (immediate imitation phase, deferred imitation phase) and the between-subjects factor sample (German sample, Chinese sample). The factor model (German model, Chinese model) was not included because latency could not be measured independently for both models. Results revealed no difference between the immediate (M = 4.09s, SD = 1.58) and the deferred imitation phase (M = 4.27s, SD = 1.82, $F(1,78) = 0.53$, $p = .469$, $\eta^2 = 0.01$). However, in contrast to the Chinese sample (M = 4.48s, SD = 1.29), the German sample (M = 3.99s, SD = 2.11) touched the objects slightly faster [$F(1,78) = 3.63$, $p = .060$, $\eta^2 = 0.05$]. Furthermore, the interaction did not reach significance [$F(1,78) = 2.57$, $p = .113$, $\eta^2 = 0.03$].

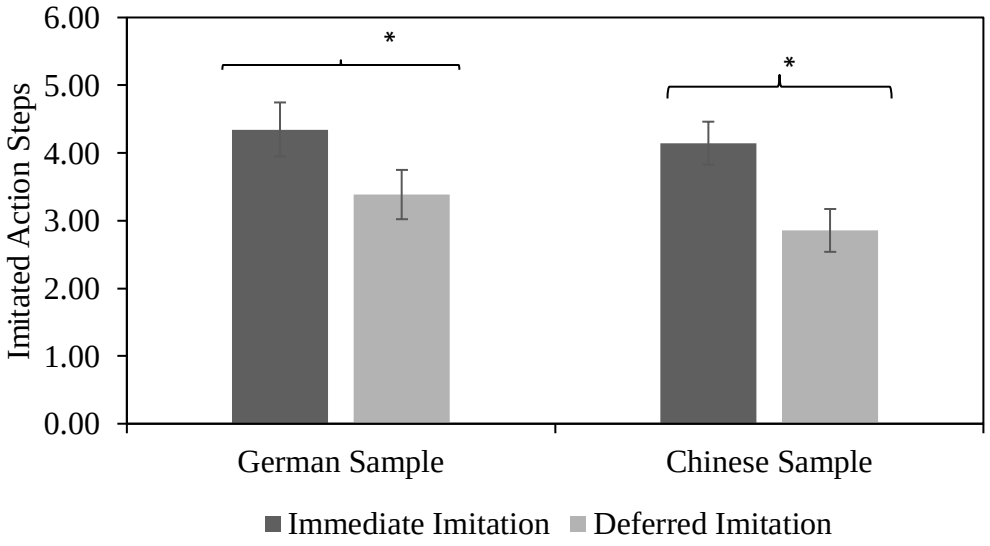


Figure 7. Mean number of imitated actions in the immediate and deferred imitation phase. Error bars indicate standard errors. Asterisks indicate significant differences (*$p < .05$).

To investigate if the direct manipulation of the objects had an influence on deferred imitation, we ran two analyses. First, a mixed ANOVA with sample (German sample, Chinese sample), group (no-practice group, practice group) as between-subject factors and model (German model, Chinese

model) as within-subject factor was calculated for imitated action steps as dependent variable. Results revealed no significant main effect for model [$F(1,161) = 1.94$, $p = .165$, $\eta^2 = 0.01$]. However, the interaction between model and group reached significant level [$F(1,161) = 6.10$, $p = .015$, $\eta^2 = 0.03$]. Subsequent paired t-test showed, that the practice group imitated the German model ($M = 3.57$, $SD = 2.04$) more frequently [$t(82) = -2.44$, $p = .017$, Cohen's $d = -0.39$] compared to the Chinese model ($M = 2.78$, $SD = 1.98$), whereas no difference appeared between the two models within the no-practice group [$t(81) = 0.66$, $p = .514$, Cohen's $d = 0.12$]. Analyses also revealed a significant interaction between model and sample [$F(1,161) = 24.03$, $p < .001$, $\eta^2 = 0.12$]. Subsequent paired t-tests revealed, that the German sample imitated the Chinese model ($M = 3.42$, $SD = 2.17$) more frequently [$t(81) = 2.38$, $p = .019$, Cohen's $d = -0.36$] compared to the German model ($M = 2.71$, $SD = 1.72$). Similarly, the Chinese sample imitated the German model ($M = 3.76$, $SD = 2.12$) more frequently [$t(82) = -4.41$, $p < .001$, Cohen's $d = 0.70$] compared to the Chinese model ($M = 2.47$, $SD = 1.55$, see Figure 8). Further main effects and interactions did not reach significance level ($p > .20$). As second analysis, a mixed ANOVA with sample (German sample, Chinese sample) and group (no-practice group, practice group) as between-subject factors for the dependent variable latency was calculated. Results revealed marginally significant differences of factor sample [$F(1,77) = 3.38$, $p = .070$, $\eta^2 = 0.04$]. The German sample touched the objects slightly faster ($M = 3.68$s, $SD = 2.29$) than the Chinese sample ($M = 4.43$s, $SD = 1.17$). There was no other significant result neither of the factor group [$F(1,77) = 2.00$, $p = .161$, $\eta^2 = 0.02$] or of the interaction between both factors [$F(1,77) = 0.56$, $p = .458$, $\eta^2 = 0.01$].

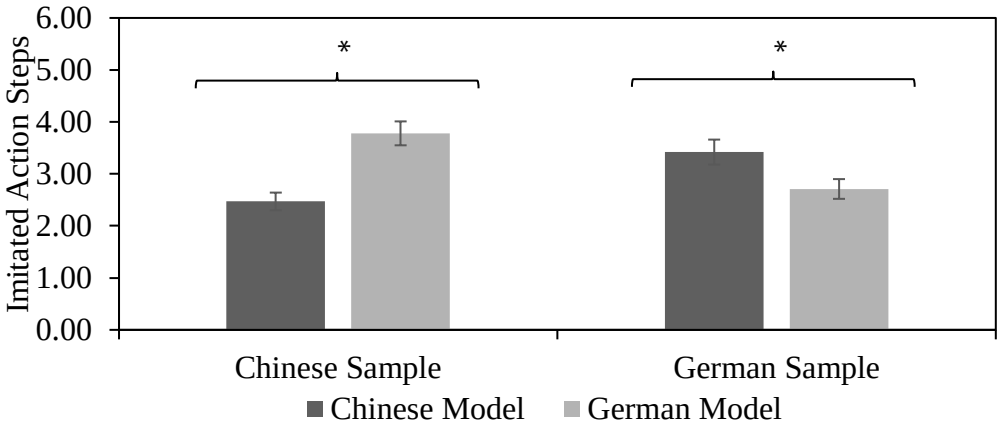


Figure 8. Number of imitated action steps within deferred imitation phase depending on the model and the group. Error bars indicate standard errors. Asterisks indicate significant differences (*$p < .05$).

4 Discussion

The aim of this cross-cultural study was to investigate the influence of the model's group membership on children's imitation of demonstrated actions and their preference for the models who performed these actions. Thus, immediate imitation, deferred imitation and preference of Chinese and German three- to four-year-old children were measured after a Chinese and a German model presented novel actions on objects. As expected, results showed an in-group bias in their preference within both the German and the Chinese sample. Chinese children preferred the Chinese model compared to the German model, whereas German children preferred the German model compared to the Chinese model. Further, results revealed no in-group bias in immediate imitation, thus, no difference in imitative performance was obtained after observing the German or the Chinese model, replicating previous results (Krieger et al., 2016). After a one-week delay, imitative performance, however, revealed a reverse in-group bias within both samples, that is, the German children showed more action steps previously presented by the Chinese model and the Chinese sample imitated the German model more frequently. Finally, the possibility to manipulate the objects immediately after the presentation of both models did not alter the imitative performance one week later. However, children of the practice group imitated the German model more frequently than the

Chinese model during deferred imitation phase. Within the no-practice group, children's imitation of both models did not differ.

In accordance with previous research (Bar-Haim et al., 2006; Kinzler et al., 2009; Kinzler & DeJesus, 2012; Sangrigoli & de Schonen, 2004b) children of both samples preferred their in-group model. German children preferred the German model, whereas Chinese children preferred the Chinese model. This can be explained by familiar properties of the physical appearance of the respective in-group model that provided cultural information due to an evolutionary function (Aboud, 1988; Clark & Clark, 1940; Goodman, 1970; Holmes, 1995) and influenced children's preference (Kinzler et al., 2010).

Although there was a preference for the in-group model, this did not affect immediate imitative performance. Thus, the model's group membership did not affect immediate imitation, which replicates recent research (Krieger et al., 2016). Previous findings suggested that children's imitation is more strongly influenced by a model's language (Howard et al., 2015) as language is more prominent than the model's physical appearance (Krieger et al., 2016). This finding suggests that the finding of an in-group bias that involve a model's physical appearance might be mediated by the children's identification of the model's physical appearance with the own or a foreign culture. This interpretation is also in line with a recent study in which children's preference was mainly influenced by a model's accent and not by a model's facial appearance (Kinzler et al., 2009). In the present study, no language was available as cue for group membership. This might be an explanation for the observation that children did not differ in their immediate imitative performance. Another possible explanation might be related to the type of action used in the present study. Previous studies (e.g. Howard et al., 2015) often used irrelevant (i.e., not necessary to obtain a goal) as well as relevant actions (i.e., necessary to obtain a specific goal). Interestingly, significant differences between the (linguistic) in-group and out-group model were only found for irrelevant actions, both in infants (Buttelmann et al., 2013) and in early childhood (Howard et al., 2015). In contrast to that, only relevant actions were used within the present study

as well as in the study by Krieger et al. (2016). As children tend to imitate any seemingly knowledgeable behavior of an adult due to norm learning (Kenward, 2012; Keupp et al., 2013), participants of the present study might have encoded all actions as causally relevant and immediately imitated all actions regardless of the model who presented the actions (Lyons et al., 2007). This assumption is supported by a recent study by Krieger et al. (2018) that found evidence for an in-group bias for irrelevant but not for relevant actions. Thus, we assume that the relevance of the modelled actions is responsible for not finding an in-group bias in immediate imitational performance within the present study.

However, we did find an influence of group membership on deferred imitation: After a one-week delay, German children imitated the Chinese model more frequently compared to the German model whereas Chinese children imitated the German model more frequently than the Chinese model. How can this reverse in-group bias be explained? A possible explanation of this unexpected result might be based on curiosity. Recent research found evidence for better rehearsal of information participants were curious about (Gruber, Gelman, & Ranganath, 2014; Kang, Hsu, Krajbich, Loewenstein, McClure, Wang, & Camerer, 2009). In these fMRI studies, participants rated their curiosity towards a series of trivial questions and performed a surprise recognition memory test concerning the answers to these questions afterwards. Results revealed that participants showed improved memory immediately (Gruber et al., 2014) and one and two weeks later (Kang et al., 2009) for information, which participants were curious about. Authors assumed, that this information was better stored and thus better recalled after delay. Within the current study, children might imitate both models equally frequent during immediate imitation because all actions were encoded as causally relevant (Lyons et al., 2007). However, children might have been more curious about the foreign model due to differences in physical appearance and were more interested in the actions. Thus, curiosity possibly influenced memory (Kang et al., 2009), which then resulted in the children's higher deferred imitation

of the out-group compared to the in-group model. The connection between curiosity and memory has been shown in previous research as the same brain regions that were associated with storage (Düzel, Penny, & Burgess, 2010; Lisman, Grace, & Duzel, 2011) were activated more during states of curiosity (Gruber et al., 2014; Kang et al., 2009). Since the present study is the first study that investigated influences of delay on an in-group bias, we can only assume curiosity as a possible explanation. To verify this assumption, further studies with infants and children integrating behavioral and neuroimaging measurements are needed to investigate underlying mechanisms of learning through imitation over time in more detail.

The present study replicated previous research by finding a decline in immediate compared to deferred imitation (Klein & Meltzoff, 1999), which can be explained by forgetting during the delay between demonstration and imitation (Meltzoff, 1985). A further explanation of the decline in performance is the limited persistence of declarative memory early in life (Bachevalier & Mishkin, 1994; Squire, Knowlton, & Musen, 1993). The formation of declarative memories matures approximately at the age of six months (Collie & Hayne, 1999; Diamond, 1990; Diamond, 1995) and is associated with structures in the human brain that are believed to be immature in the human infant brain (Barr et al., 1996) and which are believed to have not yet completed their development by the age of four to five years (Eckenhoff & Rakic, 1991). Inferential, declarative memory is not fully developed in infancy and early childhood, which hampers memory performance and might have led to a decline in imitational performance between sessions within the current study.

Finally, the present study investigated whether children's deferred imitation is influenced by a preceding imitation directly after the demonstration. Results revealed no difference in deferred imitative performance regardless of whether or not children have had the possibility to manipulate the objects one week before. This finding is not in line with previous study testing infants that showed that practice compared to no

practice after presentation enhanced deferred imitational performance after delay for 9- and 14-month-old (Heimann & Meltzoff, 1996) and 18-month-old infants (Hayne, Barr, & Herbert, 2003). However, it is assumed that the ability to preserve memories of one-time presented events emerges gradually over the second year of life (Bauer & Leventon, 2013). Thus, three- to four-year-old children of the present study in the no-practice group were probably able to preserve the presented actions over a delay of one week and, thus, did not show differences in deferred imitational performance compared to children of the practice group. This is also in line with previous research showing that children remembered events that they experienced only once, over longer delays (e.g., Hamond & Fivush, 1991; Rudy & Goodman, 1991). However, the German model was imitated more frequently compared to the Chinese model during deferred imitation phase but only within the practice group. Thus, immediate imitation affected deferred imitational performance if group membership was manipulated as well. Further research should take factors like group membership into account when investigating deferred imitation to avoid confundations.

Concerning the overall cross-cultural comparison, both the German and Chinese sample showed the same pattern of results within almost all analyses. That is, the model's group membership influenced their immediate and deferred imitation as well as children's preference in the same way. Thus, not only imitation itself but also its interaction with the model's group membership seemed to be stable across various cultures. This pattern of results is not self-evident because the Chinese culture differs in various ways from the Western culture (Nisbett et al., 2001; Wang, 2004). The results of the present study provided further evidence that imitative performance is independent of the culture children grow up with (Callaghan et al., 2011; Graf et al., 2014; Lieven & Stoll, 2013; Wang et al., 2012).

E Study 4: Krieger, Zmyj, & Aschersleben, 2018

In-Group Bias and Affiliative Imitation in Preschoolers

1 Introduction

Humans are reliant on the transmission of cultural knowledge and have evolved mechanism to transmit knowledge through communication (Csibra & Gergely, 2011). Imitation is, for example, one important mechanism that enables children to learn novel actions from others (Meltzoff, 1988) and share cultural knowledge with others (Király, Csibra, & Gergely, 2013). However, children differentiate others regarding a number of characteristics such as their group-membership, age and reliability (see Flynn & Smith, 2012 for a review). One important effect, the so-called in-group bias, describes the systematic tendency to prefer members of the in-group over the out-group (Hewstone et al., 2002). There is growing evidence, that group membership influences preference towards in-group members or choices made by the in-group (e.g., Shutts et al., 2010). In addition, previous research showed that already infants rather imitate actions of an in-group member than those of an out-group member (e.g., Buttelmann et al., 2013) and thus are influenced by members of their in-group (e.g., Bar-Haim et al., 2006) and. This effect was also found in three-year-old children for imitational learning (Howardet al., 2015) and for learning functions of objects (Oláh, Elekes, Petõ, Peres, & Király, 2016). In these studies, language was used as a cue for group membership. However, no influence of group membership was found, when physical appearance was used as a cue for group membership (Krieger et al., 2016). One explanation is that children do not regard the other person's race as important characteristic (see also Kinzler et al., 2009). Thus, although children are well aware of the differences in physical appearance but these differences are not sufficient to evoke preferences in imitational performance, at least in normal situations. If children's desire to belong to a group is enhanced through external circumstances their in-group bias

might also extend to a model's race. The desire to be accepted and liked by others is called affiliation (Youngleson, 1973). There is growing evidence that children imitate to affiliate with other people (Over & Carpenter, 2009, Slaughter, Nielsen, & Enchelmaier, 2008). Over and Carpenter (2009), for example, investigated whether third-party ostracism increases affiliative imitation in five-year-olds. They primed a group of children by presenting videos of a shape that was ostracized by three other shapes whereas another group of the children observed a control video without any third-party ostracism. Results revealed that children who were primed with ostracism imitated the actions presented by a model more closely than children who were not primed with ostracism. Thus, children are sensitive to social exclusion and modify their behavior accordingly (Over & Carpenter, 2009). Thus, children's need to affiliate with others can be induced through the demonstration of third-party ostracism. Considering that humans rather try to affiliate with their in-group than with members of an out-group (Festinger, 1954, Schachter, 1959), the need to affiliate with others through ostracism might also be influenced by group membership. Previous research investigated this question for five- to six-year-olds (Watson-Jones et al., 2016). Children were either excluded or included by in- or out-group members. Afterwards, children observed videos of either an in-group or an out-group member presenting novel actions. Results revealed higher-fidelity imitation after exclusion compared to inclusion. Furthermore, group membership influenced imitational performance as well: Children showed higher-fidelity imitation after being ostracized by their in-group. Exclusion of the out-group did not influence children's imitation scores. One mentioned explanation is, that the experience of ostracism altered the way in which participants processed presented information because ostracism enhances recall of social information (Gardner et al., 2000). Another explanation might be that children used imitation strategically to integrate themselves with another group (see Lakin, Chartrand, & Arkin, 2008; Legare & Nielsen, 2015). To answer the question, which explanation is more probable, the present study used third-party ostracism. Thus, children were not directly included or excluded by

their in-group members (Watson-Jones et al., 2016), but they observed ostracism of others. If ostracism alter the way of processing information, children should not differ in their imitation of both the Caucasian and the Asian model. If children imitate to affiliate, they should imitate the in-group model more frequently. Thus, based on the design used in Krieger et al.'s (2016) study and the videos of third-party ostracism designed by Over & Carpenter (2009), the influence of model's group membership on the effect of third-party ostracism is investigated in the present study.

The current study follows two main aims, (i) to replicate the effect of ostracism on imitation (Over & Carpenter, 2009; Watson-Jones et al., 2016) in younger children, and (ii) to investigate whether a model's group membership moderates the influence of ostracism on imitation. For that purpose, three- and four-year-old children watched videos of third-party ostracism. Subsequently, children observed either an in-group or an out-group model demonstrating actions on novel objects. Results were compared two control groups who had watched a video with no shape being excluded. Replicating previous research (Over & Carpenter, 2009; Watson-Jones et al., 2016), we expected higher imitation scores when children had been primed with ostracism compared to when they had watched a control video. Furthermore, we expected an interaction between ostracism (i.e., present, absent) and the model's group membership (in-group, out-group). Children were expected to imitate more when ostracism was present and they observed an in-group model than in the other three conditions. Moreover, replicating previous findings that physical appearance does not evoke an in-group bias in imitation, no difference in imitation between in-group and out-group model was expected in the ostracism absent conditions (Krieger et al., 2018).

2 Method

2.1 Participants

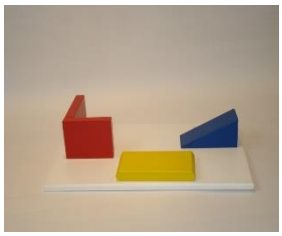
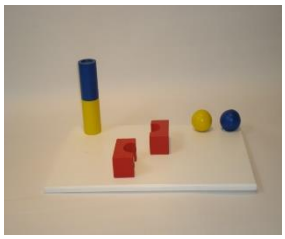
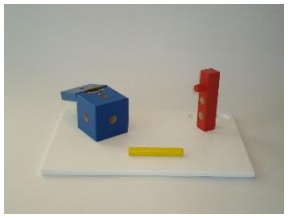
The current study was conducted in a medium-sized German city with participants recruited from a database of parents who had earlier expressed interest in volunteering for research on child development. A total of sixty-four three- and four-year-old boys [n = 32, M = 4,1 (years,months), range = 3,1-4,9] and girls [n = 32, M = 4,1 (years,months), range = 3,0-4,9] participated and were randomly assigned to one of four conditions (in each condition: *n* = 16). Children's age and the distribution of their sex did not differ between conditions. Four additional children were tested but not included in the final analyses because of motivational reasons (*n* = 3) and technical problems (*n* = 1). This study has been conducted in accordance with ethical guidelines and received ethical clearance by the local ethics committee at the Saarland University.

2.2 Materials and design

The testing material consisted of four sets of three colored wooden building bricks that were identical to the material used in Krieger et al. (2016). Each set (i.e., the bridge, the bookend, the rod and the box) consisted of three different steps. For the bridge, for example, the model first tipped over the blue block on its left side. Then, one edge of the red rectangular prism was placed on one edge of the blue block. Finally, the blue ball was placed on one of the upper yellow millings. Action steps for each set of action are described in Table 5 (for closer descriptions see Krieger et al., 2016).

Two televised models demonstrated the four sets. Both the in-group model and the out-group model were female and 22 and 23 years old, respectively. They showed race-specific features (e.g., hair, eye color, eye relief, facial proportions) and thus differed in their racialappearance. Videos were closely matched concerning velocity of the action steps, duration of

Table 5. Action steps for each set of objects. The pictures illustrate the starting position from the participants' perspective

Item		Target action
		The bridge
	Step 1	Tip over the blue block on its left side
	Step 2	Place one edge of the red rectangular prism on one edge of the blue block
	Step 3	Place the blue ball on one the right upper yellow milling of the red rectangular prism
		The bookend
	Step 1	Put the L-shaped red object in an upright position
	Step 2	Lean the yellow building brick on the longer side of the L-shaped object
	Step 3	Lean the blue rectangular prism on the yellow flat building brick with the longer side of the right angle
		The rod
	Step 1	Put together the two parts of the red squared block with the round opening
	Step 2	Positioning the rod within the round opening of the red squared block
	Step 3	Positioning the blue ball on top of the rod
		The box
	Step 1	Put the yellow stick into the opening of the box
	Step 2	Close the box
	Step 3	Push the red bar on the yellow stick and use it to close the lid of the box

demonstration and amplitude of actions. First, a bell rang and a curtain opened. Then, the model looked towards the camera to get children's attention for four to five s. Then, the model presented each action step. After presentation, the model looked again towards the camera and the curtain closed again. Further, the bell that was used in the videos was given to the children during testing as a signal that they have finished playing with the objects.

A second set of videos was used to induce the feeling of ostracism. This set of videos was identical to the videos that were used in Over and Carpenter

(2009) . There were two ostracism videos, one control video, and one final video. In one of the ostracism videos, four shapes without any facial feature or any use of language moved around the screen. Three of the four shapes played ball and excluded a fourth one. The other ostracism video followed the same procedure but only two shapes excluded the last one. In the control video, two shapes and one butterfly moved around the screen. Identical to the ostracism videos, the two shapes played ball. However, the butterfly only moved around the screen without any connection to the shapes and without leaving the impression to be ostracized. A final video showed seven shapes playing together. This video was presented after the imitation task to alleviate any negative feeling, which may have been induced via the ostracism videos.

Children were tested in a 2x2 between-subjects design. The first factor was the presentation of ostracism (present/absent). The second factor was the model's group membership (in-group/out-group).

2.3 Procedure

A female experimenter individually welcomed the child and his or her parent who waited in a separate room and were asked to complete questionnaires while waiting. The testing room was equipped with a table, two chairs, and a laptop (15.6´´). The experimenter started the testing session with asking the child to ring a bell that was placed on the table to test handedness of the child. Then, the child was allowed to play with each set of objects for 30 s or until children rang the bell (baseline phase). Next, a photograph of each model (Caucasian and Asian) was presented and the child was asked, with which model they would rather share their toys. Afterwards, either both ostracism present or ostracism absent videos were presented to the child, while the experimenter turned away from the child and pretended to fill in some forms . Then, the experimenter showed the first video of either the in-group or the out-group model. Immediately after the end of the first video, the child was handed over the corresponding objects ("Now it is your time to play"). After 30 s or when the child rang the

bell, the experimenter removed the objects and started the next demonstration video. This was done until the child had played with the last of the four object sets. For the demonstration videos, four different orders of sets of objects were used and balanced across condition. At the end of the experiment, the final video was played to alleviate any negative feeling, which may have been induced during the presentation of the ostracism videos. Then, the child could choose a toy and were brought back to their parents who received travel compensation. Each session was videotaped by a camera (Canon Legria FS200E) and was placed opposite the child.

2.4 Coding

For each set of objects, children's responses were coded for number of target action steps and latency. Latency was measured as the time when the experimenter had placed the last object in front of the child until the child's first touch of an object. A target action step was coded as performed when the child did the same movement with the same object as the model. For each target action step, children could reach a score from 0 to 3, where 0 indicated that children did not imitate any of the presented action steps and a score of 3 that all three action steps were imitated. In total, children could reach a score from 0 to 12.

3 Results

Two ANOVAs with the between-subjects factor group membership (ostracism present/in-group, ostracism present/out-group, ostracism absent/in-group, ostracism absent/out-group) was calculated to test for differences in the imitation of target action steps during baseline phase. Results revealed no difference between groups neither for target action steps [$F(3,60) = 2.02$, $p = .121$, $\eta^2 = .09$] nor for latency [$F(3,60) = 1.50$, $p = .225$, $\eta^2 = .07$]. Additional preliminary analyses of the main data revealed no

effect of sex or presentation order neither on target action steps nor on latency (p>.10) except for a main effect of the factor age (p = .047) indicating that four-year old children imitated more action steps than three-year olds.

A 2 (ostracism: present/absent) x 2 (model: Caucasian/Asian) ANOVA revealed a main effect for group [$F(1,60) = 3.87$, $p = .045$, $\eta^2 = .06$]. In the ostracism present condition, in which children had watched videos of third-part ostracism, children imitated more action steps (M = 8.19, SD= 2.66) compared to the children in the ostracism absent condition (M = 6.88, SD = 2.66). For the factor model a marginal main effect [$F(1,60) = 3.51$, $p = .056$, $\eta^2 = .06$] indicating that children tended to imitate the in-group model (M = 8.16, SD = 2.66) more frequently than the out-group model (M = 6.91, SD = 2.66). A marginal significant interaction of group and model [$F(1,60) = 2.85$, $p = .085$, $\eta^2 = .05$] was obtained (see Figure 9). As we predicted a moderating effect of the model on the effect of the ostracism video, this interaction was further investigated. Children imitated the in-group model more frequently after having seen the ostracism video (ostracism present: M = 9.38, SD = 2.68) as compared to children from the control group (ostracism absent: M = 6.94, SD = 2.68, $t(30) = 2.43$, $p = .021$, $\eta^2 = .86$). However, no influence of the ostracism present condition was obtained for children who had watched the out-group model (ostracism present: M = 7.00, SD = 2.00, ostracism absent: M = 6.81, SD = 2.92, $t(30) = 0.21$, $p = .833$, $\eta^2 = .075$). As expected, children in the ostracism absent condition did not show a difference in the imitation score between both models (in-group: M = 6.94, SD = 2.68, out-group: M = 6.81, SE = 0.73, $t(30) = 0.14$, $p = .904$, $\eta^2 = .00$). For latency, an analogous ANOVA revealed no main effect of the factor ostracism [$F(1,60) = 0.00$, $p = .954$, $\eta^2 = .00$], or an interaction of model and ostracism [$F(1,60) = 1.19$, $p = .279$, $\eta^2 = .02$]. The main effect for model [$F(1,60) = 3.29$, $p = .075$, $\eta^2 = .05$] reached marginal significance. To investigate the preference towards the models, a chi square test revealed that children preferred the in-group model [$n = 43$, $\chi^2(1) = 34.91$, $p < .001$].

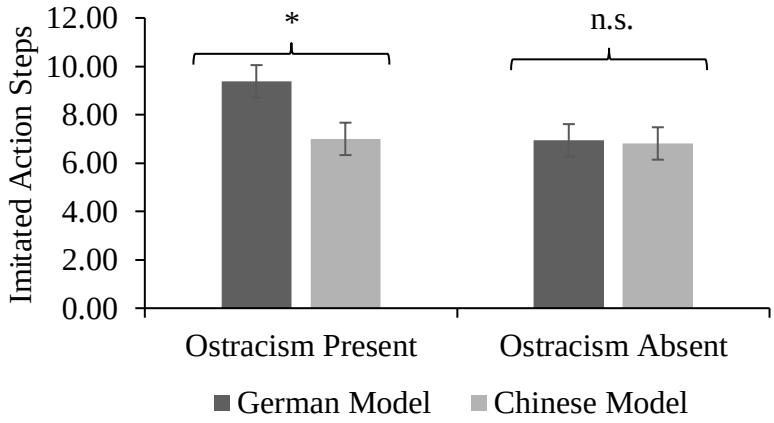


Figure 9. Target action steps after demonstration of actions within ostracism present and ostracism absent condition separated for the in-group and out-group model. Error bars indicate standard errors. Asterisks indicate significant differences (*p < .05, n.s., not significant).

4 Discussion

The present study aimed to test whether ostracism increase the children's in-group bias when imitating others. First, the study replicated a previous finding with older children, that ostracism increases imitation in children. Second, this effect was only present when children observed the in-group model, but not the out-group model. In addition, children showed a preference for the in-group model compared to the out-group model.

These results replicate the finding that children are influenced by their need to belong (Over & Carpenter, 2009). The current study extends this finding by showing that the effect of ostracism on imitation is present already at the age of three to four years. Since this effect was present in both different cultures it might be based on selection process that took place in human evolution. Individuals who were ostracized from a group were less likely to survive (Lewin, 1993; McKee, Poirier, & Mcgraw, 1999). The risk of ostracism seems to be aversive for three-year-old children as they reacted sensitively to videos of third-party ostracism which did not show ostracism of humans but shapes that have no human features and were ostracized by a group of other shapes. Thus, children used imitation because they are reliant on avoiding ostracism and learning strategies to affiliate with others

early in development to establish group membership (Over & Carpenter, 2013).

Furthermore, ostracism moderated the influence of group membership on imitation. Previous research showed an influence of group membership on imitation only for linguistic in-group models (Buttelmann et al., 2013, Howard et al., 2015) but not racialappearance (Krieger et al., 2016). Children of the ostracism absent condition did not differ in their imitation, whereas children of the ostracism present condition imitated the in-group model more frequently. Thus, we suggest that children do not information like physical appearance when imitating spontaneously in normal situations. However, when primed with ostracism, children used physical appearance of the models to decide which model they imitate. In the context of ostracism, children use cues for group membership that they usually do use to decide which group they affiliate to. Some evolutionary accounts suggest that this behavior became selected because individuals with a high motivation to affiliate with in-group members were better protected by the groups than individuals with a low motivation to affiliate with in-group members (Lewin, 1993; Poirier & McKee, 1999). Along this evolutionary line, one can explain why ostracism influenced the imitation of in-group but not out-group members: Out-group members usually do not protect an individual who is in danger. This replicates previous research for five- to six-year-olds (Watson-Jones et al., 2016). However, the question arise, if the experience of ostracism altered the way in which participants processed presented information because ostracism enhances recall of social information (Gardner et al., 2000) or if children used imitation strategically to integrate themselves with another group (see Lakin et al., 2008, Legare & Nielsen, 2015). Results of the current study supports the latter view. If ostracism have altered the way of processing social information, then imitation of both the in-group and the out-group model should have increased after the experience of ostracism because both models presented the same social information. Thus, experience of third-party ostracism enhanced the need to belong which lead to the use of affiliation strategies

like increase of imitational behavior of in-group members. Since the children, who were ostracized, preferred the in-group model more frequently whereas children within the ostracism absent condition did not prefer one of the models, we suggested that not only imitational behavior but preference as well are used to affiliate with the in-group after ostracism.

To conclude, the current study showed that in the context of ostracism, children show the in-group bias towards a same-race model compared to an other-race model. This study specifies previous findings on the influence of ostracism on imitation suggesting that this effect is limited to in-group members. This study also showed that the link between ostracism and the in-group bias is already present in three- to four-year-olds. It might be a fruitful avenue for future research to investigate whether the feeling of belonging in early years decrease interracial prejudices which are notoriously virulent in multiracial societies.

F Study 5: Krieger, Buttelmann, & Aschersleben, 2018

Selective Suppression of Overimitation for In-Group over Out-Group members in Six-Year-Olds

1 Introduction

Learning through imitation is an adaptive strategy that enables cultural transmission (Nielsen, 2012; Whiten, Hinde, Laland & Stringer, 2011). Consequently, it is mediated by the learner's social groups, like peers, and induced behavioral variability in dependence of cultural background (Shweder, Goodnow, Hatano, LeVine, Markus & Miller, 2006; Super & Harkess, 1986). Recent research focusing on group membership as a critical factor of imitation revealed an in-group bias in toddlers. That is, they show the tendency to preferably adopt behavior or actions from an in-group as compared to an out-group model (Aronson et al., 2010). This effect is present even in infancy: already 10-month-olds prefer adult speakers from their linguistic in-group (Kinzler et al., 2007) and more frequently imitate these over speakers of a foreign language (e.g., Buttelmann et al., 2013). However, research on the in-group bias in older children revealed inconsistent findings. For example, three-year-olds show a tendency to selectively imitate the actions demonstrated by a linguistic in-group compared to an out-group model (Howard et al., 2015). Four-year-olds, in contrast, did not show any in-group preference in imitative performance when an in-group (i.e., German) and an out-group (i.e., Chinese) model presented novel actions when physical appearance rather than language was given as cue for group membership (Krieger et al., 2016). A possible explanation that has not yet been investigated systematically might be the type of action presented, in particular its relevance for obtaining the goal. Howard et al. (2015) presented toy sets with two accompanying actions each. One action (so called 'manner action') that was irrelevant for obtaining a specific goal (e.g., put head to light) and another action (so-

called 'goal action') that was relevant for obtaining the goal (e.g., push light to turn on light). In contrast, in the study by Krieger et al. (2016) only relevant actions were presented. Interestingly, both studies did not find an in-group bias in the imitation of relevant actions. However, in the Howard et al. (2015) study, children imitated more irrelevant actions from the in-group model, thus, revealing an in-group bias.

The imitation of causally irrelevant action steps, so-called overimitation (e.g., Lyons et al., 2007) emerges early in childhood (McGuigan & Whiten, 2009; Nielsen & Tomaselli, 2010) and can be found in various cultures (Nielsen & Tomaselli, 2010). Different accounts have been discussed to explain overimitation. The causal confusion account assumes that children are confused about the irrelevant action's causal status and so they encode all elements of an action sequence as causally relevant (Lyons et al., 2007). Thus, children persisted in copying irrelevant actions even though overimitation meant losing the game by wasting time (Lyons, Damrosch, Lin, Macris, & Keil, 2011). The affiliation account, however, explains overimitation because of children's need to affiliate with others (e.g., Over & Carpenter, 2012). Thus, children were more likely to imitate a social responsive model (Nielsen, 2006). Finally, overimitation can also be dependent on available resources. When resources are available, children imitated both the action sequence as well as the end-state correctly. However, in case of stinted resources, children imitated only the end-state of an action correctly (Bekkering, Wohlschlager, & Gattis, 2000). In conclusion, according to normative accounts, children overimitate as a result of social motivations. In contrast to the assumption of the affiliation account, children understand the causally irrelevant elements of an action sequence as an essential part of it and thus copy any action. However, children might not imitate any action but only the ones they were able to remember because children's overimitation depends on available resources.

Both the in-group bias and overimitation are of clear relevance and received growing attention from developmental researchers (e.g., Lyons et al., 2011;

Oostenbroeck & Over, 2015), but have not been linked to each other, to our knowledge. One previous study (Hoehl et al., 2014) investigated how familiarity with a model modulates preschoolers' imitation of both irrelevant and relevant actions to retrieve a reward. Results of a between-group comparison revealed that preschoolers imitated the irrelevant actions both when they were demonstrated by a familiar model and when they were shown by an unfamiliar model. Next, in a second phase, the alternative model (i.e., familiar to one group of children, unfamiliar to the other one) demonstrated only the relevant action. Results indicated, that imitation of irrelevant actions was reduced only within the group that first saw the unfamiliar model presenting both the irrelevant and the relevant action followed by the familiar model presenting the relevant action only. Thus, familiarity (in terms of previous contact) seems to affect the reduction of overimitation (Hoehl et al., 2014). Based on the assumption that children have more contact with their ethnical in-group than with an ethnical out-group, the present study adapted the design used by Hoehl et al. (2014) to investigate (i) whether a model's group membership influences overimitation in preschoolers and (ii) whether the group membership of a model performing the relevant action only modulates the reduction of overimitation. In phase 1 of the present study, either an in-group model (German) or an out-group model (Chinese) presented causally relevant and irrelevant actions to retrieve a reward from a transparent apparatus. During phase 2 of the study, the alternative model (i.e. the one not observed in phase 1) presented only the relevant action shown in phase 1. In addition to these two experimental groups (in-group-first and out-group-first condition), a third group of same-aged children interacted with the apparatus without any prior demonstration (baseline condition). In phase 1, children in both experimental conditions were expected to show more irrelevant and relevant actions compared to children in the baseline condition independently from the model's group membership, thereby demonstrating that social learning took place. Furthermore, the model's group membership was expected to influence imitation of irrelevant actions in phase 2. Children in the in-group-first condition should imitate irrelevant

actions to the same amount as in phase 1, even after seeing the out-group model perform the relevant means to retrieve the reward only. In contrast, children in the out-group-first condition should imitate irrelevant actions to a lesser extent after having seen the in-group model perform the relevant means to retrieve a reward only.

2 Method

2.1 Participants

The current study was conducted in a medium-sized German city with participants recruited from a database of parents who had expressed willingness to volunteer for research on child development. A total of 48 six-year-old children [*M* = 6;5 (years; months); range = 6;0–7;0; *SD* = 3.43 months; 24 boys) participated. They were randomly assigned to one of three conditions (for *n* = 16, 8 boys, in each condition), see below. Since our study is the first study, to our knowledge, that investigated the in-group bias by using overimitation, there were no effect sizes from previous studies to determine an appropriate sample size a priori. Thus, we tested the number of children that are usually tested within our department. Importantly, post hoc analyses revealed an effect size of *d*=0.90 and a power of .91 for the hypothesized effect. The study has been conducted in accordance with ethical guidelines and received ethical clearance by the local ethics committee at Saarland University.

2.2 Materials and methods

The present study was conducted with a 2 (phase) x 2 (condition) design. The within-subject factor ‘phase’ consisted of phase 1 and phase 2. The between-subject factor ‘condition’ consisted of the order of the appearance of the two models: out-group-first versus in-group-first. In addition to these two experimental conditions, children in a baseline condition received no treatment but were presented with the apparatus in order to observe appearance of relevant and irrelevant actions without any prior

demonstration. The dependent variables were participants' imitation of relevant action steps, participants' imitation of irrelevant action steps, and preference towards the models. Interrater agreement was $\kappa = 1.00$, $p < .001$ for imitated relevant action steps, $\kappa = .88$, $p < .001$ for imitated irrelevant action steps and $\kappa = .99$, $p < .001$ for preference.

The apparatus was placed on a white wooden activity board [30cm (length) x 20cm (width) x 0.5cm (heigth)] with two white millings on the left side (4cm in diameter), see Figure 10. It consisted of a clear plastic container (6cm x 22cm x 5cm) with a square opening on the bottom (2cm x 4cm x 5cm) and a rectangle wooden upper side (0,5cm x 22cm x 5cm). The upper side was colored half yellow and half blue with a red ring (2,5cm in diameter) affixed in the middle. Both the yellow and the blue side had a hole (4cm in diameter) in the middle of each side and a rectangle slot (3.5cm x 1cm) on both sides of the red ring. The clear plastic container was affixed on two wooden side parts that had two rectangular openings on both sides (4cm x 4cm x 1.5cm). Two red containers (4cm x 4.5cm x 4.5cm), affixed on a rectangular white board (4cm x 26cm x 1cm), where placed under the square opening and could be pushed towards the left and the right opening of the wooden side parts of the white plastic container. Furthermore, the apparatus consisted of a red ball (4cm in diameter) and a blue box (3cm x 3cm x 3cm). The red ball was placed within the white millings on the activity board. The blue box was positioned within the square opening on the bottom of the clear plastic container. It contained a golden marble (0.5cm in diameter), used as a reward for children to retrieve.

Figure 10. Illustrated are the starting position (left), the blue box with the golden marble in it (middle) and the final state after the last action (right).

Five different actions were presented on the apparatus with four actions being irrelevant and only the last one being relevant for the retrieval of the golden marble. For the irrelevant actions, the model clapped her hands three times, then pushed the white rectangle board with the red containers on it to the left and then to the right side. She then handed over the ball three times between her hands beginning with the right hand and subsequently placed the red ball on top of the red ring. For the relevant action, the model threw the ball into the hole of the blue upper side of the apparatus. Consequently, the blue box fell into one of the red containers. The model then took the blue box and opened it to present the hidden golden marble inside.

Two female adults served as the in-group (German) and out-group (Chinese) model. The models were 22 and 23 years old, respectively. To demonstrate group membership, the models differed in their physical appearance. That is, they showed race-specific features in hair and eye color, eye relief, and facial proportions. Videos were closely matched between the two models (i.e. duration of demonstrations, velocity and amplitude of actions). First, a bell rang to draw children's attention to the video where a closed curtain was presented. Then, the curtain opened and the model looked directly at the child for 4–5 s. Then, the model raised her hands, looked at her hands and started with the first irrelevant action (clapping three times). After performing the four irrelevant and one relevant actions, the model again looked toward the child. Then, the curtain closed. Videos were presented on a Laptop (15,6´´) that was placed in front of the children behind the white colored activity board. At the beginning of the response phases, children were given a bell. They were instructed to ring the bell when they finished playing. Each session was videotaped (Canon Legria FS200E) directed frontally at the children for later coding.

2.3 Procedure

A female experimenter (who did not act as a model) individually played with the child while his or her parent filled in questionnaires (e.g.

background information like age, noticeable problems) in a separate room. When entering a quiet laboratory room, the experimenter introduced the children ("Soon we will play some games together") and started with a warm-up phase by playing a brief interactive game with the child.

After the warm-up phase, the experimenter introduced the apparatus and instructed the child by saying:" The next game is about golden marbles. You can find them in this blue box. When you receive a marble, and give it to me, I will give you a stamp afterwards. Now I will show you a video of a person who already did this before. Then it will be your turn." Then, the experimenter presented the video with the first model performing the irrelevant and relevant actions (out-group-first condition: Chinese model, in-group-first condition: German model). Immediately after the end of the video, the experimenter handed over the apparatus to the child and said: "Now it is your turn. I will be waiting outside. When you finished playing, you can ring the bell and I will come in again and show you another video." When the child had rung the bell, the experimenter entered the room again, removed the objects from the table and exchanged the golden marble for a stamp (end of phase 1). Phase 2 followed the identical procedure with the exception that a video of the other model (out-group-first condition: German model, in-group-first condition: Chinese model) was presented in which the model performed the relevant action only. At the end of the session, the experimenter presented photographs of both the German and Chinese model and asked with which person children would rather be friends with. Then, children were given a small gift and re-united with their parents.

In the baseline condition, children were asked to remove the token after the warm-up phase without prior demonstration. Thus, the experimenter introduced the apparatus, showed the child the blue box with the marble, then put the blue box back in the apparatus (out of children's view) and left the room waiting for the child to ring the bell. After entering the room again, the experimenter told the child that they are going to watch a video in which a person also plays with the apparatus. Half of the children (n = 8) saw the

German model presenting the irrelevant and relevant actions whereas the other half of the children (n = 8) watched the Chinese model. At the end of the session, the experimenter asked for children's preference using the photographs. Then they received a reward for participating.

2.4 Coding and analyses

Each session was coded from videotape. The overimitation (OI) score (number of imitated irrelevant actions) ranged from 0 to 4, where 0 indicated that children did not imitate any irrelevant action. A score of 4 indicated an imitation of all four possible irrelevant actions. Only if the children imitated the action exactly like the model demonstrated them, it was coded as imitated. Thus, children had to clap three times, move the container two times, handed over the ball for three times and place the ball upon the red circle to score. An action was coded as imitated when it was shown within 30 s (irrespective of order). Imitation of the relevant action was coded with 1, if the child threw the ball in the hole of the blue side of the upper side of the apparatus, if they did anything else to retrieve the token, it was coded with 0.

3 Results

First, we controlled whether the imitation scores of the two experimental groups differed from the actions shown by the baseline group. In the baseline group, children showed neither the target action nor any of the four irrelevant actions (see Table 6). We conducted an exact chi-square test to compare the number of imitated irrelevant actions between baseline and experimental groups separately for phase 1 and phase 2. The same was done for the relevant actions. Results revealed a stochastic dependency on condition concerning imitation of irrelevant actions [Phase 1: $\chi^2(4) = 26.56$, $p < .001$, Phase 2: $\chi^2(6) = 26.46$, $p < .001$] and relevant actions [Phase 1: $\chi^2(2) = 28.06$, $p < .001$, Phase 2: $\chi^2(2) = 32.00$, $p < .001$]. Thus, imitation of

relevant and irrelevant actions differed significantly between baseline and experimental condition in both phases.

Table 6. Number of children imitating the irrelevant actions and the relevant action, as well as the mean OI score and mean score of relevant actions in each condition

Condition	Irrelevant action					Relevant action	
	Clapping	Pushing container	Handing over ball	Placing ball on the ring	Mean OI-Score (*SE*)	Throw ball in hole	Mean OI-Score (*SE*)
Baseline	0	0	0	0	0	0	0
In-group first							
Phase 1	1	5	0	11	1.06 (0.19)	3	0.19 (0.10)
Phase 2	1	6	0	8	0.94 (0.19)	5	0.31 (0.12)
Out-group first							
Phase 1	2	6	0	12	1.25 (0.19)	4	0.25 (0.11)
Phase 2	1	2	0	5	0.50 (0.19)	8	0.50 (0.13)

As main analyses, repeated-measures 2 x 2 analyses of variance (ANOVA) with the between-subject factor condition (in-group-first, out-group-first) and the within-subject factor phase (phase 1, phase 2) were conducted for the OI score. For the OI score, there was a significant main effect of phase [$F(1,30) = 5.23$, $p = .029$, $\eta^2 = 0.15$], indicating that more irrelevant actions were imitated in phase 1 ($M = 1.06$, $SE = 0.14$) compared to phase 2 ($M = 0.72$, $SE = 0.13$). Condition x phase interaction [$F(1,30) = 4.12$, $p = .051$, $\eta^2 = 0.12$] reached marginal significance level. No other effects reached significance ($p > .20$). As we predicted that children in the in-group-first condition should imitate irrelevant actions to the same level in both phases, whereas children in the out-group-first condition should show a reduction of overimitation in phase 2, we further explored this interaction by calculating paired *t*-tests between phases for each condition. Results revealed no difference between phase 1 ($M = 1.06$, $SE = 0.17$) and phase 2 ($M = 0.94$, $SE = 0.14$) for children in the in-group-first condition [$t(15) = 0.70$, $p = .497$, Cohen's $d = -0.19$]. However, within the out-group-first condition, the OI score dropped significantly from phase 1 ($M = 1.25$, $SE =$

0.19) to phase 2 (M = 0.50, SE = 0.22, $t(15)$ = 3.00, p = .009, Cohen's d = -0.90). Results are illustrated in Figure 11.

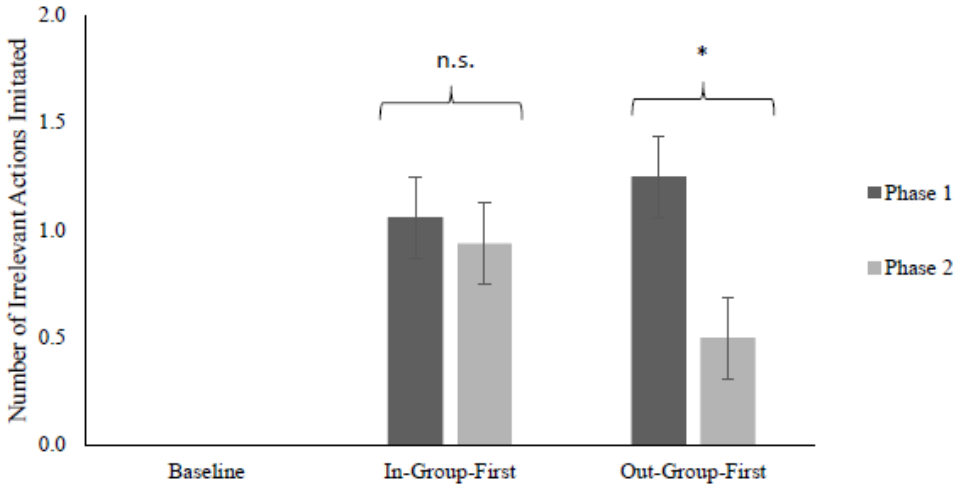


Figure 11. Number of irrelevant actions children imitated in each condition. Error bars indicate standard errors. Asterisks indicate significant differences in mean OI scores (*p<.05; n.s. = non-significant)

To investigate the imitation of the relevant action, a 2 x 2 contingency table for the German and the Chinese model in phase 1 and phase 2 was calculated. The analyses revealed no significant effects [$\chi^2(1)$ = 0.64, p = .423]. Thus, imitation of the relevant action did not differ between models or phases. Further, the majority of children (95,8%) preferred the in-group model. Only two children from the baseline group preferred the out-group model.

4 Discussion

The aim of the present study was to investigate the influence of group membership on children's overimitation in middle childhood. For this, six-year-old children observed either an in-group (German) or an out-group (Chinese) model performing irrelevant and relevant actions to retrieve tokens from an apparatus. After a brief imitation phase, participants observed the other model presenting only the relevant action and thus, demonstrating that the irrelevant actions were indeed inefficient for token retrieval. After the first demonstration, irrelevant actions were imitated by all children regardless of the presenting model. After the second

demonstration, however, imitation of irrelevant actions differed between conditions: while children in the in-group-first condition did not differ in their imitation rates between phases, overimitation dropped significantly for children in the out-group-first condition. As expected, further results revealed that the majority of children preferred the in-group model. This is in line with previous research demonstrating an in-group bias in choices of friends or reception of toys in children at preschool age and middle childhood (e.g., Kinzler et al., 2007; Kinzler & Spelke, 2011; Kinzler et al., 2009).

Children's similar imitation score for both models in phase 1 adds relevant data to the ongoing debate on the nature of the in-group bias in middle childhood. Firstly, physical appearance did not elicit an in-group bias in imitation in this phase, neither for relevant nor for irrelevant actions. This might be explained by the causal confusion account that claims that children overimitate because they are confused about the causal status of the irrelevant actions (Lyons et al., 2007). Thus, children encoded all irrelevant actions as causally relevant elements of a bigger action sequence and imitated all actions regardless of the identity of the model. Still the question remains, why did children follow the out-group model in phase 1, given infants' selectivity in imitation in between-subjects designs (cf. Buttelmann et al., 2013)? This might be explained by differences in available resources. Fourteen-month-old infants do not have the capacity to store all actions that are presented. Thus, they use their limited resources in an effective way and imitate only the in-group model (Buttelmann et al., 2013). However, six-year-old children can be assumed to have enough storage capacity to store any presented action that is interpreted as casual relevant (Lyons et al., 2007) and, consequently, imitated both models in the present study. Secondly, the relatively high level of overimitation in response phase 1 might indicate children assumed that the experimenter presenting them with the apparatus expected them to perform every action they had observed (cf. Over & Carpenter, 2012). However, the results of response phase 2 make this explanation seem unlikely.

In response phase 2, the models demonstrated that only the relevant action was necessary for token retrieval. This observation caused differences in children's OI scores depending on the model's group membership. Overimitation was significantly reduced in the group of children observing the in-group model in this phase. If this reduction of overimitation would be a result solely of the demonstration of only the relevant action then children in both conditions should have shown a decline of imitation of irrelevant actions. This is not what we found: children in the in-group-first condition did not change in their level of overimitation. The causal confusion account (Lyons et al., 2007) cannot explain this pattern of results. If children had encoded all actions as relevant, no reduction of overimitation should have occurred in any condition. The results obtained in this phase, however, are in line with the affiliation account (Over & Carpenter, 2012). First, children in the in-group-first condition imitated the irrelevant as well as the relevant actions observed from the in-group model in phase 1 even after having observed the out-group model performing the relevant action only. Thus, they stuck to the way their cultural group operated the apparatus. Second, children in the out-group-first condition withdrew from imitating the irrelevant actions after having seen the in-group model demonstrating the relevant action only. Thus, they also adopted the way their cultural group operated this apparatus.

5 Conclusion

In conclusion, children seemed to switch in their strategy from 'imitate everything' in phase 1 to 'imitate actions when presented by an in-group model' in phase 2. If the causality of actions is not revealed to children, and they are insecure about how to operate an apparatus (i.e., no child retrieved the reward in the baseline condition), they consider all actions as relevant for reward retrieval and imitate them. However, as soon as the causal relevance of actions is obvious, children overimitate selectively and imitate irrelevant actions predominantly from models with whom they presumably have a strong bond given their shared group-membership.

G General Discussion

This dissertation enlarges present research regarding the question how group membership influences children's imitational performance. Research on the influence of group membership concentrated on linguistic in-group models and revealed an in-group bias in imitational performance of infants and children (Buttelmann et al., 2013; Howard et al., 2015). However, evidence, whether group membership indicated by the model's physical appearance influences imitational performance, from the age of three years onwards is scarce and the interplay with factors like the need to affiliate or the cue for group membership is still an ongoing question.

To enrich present research this dissertation manipulated the respective factors and investigated whether the acquisition of knowledge, assessed through imitation, is influenced by the model's group membership. In addition, we investigated how the need to affiliate and the relevance of presented actions influences the connection between group membership and imitation. Before we come back to this general question whether group membership influences children's acquisition of cultural knowledge, the research questions, the designs and the results of the five studies are briefly summarized.

1 Summary of the studies

The first study investigated the influence of group membership indicated by the physical appearance of a model on the imitational performance of four-year-old children. Results revealed no influence of group membership neither for children's imitational performance nor for latency. Furthermore, children's imitational performance increased after the second compared to the first run and did not differ between a live and a video presentation of actions. This allowed us to use video presentations in the following studies to avoid possible sources of errors from live presentations, like unstandardized interaction between model and subject.

To test the assumption based on the results of the first study, that language is more informative than the model's physical appearance, we varied the information about the model's group membership across three conditions. Six-year-old children were presented either the model's physical appearance or information about the model's home country or language. Preference towards the models was included as dependent variable as well since previous research found evidence for an in-group bias on preference of five-year-old children (Kinzler et al., 2011; Kinzler & DeJesus, 2013). Results revealed no influence of group membership on children's imitational performance within all groups. All children, however, showed an in-group bias in preference. This encouraged us to include preference as a second dependent variable within the following studies.

The aim of the third study was the investigation of the influence of group membership on imitation in a cross-cultural design. We therefore investigated the influence of group membership on immediate and deferred imitation and on preference. One group of children was allowed to play with the objects before and after a delay of one-week whereas a second group played with the objects only after delay. Results revealed no in-group bias in immediate imitation replicating the findings of the first two studies, and a reverse in-group bias in deferred imitation within both samples. Thus, children immediately imitated both models equally frequent, but preferable imitated the respective out-group model after delay. Regarding children's preference, results revealed an in-group bias on preference towards the in-group model. German children preferred the German model whereas Chinese children preferred the Chinese model.

To investigate possible underlying mechanism, the need to affiliate was manipulated within the fourth study as it is one common underlying mechanism that was referred to for both imitation and group membership (Gardner et al., 2000; Over & Carpenter, 2009). First, we were interested in a replication of previous research, showing increased imitation after the observation of third-party ostracism (Over &Carpenter, 2009). In accordance, three- to four-year-old children imitated more actions after

observation of third-party ostracism. Second, we were interested in the influence of third-party ostracism on the in-group bias in imitation. In accordance with the results of the first three studies of this dissertation, children who did not observe third-party ostracism, did not differ in their imitational performance between models. Children who observed third-party imitated the in-group model more frequently compared to the out-group model. Third-party ostracism, though, did not affect the imitation of the out-group, as children did not imitate the out-group model more frequently in dependence of the experience of ostracism. This is in line with previous research, that found evidence for an influence of exclusion of the in-group but not exclusion of the out-group on five- to six-year-olds' imitative performance (Watson-Jones et al., 2016). These results can be explained by the fact that ostracism enhances children's strategically use of imitation to integrate themselves with their in-group (see Lakin et al., 2008).

Finally, we investigated whether group membership indicated by the model's physical appearance influences overimitation of six-year-olds. Overimitation is explained among others by social oriented accounts claiming that children imitate irrelevant actions to affiliate with a model (Nielsen & Blank, 2011). Previous research that differed between the presentation of irrelevant and relevant actions, revealed an in-group bias in the imitation of irrelevant actions for linguistic in-group models (Buttelmann et al., 2013; Howard et al., 2015). Thus, we investigated whether children's overimitation is influenced by the model's physical appearance as an indicator for group membership. Results revealed that children did not differ in their imitation of irrelevant and relevant actions if both models are presenting the same actions within a first phase of the study. However, if the models presented only the relevant actions within a second phase, children either imitated irrelevant actions or reduced their overimitation in dependence of the model who presented the relevant action. Thus, all children followed the behavior of their in-group model during the second phase of the study.

In summary, the results of the first three studies revealed no influence of group membership on children's imitational performance. These studies have in common that both models presented the same actions within an ostensive context as both models looked towards the children before their presentation. However, if the children's need to affiliate was strengthened (Study 4), or overimitation was measured (Study 5), an in-group bias in (over-)imitation revealed. In contrast to the first three studies of this dissertation, the last two studies rather focused on the social aspect of imitation since they manipulated the need to affiliate. A theoretically oriented explanation of these results will be provided in the next section.

2 The two functions of imitation and group membership

As outlined in the introduction, infants and children pursue two distinct functions when imitating others. If they intend to learn novel behavior and acquire knowledge, imitation serves a cognitive function. However, if they use imitation to establish contact with others, it serves a social function (Uzgiris, 1981). The cognitive function is assumed to decrease with age whereas the social function is assumed to increase with age (Uzgiris, 1981). However, only a few influencing variables are known, from which it is derivable when imitation serves rather a cognitive, a social or both functions especially since infants and children are usually not aware of the actual function of their imitative behavior (Zmyj, 2009). Previous research, for example, showed that imitation serves a social function when presenting familiar actions. However, when presenting unfamiliar actions, infants rather imitated to acquire novel behavior. Thus, imitation served a different function in dependence of the familiarity of actions (Zmyj et al., 2012).

When investigating the connection between imitation and group membership, it is reasonable that imitation possibly serves both functions. Children might use imitation to get in contact with their group (Over & Carpenter, 2009) or they might use imitation to acquire novel behavior that

is relevant to them (Lyons et al., 2007). Previous research that showed an in-group bias in imitation (Buttelmann et al., 2013; Howard et al., 2015), can therefore be interpreted in both ways: Children might have imitated the in-group model more frequently because infants wanted to affiliate with the in-group model *and* / *or* they imitated the in-group model more frequently because they interpreted its actions as relevant to them. The authors, however, did not include the function of imitation in their interpretation of results. They assumed that the children compared the model with themselves to conceptualize the degree of similarity. Since linguistic cues were used, the in-group model was judged to be very similar and therefore imitated more often (Buttelmann et al., 2013). Another explanatory approach focused rather on the familiarity of the in-group model. Children therefore focused more on the actions of the in-group model since the model's characteristics were more familiar to them and thus, they were able to imitate it more frequently (Heyes, 2017).

This dissertation provides a third explanation that includes the function of imitation as an underlying mechanism that influences the connection between group membership and imitation. If the cognitive function of imitation is predominant, the model's group membership is assumed to be irrelevant for children's imitation. Children focus on the cognitive function of imitation, if novel actions are presented in an ostensive context that indicates an opportunity to acquire novel knowledge (Csibra & Gergely, 2011). Since children try to ensure guarantee maximum growth of knowledge (Keupp et al., 2013), they are interested in learning novel actions of both the in- and the out-group model. Thus, they imitate both models regardless of their cultural group membership. However, if the social function of imitation is predominant, the model's cultural group membership influences children's imitational performance. Children focus on the social function of imitation, if their need to belong is triggered by presenting first- or third-party ostracism (Over & Carpenter, 2009; Watson-Jones et al., 2016). Children are assumed to affiliate with their in-group again to satisfy this need, by imitation members of their in-group. Since

children are reliant on belonging to their in-group they even imitate irrelevant actions (Nielsen & Tomaselli, 2010).

This alternative explanation is supported by the results of the current work. We assume that the first three studies of this dissertation triggered the *cognitive* function of imitation. As outlined above, all studies used videos of the models that were matched regarding, for example, velocity and ostensive cues. Further, both models presented the same actions (Study 1&2), or similar actions with the same objects (Study 3). Thus, both models presented novel actions that children are assumed to consider as causally relevant (Lyons et al., 2007). This assumption is supported by previous studies showing that children automatically encode all elements of actions as causally relevant, when they are confronted with a model who is demonstrating an action sequence in an ostensive way (Keupp et al., 2013). Both models presented the actions within an ostensive context by looking at the children before presenting their actions; therefore, children are assumed to perceive the actions of both the in- and out-group model as causally relevant (Csibra & Gergely, 2011). In addition, previous research showed, that multiple presentations of actions led to a better recognition of whether actions are dependent on each other or independent in order to achieve a certain goal (Buchsbaum, Gopnik, Griffiths, & Shafto, 2011). Children, however, did not have this benefit since actions were presented only once or twice, and thus, each action step might have been understood as causally relevant. If all steps were considered to be relevant, children probably imitated to acquire novel knowledge. This supports the assumption that the *cognitive* function of imitation was predominant.

As children imitated both the in- and the out-group model equally frequent we suggest that the model's group membership might be irrelevant when imitating to acquire novel knowledge. This assumption is supported given the fact the first three studies revealed no effect of group membership on imitation although various conditions were experimentally varied. We obtained no effect of neither children's age nor of the use of different cues for group membership (Study 2). Further, we obtained no effect of the use

of a between (Control group of Study 4) or within design (Study 1-3) for the factor model, and nor the use of different Chinese and German models. Regardless of all these experimentally varied conditions, no effect of group membership on imitation revealed. However, this finding is in line with our interpretation regarding the cognitive function of imitation: To acquire novel knowledge, children focused on the actions, and thus it was not important whether group membership was indicated by physical appearance or language or whether the children observed only one model or both models. As a result, children imitated all actions and their imitational performance did not differ between models.

Of course, another explanation would be that no effect was found because it simply does not exist. However, this interpretation is challenged by the results of the fourth and fifth study. We assume that in these studies, the need to affiliate was triggered and thus the social function of imitation. As a consequence, children increasingly imitated their in-groups in order to satisfy their need to belong (Over & Carpenter, 2009). In the fourth study, the need for affiliation was strengthened by children's observation of third-party ostracism. These children imitated the actions of the in-group model more frequently to affiliate with their in-group and thus, to minimize the negative feeling of exclusion. In the fifth study, the in-group bias in imitation revealed within the second phase of the study. In this phase, the opposite model to the first phase presented the relevant action only and thus presented an efficient way to receive a reward. Children who first observed the out-group model presenting both irrelevant and relevant actions observed the in-group model presenting only the relevant action and vice versa. Those children who observed the in-group model performing both relevant and irrelevant actions still imitated both types of actions after having seen the out-group model presenting only the relevant and thus efficient action. This is in line with previous research showing that children imitated a complex action sequence after a model's demonstration of this complicated sequence although children knew a more efficient way (Nielsen & Tomaselli, 2010). The authors suggested that children

performed the complex sequence although they were aware that the irrelevant action element is causally irrelevant and not an essential part of a bigger action, to affiliate with the model (Keupp et al., 2013). The imitational performance of children who first observed the out-group and second the in-group model reduced after the second phase. The reduction in overimitation implies that children imitated the irrelevant actions, presented by the out-group model within the first phase, less often. Children therefore oriented towards the behavior of their in-group model. In conclusion, children of both groups followed the behavior of their in-group model.

We assume that the basic human need to affiliate caused the in-group bias in children's imitational performance by triggering the social function of imitation. The fourth study directly manipulated this need. By observing third-party ostracism, children focused on the social function of imitation and imitated members of their in-group more frequently to affiliate with their in-group. The fifth study manipulated the need to affiliate since both models presented irrelevant and relevant actions. Children therefore had to decide which model to follow and oriented their behavior towards the in-group model. Based on the results of these studies, we assume that group membership is highly relevant for children's imitational performance if the social function of imitation is triggered.

Until now, however, research that supports this assumption regarding children's *imitational* performance is scarce (Watson-Jones et al., 2016). As outlined in the introduction, research concerning children's *social preferences* showed an in-group bias from the age of three years onwards (Kinzler et al., 2010; Kinzler e al., 2009; Kinzler & Spelke, 2011). As the phrase 'social preferences' suggests, it is likely to explain these results by a predominant social function. Children not only preferred the in-group model but also adopted model's preferences towards objects if the cultural group membership was indicated by both language and physical appearance. Results of the current work replicates these findings. Children's preference towards the models was influenced by the model's

cultural group membership with the last four studies. However, we extended the current research by showing an in-group bias in *imitation* of novel actions besides preference. Thus, children not only guide their *preferences* towards objects of toys (e.g. see Shutts et al., 2009) but also their *imitational behavior of novel actions* if the social function is predominant. More interestingly, we assume, based on the results obtained by the current work, that the social function is not exclusive to imitation but can also be considered as an underlying mechanism for preference. This assumption must be considered in future research.

In summary, we conclude from the results of the dissertation that group membership is not a relevant factor regarding children's imitation at the age of three to six years if they imitate to acquire novel knowledge, i. e. focusing on the cognitive function of imitation. However, if they imitate in order to approach a group, i.e. focusing on the social function of imitation, group membership influences both children's imitational performance and preference.

Previous research, though, suggested that the cognitive compared to the social function of imitation gradually pales during the second year of life (Uzgiris, 1981). This is explained by the fact that older children compared to infants reach a certain level of knowledge and thus, do not need to acquire novel knowledge. The need to affiliate, however, is present during lifetime since humans are reliant on others.

Regarding the social function of imitation, a constant influence from early childhood to adulthood has been shown in previous research. Older children but not infants imitate meaningless acts (Killen & Uzgiris, 1981; Guillaume, 1971) and not only children but also their caregivers imitate during play to maintain an interaction and thus, are socially motivated to imitate (Pawlby, 1977). The assumption regarding a constant influence of the social function of imitation is further supported by the results of this dissertation. By manipulating the need to affiliate, children prioritized the social function of imitation within the fourth and fifth study and thus,

oriented towards the behavior of their in-group. This result revealed for three- and four-year-olds (Study 4) as well as six-year-old children (Study 5).

Regarding the cognitive function of imitation, previous studies found evidence that 12-month-old infants imitated predominantly the outcome of actions to promote their knowledge about the world that triggered the cognitive function of imitation. Older infants, however, imitated predominantly the specific actions to satisfy social needs that triggered the social function of imitation (Nielsen, 2006). As a conclusion, this result was assumed to support the assumption that the cognitive function of imitation gradually fades during the second year of life (Uzgiris, 1981). This assumption, however, is challenged by the results of the current work. If children prioritized the cognitive function of imitation and thus, imitated to acquire novel knowledge, results did not reveal an influence of group membership on imitation within the first three studies. Since these children were between the ages of three- to six-years, the results of the dissertation challenge the assumption that the cognitive function fades during the second year of life that is explained by a certain level of knowledge (Uzgiris, 1981). It is more likely to assume, that children promote their level of knowledge beyond the second year of life. Thus, they are prioritizing the cognitive function of imitation if the opportunity to acquire novel knowledge is provided.

Based on this dissertation, we conclude that both the social *and* the cognitive function of imitation are present during childhood and have an impact on children's imitational performance from the age of three to six years. Besides the function of imitation, other influences on the connection between group membership and imitation have been investigated within the dissertation. These components will be described within the next sections.

3 The cue for group membership

The present dissertation aimed to expand the existing literature on the connection between imitation and group membership, by investigating the influence of the *cue for group membership*. Since previous research predominantly used language as a cue for group membership, we indicated group membership by the model's physical appearance. As outlined above, the function of imitation is of great importance regarding the influence of group membership on imitation. Thus, the function of imitation is integrated when focusing on the cue for group membership.

If the cognitive function of imitation is predominant, we did not find an influence of the model's physical appearance on the imitational performance, since all children imitated both models equally frequent. More interestingly, we did not find an influence of language as a cue for group membership either. This suggests that the specific cue for group membership is not relevant when children imitate to acquire new knowledge. Taking into account that children have limited resources (Buttelmann et al., 2013), this is very efficient in terms of acquiring as much novel knowledge as possible. Although three- to six-year-old children have more cognitive resources than infants, their cognitive structures are not yet fully developed. Since novel actions were presented in an ostensive context, it is likely that children concentrated on learning the actions rather than on differences between the models. Thus, children guaranteed maximum growth of knowledge as they acquire novel behavior of both models (Keupp et al., 2013).

However, why did previous research find an in-group bias in imitation when using language as a cue for group membership? We assume that children did not prioritize the cognitive but the social function of imitation that was triggered by the types of actions that were presented. Howard et al. (2015), for example, differentiated between manner actions, i.e. actions that were irrelevant to obtain a specific goal, and goal actions, i.e. actions that were necessary to obtain a specific goal. Results revealed an in-group

bias on imitation for the manner actions only. The same actions were used within the study of Buttelmann et al., (2013) that revealed an in-group bias in imitation as well. Since previous research showed that children imitate irrelevant actions to affiliate with their in-group (Over & Carpenter, 2009) it is likely that presented actions triggered the social function of imitation within these studies. By differing between irrelevant and relevant action the social function of imitation was predominant which led to an increased imitation of the in-group. Thus, we conclude that the in-group bias in imitation revealed in these studies because the social function of imitation was predominant and not because language was used as a cue for group membership.

More interestingly, a second result of the study by Buttelmann et al. (2013) supports our assumption, that the cue for group membership is irrelevant if the cognitive function of imitation is predominant. To investigate the influence of group membership on *imitation of preferences*, children observed the model choosing one of two novel objects. Before choosing an object, the models looked toward the children and thus provided an ostensive context. Afterwards, children were asked to choose between the same objects. Results revealed that children did not imitate the choice in dependence of the model's group membership. Since the model's choice was presented within an ostensive context, which triggers the cognitive function of imitation, this result, is further evidence for our assumption: The model's group membership is irrelevant for children's imitation regardless if it is indicated by language or physical appearance if the cognitive function of imitation is predominant.

As described above, this conclusion cannot be applied to the significance of the model's physical appearance if the social function of imitation is triggered. Results of the present studies revealed an in-group bias in imitation after ostracism and on overimitation although language was not available as a cue for group membership. Thus, we assume that the physical appearance was sufficient to indicate the cultural membership of the models as that information influenced children's imitational performance.

This is in line with previous research that assumed race as a reliable indicator of group membership since modern societies are often racially stratified (Kinzler et al., 2009) and showed an in-group bias on imitation caused by the model's physical appearance (Watson-Jones et al., 2016). However, there is evidence showing, that White children preferred Black people who had the same accent compared to White people who differed to the participant's accent (Kinzler et al., 2009). This is explained by evolutionary accounts claiming that throughout cognitive evolution, languages have served as more valid predictors of group membership than the physical appearance throughout our evolutionary history (Baker, 2001; Henrich & Henrich, 2007). The physical appearance of a person did not likely differ regarding their physiognomy in ancient times (Cosmides, Tooby, & Kurzban, 2003). The authors concluded that language might be more important for children's social preferences in comparison to race (Kinzler et al, 2009).

The results of the current work challenge this assumption by adding an important aspect: If the social function of imitation is predominant, children rely on information provided by both language *and* the physical appearance of others. Thereby, they promote their affiliation towards others to satisfy the fundamental human need to belong (Baumeister & Leary, 1988). As outlined above, this is supported by previous research revealing an in-group bias on imitation by triggering the social function of imitation (Buttelmann et al., 2013; Howard et al., 2015).

In conclusion, the influence of the cue for group membership on the connection between group membership and imitation is closely intertwined with the function of imitation. If the cognitive function of imitation is predominant, the cue for group membership itself is irrelevant. Instead of concentrating on differences of the models, children are assumed to use their limited cognitive resources to store all actions to guarantee maximum growth of knowledge. If the social function of imitation is predominant, it is irrelevant *how* group membership is indicated. Children use information of any available cue for group membership to indicate

group membership since children are reliant on affiliating with their in-group. Thus, physical appearance and language are sufficient to indicate group membership if the social function of imitation is predominant.

4 The influence of culture

Regarding the influence of culture on children's imitation and preference, we have to differentiate between the culture of the models and the culture of participants. For the culture of the models, results of children's preference suggest that the model's physical appearance is sufficient to indicate cultural group membership. Nearly all children preferred their respective in-group models, even if this preference was not necessarily reflected in their imitative behavior. Eighty-two percent (n = 197) of the German children preferred the German model whereas 80.7% (n = 67) of Chinese children preferred the Chinese model. By assessing children's preference, we further asked children for differences between the two models. Sixty-six percent of the German children (n = 158) and 78.0% of the Chinese children (n = 64) specified differences in the model's physical appearance that were caused by the different cultural background. Based on these descriptive data, we assume that children recognized the different cultures indicated by the model's physical appearance.

Regarding the culture of participants, the second study revealed a cross-cultural stability of the influence of group membership on immediate and deferred imitation as well as on preference. In both China and Germany, results revealed no in-group bias in immediate imitation, a reversed in-group bias in deferred imitation, and an in-group bias in preference. The influence of group membership on imitation and preferences therefore seem to be the same in an individualistic and collectivist culture. This is in line with previous studies showing a cross-cultural stability of imitation (Callaghan et al., 2011; Graf et al., 2014; Lieven & Stoll, 2013; Wang et al., 2012). However, studies investigating the influences of culture on children's imitation of inefficient actions of groups and individuals suggested, that

conformity and groups are more important in collectivistic cultures than individualistic cultures (Corriveaux et al., 2017). Chinese-American and Caucasian-American children observed videos of either a single model, or three models that performed a novel task with an inefficient tool. Afterwards, children could complete the task with either the inefficient tool or an efficient alternative. When observing the single mode, all children imitated the inefficient action at similar rates. However, Chinese-American children imitated the inefficient action more frequently than the Caucasian-American children did after observing a consensus. Since the Chinese collectivistic culture is rather oriented towards groups and conformity than towards individuals, authors assumed that culture influenced children's transmission of novel knowledge.

If we take a closer look towards the inefficient tool of the study of Corriveaux et al. (2017), this conclusion might be enlarged by another more underlying influence, the social function of imitation. By using the inefficient tool (i.e. a square rubber) the models were able to achieve the goal (i.e. moving water), but needed to invest more time and effort compared to the efficient tool. During presentation, the models therefore presented not only an inefficient tool but irrelevant actions as well when trying to achieve the goal with the inefficient tool. As we outlined above, the social function of imitation influences children's imitation of irrelevant actions. In conclusion, culture might have affected the imitation of the inefficient tool within the study of Corriveaux et al. (2017) because the social function was predominant in children.

As a difference between the study of Corriveaux et al. (2017) and the third study of this dissertation, the presentation of novel actions within an ostensive context triggered the cognitive function of imitation in Chinese and German children. This might explain, why group membership affected children's learning independent of culture. However, we assume that by triggering the social function of imitation, differences in culture reveal more strongly and thus, culture influences the connection between group membership and imitation. To test this assumption, an experiment testing

the amount of overimitation in dependence of the predominant function of imitation should be conducted in China. Based on findings obtained in the literature and in this dissertation, children's overimitation should not differ between models if the cognitive function is predominant in children. If the social function is predominant, however, children should orient their behavior towards the in-group model by imitating more irrelevant actions. Since a collectivist culture prioritizes the information of the in-group more strongly (Corrivaux et al., 2017), an in-group bias should reveal in imitation of the Chinese children, that is more powerful than the in-group bias within the German sample.

In conclusion, both the cue for group membership and the influence of culture on the connection between group membership and imitation are closely intertwined with the function of imitation. If the cognitive function of imitation is predominant, neither the cue for group membership nor the model's culture influenced children's acquisition of novel knowledge. If the social function of imitation is predominant, any available cue is used to indicate group membership and influences children's imitation. In accordance to that, we assume that culture influences the connection of group membership and imitation as well if the social function of imitation is predominant. However, this assumption must be approved in further research.

5 Relevance and implications for a multicultural society

What implications does this rather abstract interpretation of the results of this dissertation provide for the concrete question as to how the change of Germany towards a multicultural society could affect the cultural learning of children from the age of three years? The results of the dissertation provide two concrete aspects that are of great importance for this question.

Firstly, it should be noted that the question of the influence of group membership on children's cultural learning was only obtained in some of the studies. Namely, those that triggered the cognitive function of imitation, i. e. the aim to acquire novel cultural knowledge. The results of the dissertation suggest that the model's culture is irrelevant for the acquisition of novel knowledge through imitation. Children want to acquire as much novel knowledge as possible (Keupp et al., 2013) and therefore imitate both models equally frequent. For the concrete situation in Germany, this implies that children in kindergarten acquire novel knowledge through imitation by both caregivers of the same culture and caregivers of a foreign culture.

However, children not only learn well but also seem to benefit of a multicultural society. In this society, children are confronted with people whose behavior is influences by their culture. As a result, children observe many different behaviors and thus, are able to learn through imitation. This assumption is supported by the result of the third study. Children of both cultures imitated the respective out-group model more frequently after a one-week delay even though their imitational performance of the two models had not differed one-week before. We assumed that children were more curious about the foreign-culture model and her actions since previous research showed, that information people are curious about are better stored and rehearsed (Gruber et al., 2014; Kang et al., 2009). For this reason, we assume that children benefit from the opportunity to grow up in a multicultural society. This assumption has already been supported in other areas of child development. Bilingual children, for example, performed better in working memory tasks than monolingual children (Engel de Abreu, Cruz-Santos, Tourinho, Martin, & Bialystok, 2012). The flexibility to interact with different cultures in everyday life also seems to have an effect on the cognitive flexibility of children. Since imitation is regarded as a social-cognitive ability, it is likely that cultural diversity also has a positive effect on the ability to learn through imitation.

The second aspect relates to the social function of imitation. The fourth study revealed that children oriented their behavior towards the in-group

model if they observed third-party ostracism. What does this imply for children in kindergarten? By transferring the results obtained by the fourth study to kindergarten, children should be oriented to the behavior of same-race children or adults when witnessing ostracism. In kindergarten, children interact with both adults and children of foreign cultures but witness ostracism mainly by peers. Previous research showed that children imitate play behavior of peers to affiliate with them, since imitation serves a social function in these contexts (e.g. Grusec & Abramovitch, 1982). Based on the results obtained by this dissertation, children are expected to imitate play behavior of same-race children and not foreign-race children if they witness ostracism. Thereby, they affiliate with their in-group and minimize negative feelings caused by the observation of ostracism. This result is especially important with regard to an orientation phase, when children are accustomed to their caregivers. By understanding how children are influences by their environment, their behavior is better understood and classified.

However, the results of the fourth study are not necessarily applicable to the day-to-day interaction of children in kindergarten. It must be constrained by the opportunity of children to gain experience with other-race children. Since children are confronted with children and adults of foreign cultures in everyday life, they are able to collect experience with them. With increasing experience, foreign-race children may no longer be perceived as an out-group. This is in line with the contact hypothesis claiming that people develop expertise at recognizing own-race faces since they have more contact with face exemplars from their own race than faces from other races (see e.g. Bringham & Malpass, 1985). In accordance with this theory, previous studies showed, that infants' behavior did not differ between models after they became familiar with foreign-ethnic faces through multiple presentation (Elliott, Wills, & Goldstein, 1973; Goldstein & Chance, 1985; Lavrakas, Buri, & Mayzner, 1976; Sangrigoli & DeSchonen, 2004b). Correspondingly, that implies that more contact with the out-group might lead to an expertise for out-group members. Thus, children who

become familiar with the out-group may no longer differentiate between their in-group and former out-group. In conclusion, children in kindergarten are likely to affiliate with both children of their in- and out-group even after witness ostracism since they get in contact with them in everyday life.

6 Conclusion

This dissertation investigated the influence of the model's physical appearance as cue for group membership on the cultural learning, assessed through the imitative behavior of children between the ages of three to six years. In conclusion, the results of the five studies of this dissertation suggest that the physical appearance of a model is sufficient as a cue for group membership and influences the imitative behavior of children. However, this is modulated by the function of imitation. If children imitate to acquire novel knowledge, group membership does not affect their imitative behavior regardless of the cue for group membership. However, if children imitate to affiliate with others, children imitate the in-group model more frequently. By understanding imitation as a means of learning *and* affiliation, we can better understand the social-cognitive development of children and derive important implications for everyday life, like the advantage of a multicultural society for the development of our children.

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I Appendix

All objects were placed on a white wooden activity board [30cm (length) x 20cm (width) x 0.5cm (heigth)] with two white millings on the left side (4cm in diameter). *Shot put* consisted of a transparent plastic container (6cm x 22cm x 5cm) with a square opening on the bottom (2cm x 4cm x 5cm) and a rectangle wooden upper side (0,5cm x 22cm x 5cm). The upper side was colored half yellow and half blue. Both the yellow and the blue side had a hole (4cm in diameter) in the middle of each side and a rectangle slot (3.5cm x 1cm) on both sides. The clear plastic container was affixed on two wooden side parts that had two rectangular openings on both sides (4cm x 4cm x 1.5cm). Two red containers (4cm x 4.5cm x 4.5cm), affixed on a rectangular white board (4cm x 26cm x 1cm), where placed under the square opening and could be pushed towards the left and the right opening of the wooden side parts of the white plastic container. Furthermore, the apparatus consisted of one red ball (4cm in diameter) and a red T-shaped chipcard (10cm x 5.5cm x 0.5cm). The ball and the chipcard were placed within the white millings on the activity board. *Magnets* consisted of a transparent plastic container (30cm x 4cm x 10cm) with white wooden side parts (3cm x 3cm x 10cm) which is open on the upper side (23.5cm x 3cm). A yellow block (left) and a red block (right) were affixed on both sides of the container (9cm x 4.5cm x 4.5cm) with magnets on top of the boxes. One red and one yellow box (each 3cm x 3cm x 3cm) with magnets on top of them were placed within the plastic container. Further, the set of objects consisted of a stick (12cm x 1cm x 1cm), colored half yellow and half red stick with magnets on its left and right side and one blue box (10cm x 2cm x 2cm), which had an opening on the right side (1cm x 1cm x 1cm) and a magnet on the left side. *Rotating disc* consisted of a white colored container (18cm x 18cm x 12.5cm) with transparent plastic flats affixed on the front (18cm x 6cm x 0.5cm) and back side (18cm x 12.5cm x 0.5cm). On top of the white box a transparent plastic disc (14cm x 14cm x 0.5cm; diameter = 14cm) with a squared hole and a rectangular opening in it (3cm x 2cm) was placed on a white milling (diameter = 14cm) also with a squared hole

(3.5cm x 3.5cm x 1cm) in it. Furthermore, a blue box (3cm x 3cm x 3cm) and a blue pyramid (3cm x 3cm x 3cm) as well as a chipcard (10cm x 2cm x 7cm) colored half yellow and half red belonged to the set of objects and were placed on the right side of the white box. *The box* consisted of a transparent plastic container with two white wooden side parts (8.5cm x 2cm x 7cm) and a blue flat on the upper side which closed the box (15.5cm x 8.5cm x 1cm). The blue flat had three magnets on top of it. Within the clear container a blue box (3cm x 3cm x 3cm) and a blue pyramid (3cm x 3cm x 3cm) each with a magnet on top of it were placed. Next to the clear container, one red and one yellow ball (diameter = 3.5cm) affixed on an equally colored stick (4cm x 1cm x 1cm) were placed.