An Examination of the Cooperativeness of Games in the Context of Culture

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To my ʻohana, family, and Familie.

BIBLIOGRAPHISCHE DARSTELLUNG // BRIEF SUMMARY

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Despite being one of the few human-specific types of play that humans of various ages engage in, games are understudied in cross-cultural research. Games are not distributed randomly across cultures and vary with some socio-ecological aspects of human cultures. Previous observational studies suggest that the cooperativeness and egalitarianism of cultural groups is reflected in the games that are played across cultures, but this has yet to be studied using a breadth of methodological approaches. In this dissertation, I investigate the relationship the cooperativeness of games may have with the cooperativeness of cultural groups and offer one potential avenue as to how and why games are distributed across cultures.

This dissertation consists of two main parts. The first part (chapters 2 - 3) focuses on gathering and analyzing descriptions of historical games and cultural levels of cooperation from ethnolinguistic groups on the Austronesian language phylogeny. The second part (chapters 4 - 6) focuses on gathering games, cultural levels of cooperation, and investigating the relationship between games and cultural levels of cooperation by three modern-day cultural groups.

In chapter two, I describe the making of the Austronesian Game Taxonomy, an open-access database of game descriptions as gathered from historical, ethnographic, and other sources. I also describe my goal structure coding scheme and apply it to the 907 games in the Austronesian Game Taxonomy.

In chapter three, I test the relationship between the goal structure of games from the Austronesian Game Taxonomy and several proxies for cultural levels of cooperation in 25 ethnolinguistic groups. I find that the cooperativeness of games is negatively related to cultural levels of intra-group conflict and positively related with inter-cultural conflict. The goal structure of games is not associated with the social structure of cultures, nor reliably correlate with measures of interdependence in subsistence.

Chapter four provides a detailed description of the three cultures that are the focus of Part two of this dissertation: Hai||om and Ovambo in Namibia, and Germans in Leipzig, Germany. I use three semi-structured interviews to obtain information about the levels of social stratification, intra-group conflict, and inter-cultural conflict experienced by these three groups.

Chapter five documents the games played by Hai||om and Ovambo children and adults during my research visit to Namibia. I describe a handful of games with variety of goal structures. I provide the interview used to gather this information for future cross-cultural game collection.

In chapter six, I examine the relationship between the preference for games that are cooperative or competitive, and cultural levels of cooperation in three modern-day cultures. I also interview caretakers on their attitudes toward children's play and games. I find cross-cultural variation in children's game preferences, but adult game preferences do not vary across cultures. Game preferences do not systematically vary with predicted cultural levels of cooperation.

In the general discussion, I discuss my research findings in terms of the relationship between games and cultural levels of cooperation and suggest further improvements for the field of cross-cultural game research. This dissertation provides some evidence that games relate with types of conflict, but not with levels of social stratification nor interdependence in subsistence.

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"The world is full of unknown unknowns; as great as our uncertainty about the world is, there are even more things we don't even know we don't know. If we explored only to try to maximize expected information gain, we would miss the chance to gain unexpected information. Creating new problems with no obvious utility in themselves—playing—may be the best way to discover (genuinely) new things."

– *Chu & Schulz (2020)*

General Introduction

Many animals engage in play—dogs, cats, dolphins, chimpanzees, and others. Play is one way for animals to learn and test the boundaries of their behavioral repertoire and hone skills needed in "real life". Humans also engage in play from a young age, exploring their environments, physically engaging with peers, and imitating their elders. However, humans are the only animals that play rule-based games. Games are different from other types of play, in that they are goal-oriented actions that are governed by conventional rules (Rakoczy, 2007). By playing games, children and adults might be learning, practicing, and maintaining traits that are specific to human group life, such as cultural norms or high levels of cooperation. Interestingly, the distribution of games around the world varies with aspects of human culture, such as political organization and community size (Sutton-Smith & Roberts, 1971). Might the games that humans play be specific to the needs of their own cultural group?

Broadly speaking, the main focus of this dissertation lies in investigating the relationship between aspects of human culture and the games that are played. Specifically, I investigate the role culture may play in the distribution of games throughout cultural groups around the world. I focus on the cooperativeness of games and the potential relationship games may have with the cooperativeness of cultures, as this has often been suggested by studies investigating games on a smaller scale (e.g., Ager, 1976; Eifermann, 1970; Khouri, 1976; Boyette, 2016a).

In the subsequent sections of the general introduction, I examine the most relevant definition of games for psychological and anthropological research, then define them for the historical, modern-day, and cross-cultural research presented in this dissertation. An overview of existing game typologies follow as these are a crucial aspect of scientific research on games. Then, I elaborate on the *when, what, and why* of games across cultures, setting the framework for the research presented in this dissertation. Subsequently, I identify several shortcomings of previous research on games, which also serve as a basis for the research focus of this dissertation. Finally, I end the introduction with an outline of the research presented in this dissertation.

1.1 Games

The English language has two terms that refer to a similar leisurely activity: play and games. These terms are separate, yet are often ambiguous in their use. "Game" in "Let's play a game" can refer to an activity with rules (i.e., a rule-based game) or one that is structured, but has no formal rules (i.e., play). In other languages, such as German, there is no differentiation between

play and *game*—they are both referred to as *Spiel*—making this distinction in everyday language even less pronounced. To add to the mayhem, the conceptual boundaries between work and play are also blurred (see Ember & Cunnar, 2015; Purrington & Hickerson, 2013; Chick, 1998b, for further discussion).

The term *game* has been defined in numerous ways across the scientific literature. In the field of game studies, Stenros (2016) gathered over 60 definitions of games since the 1930s and listed ten commonalities of these definitions of games. A few of the commonalities that are relevant for the current dissertation are rules, competition, conflict, goals, and end conditions (Stenros, 2016). In psychology, *game* is most commonly referred to in the developmental literature on play in children. In his famous studies of children's understanding of rules, Piaget differentiates between "games with rules" and other forms of play, referring to games as "social institutions [...] that [...] remain the same as they are transmitted from one generation to the next and are independent of the will of the individuals who participate in them" (Piaget & Inhelder, 1969, p. 119).

In this dissertation, I will focus on rule-based games, not play. I define games as activities that have explicit rules accepted by the player(s), undetermined outcomes or actions, contest or challenge, and non-utilitarian value (Whittaker, 2012). As with definitions of leisurely activities more generally, this definition of *game* is not entirely objective from my own personal cultural influences, but rather reflects my endeavor to operationalize games for the comparative focus of this dissertation.

In anthropology, the most-widely used definition of games comes from J. M. Roberts et al. (1959). They define game as "a recreational activity characterized by: 1) organized play, 2) competition, 3) two or more sides, 4) criteria for determining the winner, and 5) agreed-upon rules" (J. M. Roberts et al., 1959). In addition to these criteria, J. M. Roberts et al. (1959) exclude other recreational activities from their definition of game, such as "noncompetitive swimming, top-spinning, and string-figure making", considering these activities to be "amusements". This definition and understanding of games as *competitive interactions* has been used by several subsequent scholars examining games (Sutton-Smith & Roberts, 1971; Peregrine, 2008; Chick, 2015; Rastegarpour, 2011; Silver, 1978); however, there are several crucial limitations of this definition of games.

First, as I will show in this dissertation, games can be cooperative interactions with no formal competition between the players. According to J. M. Roberts et al. (1959), these would be considered "amusements". Second, I will argue that games can also be played in a solitary manner with

one or multiple players engaging in a game, with neither cooperation nor competition between the players. As such, games also may not have a winner or a loser, which is in direct contrast to the fourth criterion from J. M. Roberts et al. (1959). Finally, the first criterion from J. M. Roberts et al. (1959), "organized play", lacks elaboration as to the implications of this criterion in their definition—play organized by whom and organized in what manner?

1.1.1 The definition of "game" for this dissertation

For the purposes of this dissertation, I have adapted the criteria proposed by Whittaker (2012), which allows for the existence of non-competitive rule-based games. Following Whittaker (2012), I define a *game* as an activity with:

1. explicit rules accepted by the player(s)
2. undetermined outcomes or actions
3. contest or challenge
4. non-utilitarian value

Whittaker (2012) does not clearly define each of these criterion in detail, thus, I define these criteria in my own terms in the sections below. As with definitions of leisurely behavior more generally (Purrington & Hickerson, 2013), there is not *one, "true" definition* of games; rather, the definition I use attempts to define games for use in cross-cultural research. Importantly, as defined here, games are not competitive by definition and can be played by one or more players.

In addition to these criteria and for the purposes of this dissertation, computer and video games, commercialized games (e.g., store-bought games), and professional sports (e.g., televised soccer matches) were excluded from the research presented in this thesis[1], as I take a historical approach to examining games cross-culturally in Part I. For the purposes of this dissertation, I will consider recreational activities that meet the criteria described to be "games".

Explicit rules accepted by the players

The first criterion refers to the constitutive rules of the game, or the regulating means of playing the game. Explicit rules refer to specific behaviors or actions that are allowed and prohibited by the player(s) of the game to achieve the goal of the game (i.e., the instructions or rulebook of the game; Vossen, 2004). For example[2], according to the International Football Association Board

[1] Some game scholars might refer to the focus of the games in this dissertation as "traditional" games.

[2] Written instructions and rulebooks are hard to come by for most traditional, historical games—they were typically transmitted verbally. Therefore, I provide an example from the modern-day, professional game of soccer.

(IFAB), there are 17 "laws" in a game of soccer and "it is an offence if a player deliberately touches the ball with their hand/arm, including moving the hand/arm towards the ball" (International Football Association Board, 2020). If a player breaks this law, the other team is allotted a direct free kick, thus indirectly penalizing the law-breaking player's team. These rules are explicit and by engaging in the game, the players agree to abide by the rules and be penalized if the rules are broken.

When referring to the rules of a game, I will differentiate between explicit rules and implicit rules (Stenros, 2016). Explicit rules refer to specific behaviors or actions allowed or prohibited by the player(s) of the game to achieve the goal of the game (i.e., the instructions or rulebook of the game; Salen & Zimmerman, 2004). Explicit rules can be named, described, and taught to other players, and should be known and accepted by all players at the beginning of the game. Explicit rules must be present for an activity to be considered a game. On the other hand, implicit rules can be understood as internalized, cultural norm-based rules that are not overtly described for the players (Göckeritz et al., 2014). For example, this could be an unspoken rule that players in a game of soccer are frowned upon for engaging in foul play (e.g., pushing another player on the field, faking an injury).

Undetermined outcomes or actions

"Undetermined outcomes" refers to the end-state of the game and can be as simple as not knowing whether one will achieve the goal of the game or, if the game has a winner, not knowing who will win the game. In this dissertation, I consider a 'goal' to be the overarching aim of the player(s) as a means to end the game. For example, in a game of chess, each player has the goal of placing the other's king in checkmate, and in a game of basketball, each team has the goal of scoring the most baskets. "Undetermined actions" include the uncertainty in the specific actions made by the player(s), the order of the actions during the activity, or the timing of events. In other words, the actions and outcome of the game are not scripted or pre-determined, as in a theatrical play.

Contest or challenge

A "contest or challenge" can be defined as a real or imaginary obstacle for the player(s) to overcome in order to reach the goal of the game. When this challenge is not overcome, the player(s) do not reach the goal of the game. This contest or challenge can take the form of competition between two teams toward one mutually-exclusive goal (e.g., in soccer), or it may take the form

of a task in which one individual player plays "against" time, chance, or their own abilities (e.g., in hopscotch). It is important to note that this criterion does not imply that there must be several players playing the game—a contest or challenge may exist for an individual player playing a game by themselves—and it also does not imply that there must be competition between the players in the game.

Non-utilitarian value

The final criterion, "non-utilitarian value", includes activities that people play "freely and spontaneously" (Whittaker, 2012) and suggests that people choose these activities because they want to play the game (Whittaker, 2012), but not because the game is imposed on them by others.

1.2 Game typologies

As with definitions of play and games, there are superfluous typologies of play and games. Games can be categorized based on the actions taken in the game (e.g., Pellegrini et al., 2004), the objects used in the game (e.g., Whittaker, 2012), the type of skill required in the game (e.g., J. M. Roberts et al., 1959), the imperative goal of the game (e.g., Debus et al., 2020), or the level of cooperation and competition in the game (e.g., Eifermann, 1970). In this section, I examine the two most influential typologies of traditional games for the psychological and anthropological literature and then present the theory behind my own typology of games, as presented in chapter 2.

1.2.1 A typology on game type from J. M. Roberts et al. (1959)

As mentioned in a previous section, J. M. Roberts et al. (1959) proposed one of the most influential definitions and typologies for games used in the cross-cultural psychological and anthropological literature. Their typology of games has been used to study the correlation between the type of game and cultural attributes (e.g., social classes, political integration, socialization and parenting styles; Ball, 1972; Edwards, 2000; Peregrine, 2008; Barry & Roberts, 1972; Silver, 1978; Sutton-Smith & Roberts, 1971; D. R. Thomas, 1975), ecological factors (J. M. Roberts & Sutton-Smith, 1966), and individual personality traits (J. M. Roberts & Sutton-Smith, 1962). J. M. Roberts et al. (1959) define three main categories of games: games of physical skill, games of strategy, and games of chance. These game types are also hierarchical: games of physical skill may not involve strategy or chance, games of strategy may not involve physical skill but may involve

chance, whereas for games of chance, strategy and physical skill must be absent from the game (J. M. Roberts et al., 1959).

However, the types of games in this typology are defined in a circular and often imprecise manner: "games of physical skill [...] must involve the use of physical skill" (J. M. Roberts et al., 1959, p.597). The authors give examples of marathon races and hockey, but it remains unclear *how much* physical skill is required. Defined loosely, all games require a certain amount of physical skill—even moving the pieces on a chess board. Defined narrowly, only games in which the means of the game are running, pushing, shoving, etc. would be considered a game of physical skill. Similar ambiguity exists for the other two game types as well. As this typology lacks clarity in the boundaries of these game types, I decided not to use this typology of games for my research.

1.2.2 A typology on the cooperativeness of games from Eifermann (1970)

The second important typology of games examines the cooperativeness of games (Eifermann, 1970; Orlick, 1978; Vossen, 2004). Eifermann (1970) examined the cooperativeness of games played by Israeli Moshav and Kibbutz children. Eifermann (1970) classifies games using three dimensions, asking whether each of these is present or absent in a particular game: 1) competitiveness, 2) grouping, and 3) symmetry. Competitiveness refers to the number of "parties" playing the game—a game with more than one party is considered competitive. The grouping refers to how players compete—by themselves or with others in groups. The third dimension, symmetry, refers to the roles of the players—whether these roles are interchangeable and equal or fixed and unequal. The resulting eight combinations of game types include: single party, symmetrical single party, singletons, singletons with roughly interchangeable roles, singleton vs. two or more singletons, singletons with overprivileged and/or underprivileged singletons, two groups, and two intrasymmetrical groups.

This typology offers clarity and applicability of the dimensions of games; however, applying it to cross-cultural and historical research would require a great amount of detail on the rules of each game and how the games are played. This typology is best apt to be used in observational studies of modern-day cultures.

1.2.3 The cooperative goal structure of games

I create a similar typology to Eifermann (1970), but focus on the competitiveness and grouping of players (see chapter 2 for details on the typology). My game typology on the cooperativeness

of games is in-line with the Social Interdependence Theory (SIT, Deutsch, 1949b; Johnson & Johnson, 2005). The SIT proposes that social interactions can be categorized into three groups based on the orientation of one's goal—no interdependence, positive interdependence, and negative interdependence—and these goal structures govern how people interact (Johnson & Johnson, 2005).

In my typology on the goal structure of games (i.e., the cooperativeness of games), I use these main concepts of the SIT and apply them to games. Situations in which the goal of one individual does not affect the goal of the other, such as in a game of hopscotch, would be considered to have no interdependence. Children playing a game of hopscotch each have the goal to successfully hop through all of the squares without making a mistake (i.e., jumping on the line or throwing their rock so it touches the line). When one player successfully jumps through all ten squares, they have personally reached their goal, while the others remain unaffected by this and continue to play. Negative interdependence occurs when one person reaches their goal and another person is prevented from reaching theirs. A game of competitive hopscotch, in which the players' goals are to jump through all of the squares before the other players do, exemplifies negative goal interdependence—when one player completes all ten squares, the game is over. Positive interdependence occurs when individuals' goals align and the fate of one person's goal coincides with that of other players. A game of cooperative hopscotch, in which all players win if the squares are successfully hopped through by any player, but all lose if one player makes a mistake, exemplifies positive goal interdependence. In other words, the interdependence of the players determines the goal structure of the players and the game.

In chapter 2, I make use of the goal structures proposed by the SIT to examine the goal structures of rule-based games, and then apply the typology to the games played in Austronesia.

1.3 Games in development and culture

In the following sections, I review previous literature examining games. I address the questions: when do humans start to play games, what do humans play in various cultures, how are games played across cultures, and why are these games played across cultures. This sets the framework for the research presented in this dissertation.

1.3.1 When do humans start playing games?

Jean Piaget examined French children's understanding of game rules. He found that children begin to play rule-based games in middle childhood, but understand the flexibility of rules much earlier, around four years of age (Piaget, 1997). However, four-year-old children do not retain all aspects of complex rules and are less concerned with monitoring other players' adherence to these rules (Piaget & Inhelder, 1969). Piaget & Inhelder (1969) concluded that younger children therefore engage in rule-based games mostly to have fun (Piaget & Inhelder, 1969). It is only at the age of seven that players obey the agreed-upon rules, survey other players' adherence to these rules, and have a "collective spirit of honest competition" (Piaget & Inhelder, 1969, p.119).

Piaget's research raises the question: which abilities do children need to have in order to engage in game play? Game play is complex and varies in the degree of skills required to engage in the game. The necessary level of cognitive, social, physical, and emotional skills will vary depending on the game being played.

Some of the basic skills that children need to engage in rule-based games include an understanding of rules and perspective-taking. Given the importance of rules in rule-based games, children need to have an understanding of the normativity of rules, which children develop around five years of age (Rakoczy et al., 2008, 2009). Five-year-old children also enforce and transmit the rules of a game, regardless of whether they are taught the rules by an adult or create the rules by themselves (Hardecker et al., 2017). However, five-year-olds consider the rules to be more flexible when children create the rules themselves, while seven-year-olds consider the rules to be equally flexible regardless of who creates them (Hardecker et al., 2017). Another set of skills that children need to engage in playing games with other players is to understand social interaction patterns and cues. Typically developing three-year-olds adjust the informativeness of their explanations to the knowledge of partners while playing a game, thus taking into account how knowledgeable partners are (Köymen et al., 2015). Children with impaired development in social interactions and communication, such as children with Autism Spectrum Disorders (ASD), experience difficulties engaging in spontaneous playful interactions (Jung & Sainato, 2013; Gammeltoft & Nordenhof, 2007) and play by themselves more often than with social partners (Holmes & Willoughby, 2005).

Although typically developing children possess the skills at an earlier age, it is not until the beginning of the first grade (i.e., around six to seven years of age) that children in Western societies begin to engage in rule-based games (Piaget & Inhelder, 1969; Vygotsky, 1967; Pellegrini

et al., 2004). In non-Western cultural contexts, children engage in rule-based games at roughly the same age—between the ages of six and eight years of age (Mogel, 2008). Children also engage in rule-based games to various degrees—Edwards (2000) found that the frequency with which children play games in six different cultures ranges from 12% to 75%.

Game play is not only children's play—games are played throughout the lifetime. Although examination of adult game play lacks the breadth and depth that children's play has been given, previous studies have investigated the benefits of game play for adults. For example, some studies claim that the cognitive abilities of young adults, such as spatial cognition (Feng et al., 2007) and reasoning (Wood & Stewart, 1987), can be improved by playing video games (McLaughlin et al., 2012). A qualitative study examining video game play in adults with ASD suggests that games are fun and entertaining for adults and may provide relief from stress and anxiety (Mazurek et al., 2015).

In sum, young children have the abilities needed to play games around age four, but do not start properly playing complex rule-based games until the ages of six to eight years. Humans also do not stop playing games—adults also play games. Now that I've established *when* humans play games, we can look at *which* games humans play across cultures.

1.3.2 Which games are played across cultures?

Games are not distributed randomly across cultures (Chick, 2015), rather, several factors influence the games that are played across cultures; varying from seemingly minuscule details of children's daily lives, such as the frequency of school recess (Pellegrini et al., 2004), and spanning to cultural-level attributes, such as societal complexity (J. M. Roberts et al., 1959). Individual level factors, such as personality traits (i.e., extroversion, neuroticism, conscientiousness) and sex could also influence game preference, the effects of which may vary across cultures. For example, in U.S. American culture, boys tend to play more "complex" ball games, while girls tend to play more jumping and verbal games (Pellegrini et al., 2004). Also, sex differences in children's play has been suggested to emphasize the adult gender-roles in societies (Lever, 1976, 1978); however, these findings are controversial (Gougoulis, 2003). The relationship between personality and games has been investigated for the preferences of video games (deGraft Johnson et al., 2013), but this relationship has yet to be examined for analogue, rule-based games.

At the cultural level, J. M. Roberts et al. (1959) shows that the presence of games requiring physical skill, strategy, and luck/chance depends on ecological and cultural attributes. For in-

stance, the presence of games of chance or luck in a given cultural group is positively correlated with the benevolence and aggression of gods, while games of physical skill are likely related to environmental conditions, such as the distance to the equator (J. M. Roberts et al., 1959).

While there is some evidence that the games played across and within cultures differ, there is a lack of systematic, comparative studies on the particular games that are played across cultures. The focus of this dissertation is less on which specific games are played in which cultures, and more on *why* these games are played. Therefore, aside from the Hai||om and Ovambo games I describe in chapter 5, I will not list the games nor go into detail on which exact games are played by the groups I studied. Lists and descriptions of specific games do exist for American (Sutton-Smith & Rosenberg, 1961; Rastegarpour, 2011; Pellegrini et al., 2004), Austronesian (S. M. Leisterer-Peoples et al., 2021), Israeli Kibbutz and Moshav (Eifermann, 1968), and many other cultural groups (Hawaiian: Culin, 1899; Māori: Sutton-Smith, 1951, A. Thomas, 1993; Iran: Rastegarpour, 2011; Syrian: Khouri, 1976; Yoruba: Ajila & Olowu, 1992; Mbenjele Yaka: Lewis, 2002; Baka (Cameroon): Kamei, 2005).

1.3.3 Why do cultural groups play certain games and not others?

Few studies have examined the potential function of games and why games vary across cultures, but there are several plausible explanations for their non-random distribution. For example, one low-level explanation would be that the physical environment (e.g., the amount of shade, sand, buildings, playgrounds) plays a role in the distribution of game types (i.e., physical skill, chance, strategy; J. M. Roberts et al., 1959). As mentioned in a previous section, J. M. Roberts et al. (1959) found that games of physical skill are related to environmental conditions—namely, in their sample, a majority of cultural groups within 20 degrees north and south of the equator had fewer games of physical skill than cultural groups beyond this 20 degree mark[3]. Other research suggests that minuscule details of everyday life may influence the kinds of games that are played. For example, Pellegrini et al. (2004) examined the games played by British and American school children and found that American children played chase more frequently during recess than British children. The authors attribute this finding to the American children only having one recess break, whereas the British children had two or three, and the British children habituating

[3]The authors of the study postulate that "mean annual temperature and protein and fat in the diet" may be influential in this relationship (J. M. Roberts et al., 1959, p. 604), but do not provide evidence for this speculation. Therefore, it remains unclear whether the physical environment is directly *causing* an increase or decrease in physical games, or whether aspects of cultural groups, which are influenced by the physical environment, are *causing* this increase or decrease.

to the breaks and becoming bored of the game. Alternatively, a higher-level explanation is that games may vary with aspects of the cultural groups that play them. In this section, I focus on the potential influences that the cultural environment has on why certain games are played across cultures. In outlining this relationship, I focus on the cultural level and not on the individual level preferences of games.

Observational studies suggest differences in *how* children engage in games across cultures. One major focus of observational work on games has been on the competitiveness and cooperativeness of games; although this focus has frequently been set by researchers examining play and games in non-Western cultures. It is often assumed by researchers examining play and games in Western cultures that games are competitive interactions, while cooperative activities are considered "amusements" and therefore excluded from this research (J. M. Roberts et al., 1959). Indeed, one study shows that school children in U.S. American culture prefer to play competitive games as opposed to non-competitive games in experimental learning contexts (J. C. Roberts, 2016); however, there are few studies examining the cooperativeness and competitiveness of Western children's spontaneous games.

Observational studies on games in non-Western cultures are plentiful and suggest a variety of note-worthy associations, such as social interaction patterns, the level of cooperation within a culture, and egalitarianism. For example, Syrian children engaged in competitive physical games more often than cooperative physical games (Khouri, 1976). Khouri (1976) notes that winning was of key importance during play, and that players commonly engaged in cheating. Although the cooperative games were less active than competitive games, Khouri (1976) suggests that the games Syrian children play reflect the "social interaction patterns of their culture". Additional observational evidence for a relationship between the cooperativeness of games and social interaction patterns comes from D. R. Thomas (1975). D. R. Thomas finds that the Māori play more cooperatively than people of European decent living in New Zealand and suggests that this reflects the focus on cooperation and the social skills important to the Māori culture.

A separate comparative study of the egalitarian Aka forager and hierarchical Ngandu farmer children in the Central African Republic suggests that Ngandu played more competitive games than the Aka foragers (Boyette, 2016a). The Aka do play games with competitive interactions, such as soccer, but they play it in a less competitive manner than the Ngandu. Boyette (2016a) suggests this pattern reflects the same "themes" of adult activities, such as competition and social dominance in Ngandu culture, and egalitarianism, cooperation, and autonomy in Aka culture. A similar pattern is described in the egalitarian foraging Mbendjele Yaka culture of northern

Congo-Brazzaville—the Mbendjele Yaka children's games lack competition and winners or losers (Lewis, 2002). Even when a competitive game, such as soccer, is played, players do not keep track of goals (Lewis, 2002). Another extensive observational study by Eifermann (1968, 1970), examining Kibbutz and Moshav children's games in Israel suggests that children living in Kibbutz play games that reflect their cultural values of cooperation and egalitarianism. Lastly, Australian Aboriginal children play games that are group-oriented rather than team oriented and place little emphasis on winning (Salter, 1974), which suggests that children learn the "egalitarian and cooperative nature" of the society through games (Schwartzman, 1979; Bowers, 1990).

These studies provide initial evidence for a potential relationship between the cooperativeness of games and social attributes of human cultural groups. It might be that the cooperativeness and egalitarianism of cultural groups influences which games are played and how the games are played, and that these cultural values are practiced and learned through game play.

However, a more rigorous test of these qualitative findings is lacking. The qualitative findings of these previous studies suggesting a relationship between the cooperativeness of cultures and games need to be put to the test with rigorous quantitative studies using modern-day statistical methods. Qualitative and quantitative studies are equally important in scientific research (N. Tinbergen, 1963; J. Tinbergen, 1973), and as such, will contribute to a solid foundation for a theory of the distribution of games that can continue to be tested and re-evaluated in future research.

1.4 Shortcomings of previous studies on games

In this section, I outline five shortcomings of previous studies on rule-based games. I provide solutions to these problems in the subsequent section 1.5 of the introduction.

1. Definition of games. Aside from the studies using the definition and game typology from J. M. Roberts et al. (1959), games are defined differently in many studies on games[4]. And limited effort has been put into defining the terms used in J. M. Roberts et al. (1959)'s definition of games. Therefore, I create a definition of games for use in cross-cultural research and define the terms used in the definition to conduce future applicability of this definition. This definition is presented in an earlier section of the introduction and in chapter 2.

[4]I outline the drawbacks associated with this definition in the Defining games section, so I will not reiterate them here.

2. **Accessibility to raw data and replicability of typologies.** Unfortunately, the raw data[5] from the influential study by J. M. Roberts et al. (1959) are not available. This makes a replication of the findings nearly impossible. It also makes the re-use of J. M. Roberts et al.'s categorization of games and their application of it difficult. J. M. Roberts et al. do not clearly define their categories of games, and without the raw data to manually check which games were assigned to which category, an adequate understanding and application of the coding scheme is difficult at best. I did attempt to define and apply the categories proposed by J. M. Roberts et al. to the games in my game database, but the reliability of these categories was very poor[6].

   The typology proposed by Eifermann (1970) is an invaluable resource for game research; however, the main drawback of this typology is the amount of detail required to categorize each game appropriately. Given the historical and cross-cultural nature of the research in this dissertation, and the lack of detailed information on games from these historical resources, I did not apply Eifermann's typology to games.

   To address these two issues, I searched through hundreds of historical resources (e.g., books, articles, ethnographies) for descriptions of rule-based games to create a database on games. This relational database is publicly available for future research. In addition to this, I created my own typology of games focusing on the cooperativeness and competitiveness of the goal structures that can be used for research on historical and modern-day cooperation and competition. Both are presented in chapter 2.

3. **Galton's problem.** A drawback of previous large-scale research on games (e.g., J. M. Roberts et al., 1959; Edwards, 2000) is that these studies do not consider the potential relatedness of the cultural groups in their samples—a problem commonly referred to as Galton's problem (Tylor, 1889; Mace & Holden, 2005). The non-independence of individual data points within a sample can lead to spurious correlations (Mace & Holden, 2005) that are commonly non-significant when appropriate statistical methods (i.e., controlling for the non-independence of data points) are applied (Dow, 2007). Auto-correlation has been found in other large cross-cultural databases (i.e., the Standard Cross-Cultural Sample Dow & Eff, 2008) from this era. Galton's problem likely has implications for the interpretation of J. M. Roberts

[5] I am referring to the description of the games, before they were coded into categories for J. M. Roberts et al. (1959).

[6] I provide my unsuccessful early attempts at defining and applying this coding scheme in the appendix (see Appendix: Determination of the Outcome of the Game).

et al. (1959)'s findings, but this has yet to be statistically tested. In chapter 3, I examine rule-based games on a large-scale and statistically control for the relatedness of cultural groups by using comparative phylogenetic methods (Jordan, 2013).

4. **Qualitative nature and small sample sizes.** As I mentioned previously, there is ample evidence for a relationship between games and cultural attributes of cooperation and egalitarianism. However, a majority of previous game studies that suggest such a relationship are observational or have small sample sizes (e.g., two cultural groups). The qualitative nature of these studies are important for generating hypotheses (N. Tinbergen, 1963; J. Tinbergen, 1973), but these hypotheses also need to be tested in quantitative studies. Eifermann (1970) tests this relationship quantitatively in Kibbutz and Moshav children's games, but for generalizability this relationship, larger samples of cultural groups are needed. I address these concerns in chapter 3 by examining the games played by 25 ethnolinguistic groups in the general region of the Pacific, and how they are related to cultural levels of cooperation.

5. **Cooperative aspects of culture.** Previous studies that describe a relationship between the cooperativeness or type of game and the cooperativeness of cultures rarely define which aspects of culture are considered cooperative and why (e.g., Eifermann, 1970; Boyette, 2016a; Schwartzman, 1979; Bowers, 1990; Salter, 1974). I address these concerns by measuring and testing the relationship between cooperative aspects of cultures (i.e., social stratification, levels of conflict, and interdependence in foraging) and the cooperativeness of games in chapter 3 and chapter 6.

1.5 Focus of this dissertation

The research I present in this dissertation examines games cross-culturally, historically, and experimentally. I use a breadth of methods to examine games cross-culturally and gain different perspectives on games across cultures. There are two main parts to this dissertation. In Part I of this dissertation, I gather information on historical games in ethnolinguistic groups on the Austronesian language phylogeny (chapter 2) and test the relationship between games and cultural levels of cooperation (chapter 3). In Part II of this dissertation, I present information on three modern-day cultures (chapter 4), the games they engage in (chapter 5), and experimentally test the relationship between game preference and cultural levels of cooperation (chapter 6).

To understand how games are played and why, it is important to use a breadth of methods.

Observational studies on one or two cultural groups can show us the diversity of what children play across cultures and help generate hypotheses. Simultaneously, large-scale studies can show us the quantitative similarities and differences among multiple cultural groups. Qualitative, observational studies are equally important to understanding phenomena as are quantitative and large-scaled studies (N. Tinbergen, 1963; Chu & Schulz, 2020). Each chapter aims at reaching several different goals or answering questions, each outlined below.

Part One

Database on Historical Austronesian Games

The main focus of chapter 2 is to gather and describe information on rule-based games from several ethnolinguistic groups whose main languages are associated with the Austronesian language family. This relational database is the first multi-culture, open-access database on games available for future research. Additionally, I create a coding scheme of the cooperativeness of games, called the "goal structure of games", by applying the Social Interdependence Theory (Johnson & Johnson, 1974; Deutsch, 1949b) to games. The main goals of this chapter include:

I Conglomerating information from historical sources on games.

II Creating a categorization of the cooperativeness of games.

III Categorizing game descriptions based on their goal structure.

IV Preparing an open-access, relational database of games for future research.

Cooperation and Games Historically

The aim of chapter 3 is to test the relationship between the variation in the cooperativeness of games and cultural measures of cooperation across several cultures. This study uses the database on historical Austronesian games (S. M. Leisterer-Peoples et al., 2021), a database on cultural attributes (Watts, Sheehan, et al., 2015), and a mixture of phylogenetic and Bayesian statistical methods. The main questions answered in this study include:

I Do the goal structure of games vary across ethnolinguistic groups in the Austronesian language phylogeny?

II Do the cooperative goal structures of games vary with cultural levels of cooperation (i.e., social stratification, inter-group and intra-group warfare, and interdependence in subsistence)?

Part Two

Three Modern-Day Cultures

In chapter 4, I describe the three modern-day ethnolinguistic groups (the Hai||om and Ovambo in Namibia, and the Germans in Germany) that are the focus of part two of this dissertation. The main goal of this chapter is to assess and describe cultural levels of cooperation by integrating ethnographic material and semi-structured interviews.

Observations of Games

In chapter 5, I present the games I observed during my fieldwork with the Hai||om and Ovambo groups in Namibia. I relate these to games played in other cultural groups. The main goals of this chapter include:

I Recording the games played by the two ethnolinguistic groups in Namibia.

II Evaluating the goal structures of the games they play.

Cooperation and Games Experimentally

The focus of chapter 6 is to examine the relationship between the preference for cooperative and competitive games and cultural levels of cooperation. Here, I use a quasi-experimental approach and integrate the interview data presented in chapter 4 with the results of the quasi-experiment. The main questions answered in this study include:

I Do children's preferences for cooperative and competitive games vary across culture and age?

II Do game preferences coincide with cultural levels of cooperation?

III Does the development of game preference in children mimic the game preferences of adults?

Following these sections, I discuss the findings of this dissertation in the General Discussion, elaborate on the potential relationship between the goal structure of games and cultural levels of cooperation, and address limitations and future directions for research on games in cross-cultural settings.

PART I

Historical Games and Cooperation in Austronesia

Chapter 2

The Austronesian Game Taxonomy: A cross-cultural dataset of historical games

Humans in most cultures around the world play rule-based games, yet research on the content and structure of these games is limited. Previous studies investigating rule-based games across cultures have either focused on a small handful of cultures, thus limiting the generalizability of findings, or used cross-cultural databases from which the raw data are not accessible, thus limiting the transparency, applicability, and replicability of research findings. Furthermore, games have long been defined as competitive interactions, thereby blinding researchers to the cross-cultural variation in the cooperativeness of rule-based games. The current dataset provides ethnographic, historic information on games played in cultural groups in the Austronesian language family. These game descriptions (N_{games} = 907) are available and codeable for researchers interested in games. I also develop a unique typology of the cooperativeness of the goal structure of games and apply this typology to the dataset. Researchers are encouraged to use this dataset to examine cross-cultural variation in the cooperativeness of games and further our understanding of human cultural behavior on a larger scale.

Publications associated with this chapter:

Leisterer-Peoples, S.M., Hardecker, S., Watts, J., Greenhill, S.J., Ross, C.T., and Haun, D.B.M. (2021). The Austronesian Game Taxonomy: A cross-cultural dataset of historical games. *Humanities and Social Sciences Communications*, *8*(113), 1-11. https://doi.org/10.1057/s41599-021-00785-y.

Leisterer-Peoples, S.M., Hardecker, S., Watts, J., Greenhill, S.J., Forkel, R., Ross, C.T., & Haun, D.B.M. (2021). The Austronesian Game Taxonomy: A cross-cultural dataset of historical games (Version 1.2.1) [Data set]. Zenodo. http://doi.org/10.5281/zenodo.4675217.

2.1 Background & summary

For humans and non-human animals, play is an essential activity that prepares individuals for adult life. Even though play offers few direct and immediate pay-offs and requires substantial energy (Pellegrini et al., 2007), human children spend a large portion of their time playing (Lew-Levy, Boyette, et al., 2019). During play, children imitate adults and acquire culture-specific skills, norms, and behavioural repertoires (Bock & Johnson, 2004). Although human and non-human animals engage in various forms of play, there is one human-specific form of play (Lew-Levy, Boyette, et al., 2019) that humans of many different ages engage in: rule-based games (Rakoczy, 2007).

Games are a type of play characterized by predefined rules that normatively structure the actions and goals of one or more players (Whittaker, 2012; Stenros, 2016). Children as young as three understand and selectively enforce the normative rules of such games (Rakoczy et al., 2008, 2009; Hardecker et al., 2017; Rakoczy, 2007). Between the ages of five and six, children naturally begin to engage in rule-based games (Mogel, 2008). Games also play a special role in human culture, in that they simulate behaviour in important cultural activities, such as war or religious practice (J. M. Roberts et al., 1959). With regard to culture, game types vary with geographic location (Mogel, 2008), child-rearing practices (J. M. Roberts & Sutton-Smith, 1962), and social complexity (J. M. Roberts et al., 1959). For example, games of strategy are present in most societies with high-levels of political integration and social classes, but are absent in most societies without these (J. M. Roberts et al., 1959), suggesting a non-random distribution of games as a function of cultural context (Chick, 2015). As for the function of games in human development, theoretical and empirical evidence is currently lacking. Research on humans and animals suggests play has an important role in the development of social, cognitive, physical, and emotional skills (Krenz, 2001). However, rule-based games have often been excluded from this research (Pellegrini et al., 2007; P. Smith, 2005), as some have argued that rule-based games do not "foster innovation" (Pellegrini et al., 2007).

To the extent that games have been studied cross-culturally, research has mainly focused on a single category of games—competitive ones. A commonly used definition of games in the anthropological and psychological literature (Avedon & Sutton-Smith, 1971; Barry & Roberts, 1972; Chick, 1998a, 2015; Peregrine, 2008; J. M. Roberts & Sutton-Smith, 1966, 1962; Silver, 1978) also includes competition as a prerequisite: "a recreational activity characterized by organized play, competition, two or more sides, criteria for determining the winner, and agreed-upon rules"

(J. M. Roberts et al., 1959). This view has shaped our understanding of games as competitive interactions and has excluded other forms of games—such as cooperative or solitary ones—from the lenses of psychological and anthropological research (Vossen, 2004). As such, little is known about variation in the cooperativeness of games and how the cooperativeness of games might relate to variation in other aspects of the cultural environment.

One way in which the cooperativeness or competitiveness of a game manifests is through its goal structure (Johnson & Johnson, 2011; Deutsch, 1949a). Some games emphasize cooperative behaviour between individuals to achieve a shared goal (e.g., hacky sack), others emphasize competitive behaviour between individuals (e.g., chess), or solitary behaviour with no shared nor exclusive goal among players (e.g., jacks). In one of the few studies to examine non-competitive rule-based games, Eifermann (1970) finds variation in the cooperativeness of games played by Kibbutz children and Moshav children, suggesting that games mirror cultural levels of cooperation and egalitarianism. However, the small sample size of cultural groups ($N = 2$) in this study limits the generalizability of this research.

The current dataset addresses these issues by providing rich descriptions of a large set of games played in Austronesian-speaking cultural groups. Cultural groups associated with the Austronesian language phylogeny (R. D. Gray et al., 2009) share common linguistic ancestry (Greenhill et al., 2008; R. D. Gray et al., 2009) and cultural features (Watts, Sheehan, et al., 2015; Watts et al., 2016; Goodenough, 1957b), and comprise one of the largest language families in the world (R. D. Gray et al., 2009). Despite their common linguistic ancestry, these cultural groups exhibit high cultural diversity (Goodenough, 1957a; Watts, Sheehan, et al., 2015). Moreover, a significant fraction of these groups are ethnographically well-documented, making them an ideal sample for testing predictions about the distribution and role of games in human cultures.

The Austronesian Game Taxonomy is a unique dataset that can be utilized to investigate questions on the origins, distribution, and function of human games. In addition to the game descriptions (available upon request), I provide the goal structure coding (scheme), several optional filtering steps for researchers to include or exclude games according to the aims of their research, and codes for cross-cultural database matching. I encourage researchers to use the current dataset to test predictions about the distribution of the cooperativeness of games, or to code other aspects of games, such as the type of skill needed to play the game (J. M. Roberts et al., 1959), the psychological interdependence of players (Eifermann, 1970), the ages and sex of players, or the use of objects in games across cultures. For example, researchers could ask questions about the role games might play in children's social learning across cultures (Boyette, 2016b), or

whether the distribution of games relates to other cultural variables such as social stratification (Boyette, 2016a; J. M. Roberts et al., 1959) or levels of intergroup conflict (Richerson et al., 2016).

2.2 Methods

Defining Games

In most prior cross-cultural studies on games, scholars have defined games competitively (J. M. Roberts et al., 1959) and often in terms of 'rule-based games' (Boyette, 2016a; Hewlett et al., 2011). For the purposes of the current study, I have adapted the criteria used by Whittaker (Whittaker, 2012), which includes non-competitive rule-based games. Importantly, as defined here, games also include non-competitive scenarios *and* can be played by one or more players. I define a *game* as an activity with:

1. explicit rules accepted by the player(s),
2. undetermined outcomes or actions,
3. contest or challenge, and
4. non-utilitarian value

Whittaker (Whittaker, 2012) does not clearly define the game criteria in detail, thus, I define these criteria in our own terms. The first criterion, "explicit rules", refers to the constitutive rules of the game, or the regulating means of playing the game. Explicit rules refer to specific behaviours or actions allowed and prohibited by the player(s) of the game to achieve the goal of the game (i.e., the instructions or rulebook of the game) (Vossen, 2004).

"Undetermined outcomes" refers to the end-state of the game and can be as simple as not knowing whether one will achieve the goal of the game or, if there is a winner, not knowing who will win the game. "Undetermined actions" include the uncertainty in the specific actions made by the player(s), the order of the actions during the activity, or the timing of events. In other words, the actions and outcome of the game are not scripted or pre-determined, as in a theatrical play.

A contest or challenge can be defined as a real or imaginary obstacle for the player(s) to overcome in order to reach the goal of the game. When this challenge is not overcome, the player(s) do not reach the goal of the game. This contest or challenge can take the form of competition between two teams toward one mutually-exclusive goal, or it may take the form of a task in which one individual player plays "against" time, chance, or their own abilities. It is

important to note that this criterion does not imply that there must be several players playing the game—a contest or challenge may exist for an individual player playing a game by themselves—and it also does not imply that there must be competition between the players in the game.

The final criterion, a "non-utilitarian value", includes activities that people play "freely and spontaneously" (Whittaker, 2012) and suggests that people choose these activities because they want to play the game (Whittaker, 2012), but not because the game is imposed upon them by others.

Game descriptions which provided insufficient information on the game (e.g., the source mentioned the name of the game or a short description of the game without the rules) were included in the database and potentially merged with additional descriptions from other sources at a later stage. Users of the data who prefer a narrower definition of games (e.g., excluding non-competitive games as in J. M. Roberts et al., 1959) may re-code the text excerpts to reflect their views. Users may also want to re-examine the four main databases listed in Search Criteria and Methodology for further relevant text excerpts.

Defining the Goal Structure of Games

As previous studies have often defined games in a competitive manner, not much is known about the cooperativeness of games. One way to capture potential variation in the cooperativeness of games is to examine the cooperativeness of the structure of the players' goals. The cooperativeness of social interactions can be categorized into three broad types–no interdependence, positive interdependence, and negative interdependence (Johnson & Johnson, 1974, 2011; Deutsch, 1949a). No interdependence indicates the independence of individuals goals—one person is not affected by another person achieving their goal. Positive interdependence refers to the congruity of individuals' goals. For example, if one person reaches their goal the other person also reaches theirs. Negative interdependence refers to the opposition and misalignment of individuals' goals—if one person reaches their goal, the other person cannot reach theirs.

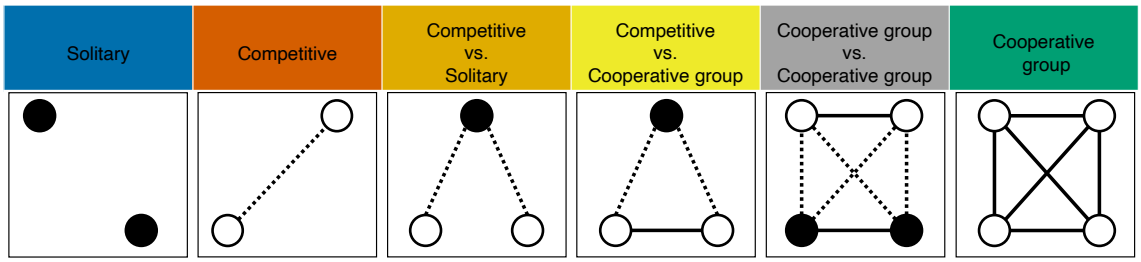
While this typology of interpersonal goal structures is useful, social interactions are rarely purely cooperative or competitive (Deutsch, 1949a). Games can also take on more complex structures due to the interaction of social interdependencies and the dyadic structure of interactions between individuals. Thus, I present a new coding scheme for the cooperativeness of games by expanding these interpersonal goal structures to examine the goal structure of games. In the context of games, I define a 'goal' as the overarching aim of the player as a means to end the

game. For example, in a game of chess, each player has the goal of placing the other's king in checkmate.

I describe our typology of goal structures in detail below and provide a visual guide in Figure 2.1. I discuss the most common types of goal structures for the games observed in our dataset here. There are other possible goal structures with more than two units that I do not present.

The description of each goal structure is followed by an example game that is familiar to the first author (i.e., American-European background), followed by one from the AustroGames database.

Figure 2.1: The goal structure of players during a game. Each dot represents one player. The colour of the dots represents the goal of the player; different coloured dots represent differing goals; same-coloured dots represent identical goals. A dashed line represents a competitive relationship between players' goals (negative interdependence), a solid line a cooperative relationship between players' goals (positive interdependence), and no line between players is neither a cooperative nor competitive relationship (no interdependence).



Our typology includes the following goal structures of games:

Solitary The players can interact in a game at the same time and usually have an identical goal, but the players neither cooperate nor compete with one another (no interdependence; Johnson & Johnson, 1974). A single player can also play a game by themselves. For example, in a game of hopscotch, players have the identical, non-cooperative, and non-competitive goal of hopping through all of the boxes by themselves. The game *tanimalenge* (Game_ID: bello04, Pulotu_culture: Renell and Bellona, Common_name: bite the apple) requires a stick (80 cm long) with a piece of yam, taro, or panna placed on top of the stick. A player attempts to bite the piece of yam off the stick while hopping on one foot with their hands behind their back. If a player succeeds, they retreat into the circle of observers surrounding the stick and join in singing, and the piece of yam is set-up for the next player. If a player does not succeed (i.e., puts their foot down or the piece of yam falls), they retreat into the circle and join in singing. There is no winner or loser of the game (Kuschel, 1975).

Competitive Players compete with one another and do not cooperate with any other players to achieve the goal of the game. There are no teams in this form of game; each player is a unit and competes against the other players (negative-interdependence; Johnson & Johnson, 1974). For example, in a game of chess, each player has the goal of placing the opponent's king in checkmate. Each player acts competitively, and players' goals are mutually exclusive to one another. In the game *lafo litupa* (Game_ID: samo44, Pulotu_culture: Samoan, Common_name: throwing and catching 100 beans), two players try to catch 100 beans in groups of four before the other player (Culin, 1899).

Competitive vs. Solitary Some players have identical, individual goals, and are neither cooperating nor competing with one another to reach this goal (no interdependence, as indicated by the white dots in Figure 2.1; Johnson & Johnson, 1974). The other individual (i.e., the black dot) has a competing goal with these players (negative interdependence; Johnson & Johnson, 1974). For example, in a game of hide-and-seek, it is one player's goal to find all other players, while the other non-cooperating individuals try to hide for as long as possible, irrespective of whether the other hiding players have been found. A similar game, *pe'epe'e akua* (Game_ID: hawa49, Pulotu_culture: Hawaiian, Common_name: hide-and-seek), is played outdoors in Hawaii with a "ghost" as the seeker (Pukui, 1943; Culin, 1899).

Competitive vs. Cooperative group Some players have identical, mutual goals, and cooperate to reach this goal (i.e., positive interdependence; indicated by the white dots in Figure 2.1; Johnson & Johnson, 1974). Another player (i.e., the black dot) has a competing goal (negative interdependence; Johnson & Johnson, 1974) with the cooperating individuals. For example, in freeze tag, one individual's goal is to tag all other players, while the opponents aim to stay unfrozen for as long as possible, and can cooperate and 'unfreeze' each other by tapping 'frozen' players on the shoulder. The game *hai kaui* (Game_ID: bell12, Pulotu_culture: Rennell and Bellona, Common_name: circle game) is played by children in water. A group of children hold hands to form a circle and one child swims inside of the circle, trying to escape the "net" by swimming through the legs of the others (Kuschel, 1975).

Cooperative group vs. Cooperative group Players cooperate with some players (positive interdependence; Johnson & Johnson, 1974) and compete with others (negative interde-

pendence; Johnson & Johnson, 1974). The goals of the groups may be identical or non-identical, but they are mutually exclusive between the groups. For example, in soccer, players of one team cooperate to score more goals/points in their opponent's net (while the other team has the opposing goal of scoring in the opposite net). *Te fafa tua* (Game_ID: vait11, ABVD_language: Tuvalu, Common_name: leap frog) is played by two teams of ten or more players, one team of standers, the other of jumpers. The standers form a sturdy line in the sand by wrapping their arms around the waist and their chest on the buttocks of the player in front of them. One at a time, the jumpers take a running leap onto the backs of the standers, thus straddling the standers and piling up behind and on top of one another. The goal of the jumpers is to break the line of the standers. If a jumper falls from the standers, the teams switch roles. If a stander breaks the line or falls, the jumpers get a point and leap again (Kennedy, 1930).

Cooperative group All players in this form of game cooperate to achieve the mutually shared goal of the game (positive interdependence; Johnson & Johnson, 1974). There is no competition between any of the players. For example, in a game of hacky sack or footbag, the goal of the game is to kick a small sack of grain back-and-forth between the players for as long as possible, without letting the hacky sack touch the ground. A similar game called *te boiri* (Game_ID: kiri02, Pulotu_culture: Kiribati, Common_name: kicking a ball in a circle) is played with a ball made out of pandanus leaves (Youd, 1961).

The number of players is often irrelevant to the goal structure of a game—players can join a game without changing the goal structure of that game. However, exceptions to this rule are the competitive units in the "competitive vs. solitary" games and "competitive vs. cooperative" games. If more than one player also competes against the other units in these two types of games, the competitive units become cooperative units because they share a common goal. Additionally, the goal structure of games, as defined here, only considers the player(s) engaged in the game; other people enabling game play (e.g., referees) are not included in the goal structure coding scheme.

2.3 Search criteria and methodology

Four main databases were used to systematically search for information on games in Austronesian cultural groups: the electronic Human Resource Area Files (eHRAF (Murdock, 1983), the re-

sources listed on the Pulotu website (Watts, Sheehan, et al., 2015), and two peer-reviewed journals (The Journal of the Polynesian Society (Allen, n.d) and American Anthropologist (D. A. Thomas, n.d)). An additional twelve data sources were opportunistically obtained by the first author. A total of 1,738 sources of data were searched, 219 of which yielded information on games. Further information on data collection is described in subsequent sections. A list of the sources yielding information on games is provided on the GitHub repository.

All sources mentioned in these databases and meeting the criteria mentioned in the subsequent subsections were searched through by the first author for passages on games according to the definition as described above. In cases where limited information on the game was provided by the original source (e.g., only the name of the game was mentioned, but not the rules), the information was included into the game database and potentially merged together with similarly referenced descriptions from other sources. In addition to the criteria mentioned below, only sources in the English and German languages were included in the search. Additional information on the geographic location of the society and language(s) spoken were also gathered from the original sources and matched to an Austronesian Basic Vocabulary Database code (ABVD (Greenhill et al., 2008)) whenever possible.

For example, on the island of Yap, the game of *văt* was described around the turn of the 20th century by two separate authors as follows:

> "văt. Ballgame for boys and girls, always played with only one hand. A four-sided ball made of plaited green coconut pinnae is thrown into the air. The next player must try to hit it from below with the palm of his hand to give it a new blow and to throw it to the next player in the same way. If one player misses the ball, his neighbours pelt him with reserve balls which each one has in his other hand. Older persons also occasionally play." (Müller, 1917)

> "First, there is the very popular ball-game. A fairly heavy, yet springy and flexible cube is plaited from two leaf pinnae of a coconut frond, the edges are not too sharp and are soon worn down sufficiently in the course of the game. The players form a circle and one tosses the "ball" into the air. As soon as it comes down, the one standing closest to it hits it strongly from below with the palm of his hand, so that it again flies high into the air, etc." (Salesius, 1906)

The two passages were identified as describing the same game and were coded as a game with a cooperative goal structure. The ethnolinguistic group also aligned with a cultural group on

Pulotu (Watts, Sheehan, et al., 2015), however, the Austronesian language phylogeny (R. D. Gray et al., 2009) does not include Yap (ABVD code: 77), thus, the game of *văt* would be excluded from analyses if the Austronesian language phylogeny (R. D. Gray et al., 2009) were to be used as a filtering criterion for games. A similar game played with a ball, and either using a hand or a foot, is described in eight ethnolinguistic groups included in our dataset. Using the AustroGames dataset, researchers could investigate questions about particular games, such as:

1. Is *văt* played in neighboring groups?
2. Are there differences in how *văt* is played in other ethnolinguistic groups?
3. Does the distribution of *văt* across cultures relate to group attributes, such as cooperation or population size, patterns of colonization, or frequency of interaction with neighboring groups?

eHRAF

The electronic Human Resource Area Files (HRAF, Murdock, 1983) provide digitalized ethnographic records and other resources relevant to research on many cultural characteristics and practices. The following search criteria were used to collect information on games in the eHRAF:

- "Oceania" (excluding Australia), AND
- "Games (524)", OR
- "Athletic Sports (526)", OR
- "Childhood Activities (857)"

In total, 2408 paragraphs from 196 sources in the eHRAF were searched through (final search date: August 2017).

Pulotu

There were 743 possible resources listed on the Pulotu website (Watts, Sheehan, et al., 2015), all of which were examined. The majority of the sources in Pulotu were books, thus, we created a search criteria to determine whether or not the source was relevant for our search on games. The following were the search criteria for Pulotu:

- A general social aspect in the title, for example, "Life in…", "People of…".
- If a PDF was available and searchable, the following terms were searched for: game/spiel, play, child(ren)/kind(er), amuse(ment), fun/spass, sport(s).
- If the source was unavailable as an electronic source (i.e., paper books, older PDFs):

  - Chapters on games, amusements, and childhood activities were searched for in the table of contents. If there was a possibility that games might be mentioned, the source was searched through by hand.
  - The sources were searched through based on:
    * the relevant chapter,
    * if there was no term index or clearly relevant chapter, the source was hand-searched for the following keywords: game, play, child(ren), amuse(ment), fun, sport(s).

Each source was subsequently examined for passages on rule-based games.

American Anthropologist

The American Anthropologist journal (D. A. Thomas, n.d) is one of the oldest existing journals in anthropology today and publishes research articles on all aspects of anthropology. A total of 413 sources were searched through using the following search criteria (final search date: October 2017):

- "Game", AND
- "Polynesia", OR
- "Melanesia", OR
- "Micronesia", OR
- "Oceania"

Each source was subsequently examined for passages on rule-based games.

The Journal of the Polynesian Society

The Journal of the Polynesian Society (Allen, n.d) is a valuable resource due to the geographic focus of the journal. A total of 374 sources were provided given the search criterion: "game" (final search date: January 2018). Each source was subsequently examined for passages on rule-based games.

Additional Sources

Twelve additional sources were not systemically obtained. The sources were either: 1) found in two local libraries (the Max Planck Institute for Evolutionary Anthropology and the Leipzig University libraries) given to the first author by colleagues.

2.4 Data records

All data and code are available on Zenodo (see S. M. Leisterer-Peoples et al., 2021) and on Github: https://github.com/ccp-eva/AustroGames. In addition to the raw game descriptions and coding (.csv), other files include a list of the sources from which passages on games were obtained, and an R (R Core Team, 2020) package to automatically load the data and conduct optional filtering steps. We provide cultural group codes from various databases—i.e., Pulotu, (Watts, Sheehan, et al., 2015), eHRAF (Murdock, 1983), Glottolog (Hammarström et al., 2020), ABVD (Greenhill et al., 2008), and D-Place (Kirby et al., 2016)—in the database, allowing researchers to cross-reference with other databases. In addition to the raw data files (.csv), we provide a metadata file (.json) to create a Cross-Linguistic Data Format (CLDF; Forkel et al., 2018). The CLDF offers a standardized and comparible format for linguistic and cultural datasets, and can be used in Python (van Rossum & de Boer, 1991). The raw game descriptions are available upon request due to copyright laws.

Variable Definitions

Table 2.1, Table 2.2, Table 2.3, and Table 2.4 list the variable names, as indicated in the data files (.csv), and provide a description of each variable. Each row in the "Games" data corresponds to a unique game in a cultural group. Each row in the "Cultures" data corresponds to a unique Austronesian Basic Vocabulary Database (ABVD; Greenhill et al., 2008) code. Other language identifiers are also provided—i.e., ISO-639-3 (SIL International, 2020), Glottolog (Hammarström et al., 2020). Each row in the "Descriptions" data corresponds to a unique description of a game, as mentioned in the original source. Each row in the "Sources" data corresponds to a unique publication describing a game. If multiple descriptions of a game in one cultural group were available, they were linked (see Record Linkage). For example, if a ball game played by Hawaiians was described by two sources, the "Game_ID" is listed twice in the "Descriptions" table, once for each description. If a description mentioned multiple games, then each corresponding "Game_ID" is listed in that row of the "Descriptions" file.

Descriptive Statistics of Games

I collected information on a total of 907 games in ethnolinguistic groups in the Austronesian language family. Each game may occur multiple times if it was described as being played by several ethnolinguistic groups; however, the game only appears once for each ethnolinguistic

Table 2.1: The variables and their definitions in the Sources data. Each row corresponds to a unique publication.

Variable	Definition
Source_ID	Unique source identifier
eHRAF_Doc_ID	Document ID from eHRAF
Publication_date	Publication date of the source
Source_citation	Citation of the original source
Time_frame	Time focus from the original source in years
Time_type	Refers to the type of information used to determine the time frame (field date, focus date)
Description_ID	Refers to the description identifier in Descriptions.csv

Table 2.2: The variables and their definitions in the Descriptions data. A description can refer to multiple games and one game can be mentioned in multiple descriptions, as indicated in "Game_ID".

Variable	Definition
Description_ID	Unique description identifier
Source_ID	Corresponds to the Source_ID in Sources.csv
Game_ID	Corresponds to the Game_ID in Games.csv
Geographic_location	Geographic location mentioned by the original source
Geographic_location_uncertainty	Uncertainty in the geographic location coding (1 = uncertainty)
Game_description	Raw game description as written in the original source (available upon request)

group. For example, if a game of baseball was played by Hawaiians and by the Māori, baseball is listed once for each ethnolinguistic group in our database and occurs twice in our database (i.e., once for each ethnolinguistic group). The exception to this rule is if a game with the same name was described with two different sets of rules (e.g., if two ethnographers described baseball in Hawaii played with different rules). In this case, both "versions" of the game of baseball would be listed as distinct games played in Hawaii. The number of games available for analysis will depend on the interests of each researcher. For example, a researcher interested in examining the goal structure of games in combination with the Austronesian language phylogeny (R. D. Gray et al., 2009) will acquire a total of 452 games from 55 ethnolinguistic groups after the necessary filtering steps (see Table 2.5 and Filtering Games for optional filtering steps). The distribution of goal structures of games within each cultural group after these filtering steps is visualized in Figure 2.2.

For example, one of the findings is evident in Figure 2.2: the distribution of the coopera-

Table 2.3: The variables and their definitions in the Games data. Each row in the Games table refers to a unique game played in a cultural group.

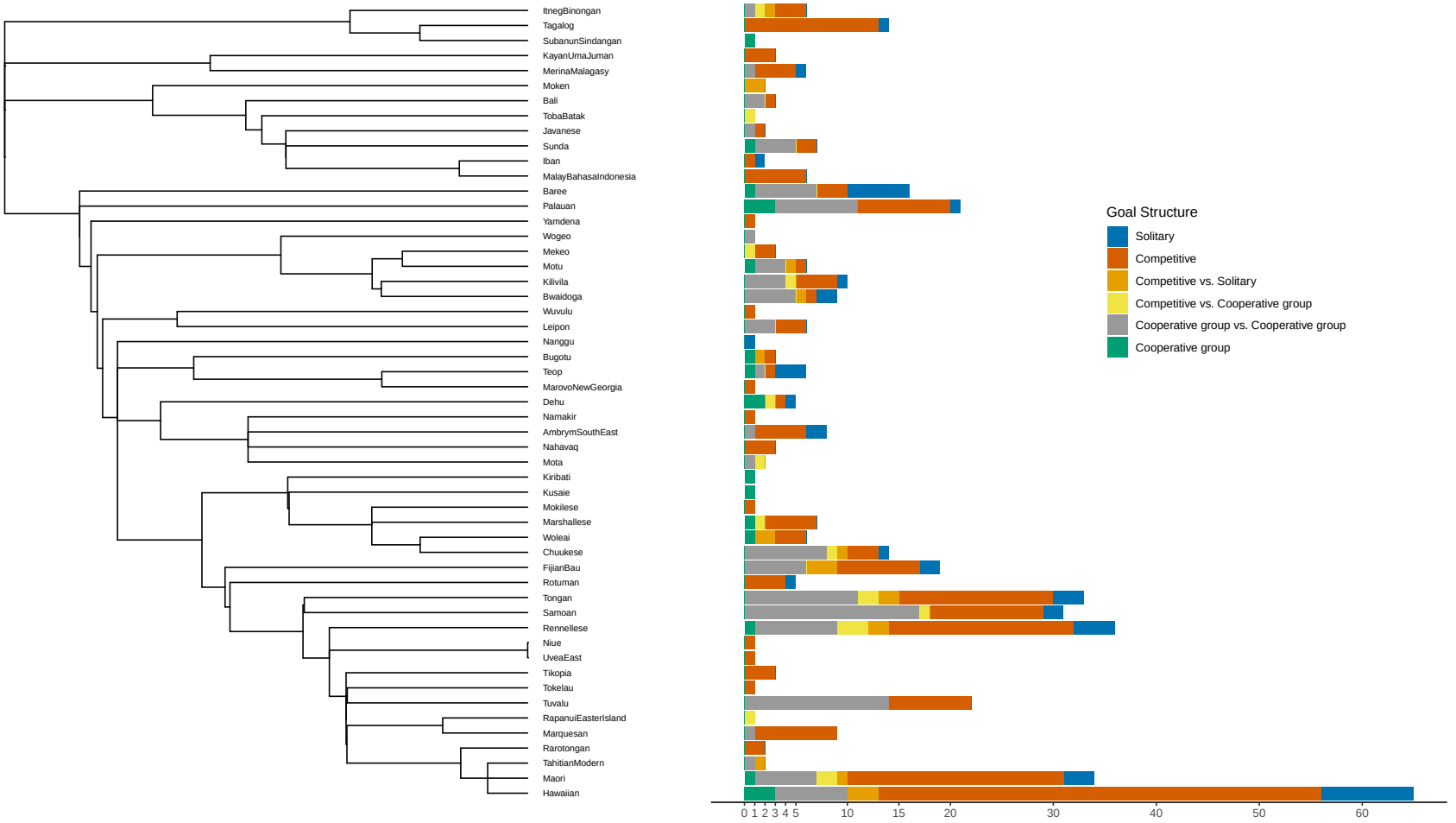
Variable	Definition
Game_ID	Unique game identifier specific to cultural group as defined by ABVD
Local_name	Name(s) of the game as indicated by the original source(s)
Common_name	Common name(s) of the game
Description_ID	Refers to the Description_ID in Descriptions.csv
Game	Indicates whether the description qualifies as a game as defined earlier in this publication (1 = game, 0 = not a game)
Game_uncertainty	Uncertainty whether the description qualifies as a game
Game_comments	Comments regarding the game description or other aspects of the data
ABVD_code	Refers to the ABVD_code in Cultures.csv
ABVD_uncertainty	Uncertainty of the ABVD coding (1 = uncertainty)
Goal_structure	Indicates the goal structure of the game
Goal_uncertainty	Uncertainty in the goal structure coding (1 = uncertainty)
Goal_comments	Comments regarding the goal structure coding
Introduced_keywords	Indicates which keywords were found in the game description(s)
Introduced_coding	Whether the game description(s) indicate non-local origin (nonlocal, local, undetermined)
Introduced_uncertainty	Uncertainty in the introduced coding (1 = uncertainty)
Introduced_comments	Comments regarding the introduced coding
Pulotu_time_ok_0	Indicates whether the 'traditional' time frame from Pulotu matches the time frame(s) from the game (1 = same time frame, 0 = different time frames)
Pulotu_time_ok_50	Indicates whether the 'traditional' time frame from Pulotu matches the time frame(s) from the game, +/- 50 years (1 = same time frame, 0 = different time frames)

tiveness of games varies across cultural groups. Competitive (n = 228) and cooperative group vs. cooperative group games (n = 121) are the most common type of games in this filtered sub-sample (n = 452).

Table 2.4: The variables and their definitions in the Cultures data. Each row in the Cultures table refers to a unique ABVD (Greenhill et al., 2008) code.

Variable	**Definition**
ABVD_code	Linguistic identifier from the Austronesian Basic Vocabulary Database (ABVD)
ABVD_language	Language corresponding to the ABVD_code in Games.csv
Glottolog_code	Linguistic identifier from the glottolog database
ISO6393_code	Linguistic identifier from the ISO-639-3 database
ABVD_longitude	Longitude according to ABVD
ABVD_latitude	Latitude according to ABVD
Pulotu_culture	Name of the culture as indicated by Pulotu
Phylo_TreeTaxaName	The name of the language on the Austronesian language phylogeny from Gray et al. (2009)
Dplace_HRAF_name_ID	Name of the culture as indicated by D-Place
Game_ID	Corresponds to the Game_ID in Games.csv

Figure 2.2: The number of games with each goal structure found in each cultural group after applying several filters (Filters 1, 2, 3, and 6 in Table 2.5), mapped onto the pruned Austronesian language phylogeny (R. D. Gray et al., 2009) (n = 452). The colourful bar graphs represent the number of the goal structure of games found in each ethnolinguistic group. The tips on the phylogeny indicate the language associated with the ethnolinguistic group. I used the ape (Paradis & Schliep, 2018), ggtree (Yu, 2020; Yu et al., 2018, 2017), and ggplot2 (Wickham, 2016) packages in R (R Core Team, 2020) to create this graphic.



2.5 Technical validation

There were several steps involved in the preparation of the game data for research use. First, I assigned cultural group identifiers (i.e., language codes; see Cultural Group Identifiers). Then, I identified game descriptions within each cultural group that described the same game (see Record Linkage). Additionally, I recommend filtering the games in several steps (see Filtering Games). I provide reliable coding for most filtering steps. Depending on the interests of researchers and the usage of other databases in addition to the games data, researchers have the option to "turn off" or "turn on" each filtering step with the provided R (R Core Team, 2020) package.

Cultural Group Identifiers

A cultural group is defined as an ethnolinguistic group, following Pulotu (Watts, Sheehan, et al., 2015). Language codes from the Austronesian Basic Vocabulary Database (ABVD, Greenhill et al., 2008), Glottolog (Glottocodes, Hammarström et al., 2020) and ISO 639-3 database (SIL International, 2020) were assigned to each description using the geographic locations (i.e., city, town, country, coordinates) as mentioned in the original source. SMLP, JW, and SJG worked in collaboration to assign the language codes to games played by a given cultural group. Given the availability of ABVD codes in combination with the Austronesian language phylogeny (Greenhill et al., 2008) and the Pulotu database (Watts, Sheehan, et al., 2015), ABVD codes were used in further validation steps.

I also provide cultural group names, as indicated in other cultural databases—i.e., Pulotu (Watts, Sheehan, et al., 2015), eHRAF (Murdock, 1983), D-Place (Kirby et al., 2016)—for additional cross-referencing. Multiple language code assignments are separated by semicolons.

Record Linkage

To prevent descriptions of the same game within one cultural group from being assigned multiple game IDs, the descriptions of the games were linked (whenever possible) according to the name of the game, details of its play, geographic location and cultural group identifiers. If there was not enough information in the game descriptions to determine whether two descriptions described the same game, the descriptions were not linked. If multiple descriptions from one cultural group did describe the same game, then each of the description IDs will appear in the "Games.csv" under the column "Description_ID". Additionally, if a game played by one ethnolinguistic group was

referenced in two descriptions, the corresponding "Game_ID" in the "Games.csv" will be listed in two different rows in the "Descriptions.csv", once for each description of the game played by the ethnolinguistic group.

Filtering and Coding of Games

As mentioned in the Technical Validation section, researchers have the option to "turn on" or "turn off" each filtering step with the provided R (R Core Team, 2020) package, thereby including or excluding certain games. Games can be filtered with the following optional steps (see Table 2.5 for the sample sizes after each filtering step):

- Combinations of descriptions that describe a rule-base game, as defined in this publication
- Games with a location that could be assigned to an ABVD code (Greenhill et al., 2008)
- Games with a goal structure code (see Figure 2.1 and Defining the Goal Structure of Games for codes)
- Games of local or non-local origins
- Games with ABVD codes corresponding with a cultural group in Pulotu (Watts, Sheehan, et al., 2015)
- Games with time foci matching the time foci in Pulotu (Watts, Sheehan, et al., 2015) (+/- 0 or 50 years)
- Games with ABVD codes corresponding to a language on the Austronesian language phylogeny (R. D. Gray et al., 2009)

Goal Structure

The amount of information in and ambiguity of each game description varies considerably, making it difficult to consistently code the goal structure of games. A game was coded as "NA" in cases where the amount of information did not suffice to assign a goal structure code to a game. Additionally, the vocabulary used in the game descriptions varies from Early Modern English to Late Modern English, and occasionally German. All of the games were coded by the first author, whose mother-tongue is English and who has fluency in German. Reliability coders (GC, SC) separately coded 15% and 25% of the game descriptions, respectively. Their mother-tongues are German and both have fluency in English. All inter-rater reliabilities were calculated in R (R Core Team, 2020, Version 3.6.3) with the irr package (Gamer et al., 2019).

Reliability of the goal structure coding was very good (κ = 0.94; see Table 2.6). Three rounds of coding were conducted. Round one of the coding was conducted during data collection by

Table 2.5: Filters applied to the games data with the number of games and cultural groups retained at each step. The final two rows exemplify the sample sizes after applying multiple filters. The number column (Nr.) is for quick reference and is irrelevant for the order in which the filters are executed.

Nr.	Filter	Games	Cultural groups
0	Before any filtering (linked game descriptions)	952	-
1	Coded as a game	907	-
2	Game and can be assigned an ABVD code	764	79
3	Game and can be assigned a goal structure code	521	68
4a	Game and without non-local games	890	88
4b	Game and has a non-local origin	62	21
4c	Game and only local games	52	17
5a	Game and time-frame of game matches Pulotu data (+/- 0 years)	86	12
5b	Game and time-frame of game matches Pulotu data (+/- 50 years)	307	35
6	Game and ABVD assigned to game is on language phylogeny	694	63
	Filters 1, 2, 3, 4a, 5a, 6	53	10
	Filters 1, 2, 3, 4a, 5b, 6	172	27

an intern (GC) using a small subset of the final data. After round one, the descriptions of the goal structures were elaborated to the goal structure coding presented in this paper. Rounds two and three were conducted with another intern (SG) after data collection was complete. After round two, the first author marked the disagreements between SG and the first author, and the reliability coder (SG) was asked to first determine whether there was enough information about the game to code the goal structure, and then to code the goal structure only if there was enough information. SG was not told that the games marked were disagreements. The two coders (SG and the first author) then met to discuss questions regarding the English expressions used in the game descriptions, after which SG finished coding. Disagreements between the two coders—along with alternative goal structure codes—are noted in "Games - Goal_uncertainty" and "Games - Goal_comments".

Introduced Games

I coded whether authors described the game as local or non-local to the cultural group of interest, as mentioned in the linked game descriptions. With this coding, researchers can include or exclude games that are described as being introduced to the cultural group (i.e., foreign origin). For example, researchers interested in understanding the core functions of games might wish to

Table 2.6: Inter-rater reliability scores (Cohen's kappa (Cohen, 1960), unweighted) for the goal structure coding and the "introduced" coding of games. The number of games vary due to the various stages of data collection. See main text for more information.

Type	Round	Coders	N Games	Kappa
Goal Structure	1	GC-SMLP	45 (15% of 300 games)	0.776
Goal Structure	2	SG-SMLP	177 (25% of 702 games)	0.642
Goal Structure	3	SG-SMLP	177 (25% of 702 games)	0.94
Introduced	1	NL-SMLP	67 (25% of 266 descriptions)	0.487
Introduced (binary)	1	NL-SMLP	67 (25% of 266 descriptions)	0.808

examine only the games that were introduced into the cultural groups in order to understand which components of these games are integrated and which are dropped during the process of cultural transmission. Alternatively, researchers interested in the relationship between games and psychological aspects of culture might want to exclude games of non-local origin, as they might not reflect the norms and cultural values of the focal cultural group.

There were two steps involved in coding the origins of each game. In the first step, game descriptions were searched through to locate keywords that might indicate the origin of the game. These keywords listed in no particular order: origin, former(ly), past, introduce(d by), introduction (of), tradition(al), generation, ancient, historic(al), authentic(ity), convention, native, mission(ary/aries), custom(s), foreign(ers), import(ed), settlement, church, American, Japanese, English, Europe(an), Chinese, Spanish, British, Arab(ia), Dutch, French. These keywords did not necessarily indicate the traditional or foreign origin of the game.

In the second step, the game descriptions with at least one keyword were coded to determine whether the games were of non-local or local origin. Only game descriptions with keywords were coded for their origin. A game was coded "nonlocal" if there was evidence that it was of non-local origin or introduced into the cultural group (e.g., by missionaries, neighboring groups, etc.). The game was coded "local" if there was evidence that the game was created within the group (e.g., played since generations). If there was insufficient evidence to determine the origin of the game, "undetermined" was coded. All games that did not mention at least one keyword were coded with "NA".

All of the combined game descriptions mentioning at least one keyword were coded by the first author and a reliability coder (NL) coded 25% of these game descriptions. The inter-rater reliability was calculated in R (R Core Team, 2020, Version 3.6.3) and with the irr package (Gamer et al., 2019). Reliability of the origin coding was low (κ = 0.487). However, of the 19 disagreements

between the coders, 5 of them were coded as "nonlocal" by one coder and undetermined by the other. There were also no cases in which a game was considered "nonlocal" by one coder and "local" by the other. Thus, a majority of the disagreements among coders was in distinguishing between games of local origins and game descriptions providing insufficient information on the origins of the game. To double-check this claim, the origin coding was re-coded into a binary format: "keep" (undetermined or local) and "exclude" (non-local). Reliability on the binary origin coding was good (κ = 0.808), thus, coders reliably coded when a game was not local, but not when a game was described as being local or had insufficient information on the game origin. The uncertainty in this coding and disagreements between the coders is provided in the database (i.e., in "Games", see "Introduced_comments" and "Introduced_uncertainty").

Cross-referencing with other databases

The ABVD code(s) assigned to each game in "Games - Game_ABVD_code" were matched with the ABVD codes in Pulotu (Watts, Sheehan, et al., 2015), ABVD (Greenhill et al., 2008), glottolog (Hammarström et al., 2020), eHRAF (Murdock & White, 1969), and D-Place (Kirby et al., 2016) for cross-referencing. If Pulotu provided multiple ABVD codes, I provide all of the ABVD codes that matched with the ABVD code assigned to a game (ABVD_code). For example, if a game had two possible ABVD codes (419, 421) and Pulotu provided a list with several ABVD codes (419, 420, 421), I assigned both of the ABVD codes that matched (419, 421). Multiple ABVD codes are separated by a semicolon.

Pulotu Time Frame

The original sources of game descriptions were searched through for information on the field dates of author visitation. The field dates were recorded in specific years or ranges of years. If field dates were not available, I searched for focus dates set by the author. For example, a publication from 2005 retrospectively writing about Hawaiian culture in 1898 would receive a "focus" date of 1898, although the author was not present (i.e., no field date) at the time. If a field date or a focus date was not mentioned in the source, and a brief search using search engines for information on the author's travels revealed no specific dates, the publication date was recorded. This time frame information is available in the dataset under "Time_frame".

Pulotu (Watts, Sheehan, et al., 2015) provides "traditional time foci" which can be used to filter out games that weren't played at the same time that cultural variables in Pulotu were described.

I give researchers the option to match the time foci from the cultural variables with the time foci of the games to ensure that the games and the cultural variables were described at similar points in time. This reduces the possibility that the games were played at a much later time than the cultural variables of the cultural group, or vice versa. The time foci for the cultural variables were provided by the Pulotu database (Watts, Sheehan, et al., 2015). Additionally, we give researchers the option to take the exact time foci from Pulotu (Pulotu_time_ok_0) or the time foci +/− 50 years (Pulotu_time_ok_50).

For example, researchers might not wish to assume that a game described in 1970 reflects cultural variables provided by Pulotu from 1830. To detect such issues, I matched the time foci of the games with the time foci of the cultural variables (with an optional buffer of $\pm$ 50 years). Thus, if the cultural variables in Pulotu were from 1820-1850, a game that was described in 1810 would still be kept in the dataset (i.e., the game was within the $\pm$ 50-year time frame: 1770-1900), while a game from 1970 would be excluded.

Austronesian Language Phylogeny

As mentioned in a previous section (see Cultural Group Identifiers), each description was assigned an ABVD code, if possible. In a subsequent step, I matched these ABVD codes to the ABVD codes on the constructed Austronesian language phylogeny (R. D. Gray et al., 2009). The Austronesian language phylogeny used in this study was constructed by Gray and colleagues (R. D. Gray et al., 2009) using 210 basic vocabulary items. Only some of the languages in the Austronesian language family correspond to languages on the Austronesian language phylogeny used in this study (R. D. Gray et al., 2009); thus, in many cases, there was no match between games and the language phylogeny (i.e., the game's ABVD code did not correspond with any branch on the phylogeny). The sample size after applying this filter and others is provided in Table 2.5.

The inclusion of phylogenies in statistical models has been proposed to allow for control of shared ancestry (Blute & Jordan, 2018; Jordan, 2013; Mace & Holden, 2005; Tylor, 1889), also known as Galton's problem (i.e., the non-independence of data or information within a sample; Mace & Holden, 2005; Tylor, 1889). Phylogenies have also been used to reconstruct ancestral states (e.g., Blute & Jordan, 2018; Jordan, 2013; Bowern, 2018; Da Silva & Tehrani, 2016; Tehrani, 2013), transitions from one trait to another along evolutionary time (e.g., Jordan, 2013; Watts et al., 2016), and answer questions about the co-evolution of traits (Blute & Jordan, 2018; Jordan,

2013; Bowern, 2018; Butler & King, 2004; C. T. Ross et al., 2016).

2.6 Research opportunities

This dataset contains rich information on games and play from Austronesian-speaking cultural groups. Cultural anthropologists, psychologists, and those interested in comparative research can use the data to generate large-scale examinations of games and play across cultures. This is a unique dataset, as no other large-scale examination of games across cultures has made their data available in a codeable format (e.g., Murdock & White, 1969; J. M. Roberts et al., 1959).

Researchers coding new aspects of this dataset are asked to consider forking and merging their own coding back to the main dataset hosted on GitHub. This will allow interested researchers to help grow our cumulative knowledge of games. This dataset provides researchers with opportunities to examine relationships between cultural variables and games, as well as study cultural change and diversity.

Researchers are encouraged to code other aspects of these games, such as the type of game (i.e., strategy, physical skill, chance; J. M. Roberts et al., 1959), the psychological interdependence of players (Eifermann, 1970), the ages of players, or the objects used in the games. For example, researchers could examine the role games might play in children's social learning across cultures (Boyette, 2016b), or whether the distribution of games relates to other (cultural) variables such as social interaction patterns (e.g., Khouri, 1976; Barry & Roberts, 1972), political stratification (e.g., Peregrine, 2008; Silver, 1978), or child socialization (J. M. Roberts & Sutton-Smith, 1962, 1966).

In addition to the research questions mentioned throughout this paper, researchers can use the dataset to answer questions about cultural evolution, human child development, and the role of games in cultural groups. Researchers can use the data to run phylogenetically-informed analyses, such as ancestral state inference for certain games or game goal structures, the co-evolution of game traits and traits of cultures, or the spread of games across Oceania. Researchers should keep in mind that the dataset provided here is not a complete collection of *all* games played by these ethnolinguistic groups, but provide a solid starting point for researchers interested in games.

2.7 Data availability

The R code (R Core Team, 2020, Version 4.0.3) for data filtering and the AustroGames dataset can be found on GitHub: https://github.com/ccp-eva/AustroGames and on Zenodo: https://zenodo.org/record/4675217. The data are in the .csv format to ease human coding of new aspects of games. Additionally, users interested in a machine-friendly version of the data are encouraged to create a Cross-Linguistic Data Format (CLDF, Forkel et al., 2018) by using the .json file provided. Additional information on the CLDF (Forkel et al., 2018) and reading CLDF into R (R Core Team, 2020) can be found here: https://github.com/cldf and https://github.com/SimonGreenhill/rcldf. The code used to pre-process the data published here and to create Figure 2.2 is available upon request. The raw data (i.e., the text excerpts) are available upon request. Users of the dataset or code are asked to cite this publication and the data (S. M. Leisterer-Peoples et al., 2021).

Chapter 3

Games and enculturation: A cross-cultural analysis of cooperative goal structures in Austronesian games

While most animals play, only humans play games. As animal play serves to teach offspring important life-skills in a safe scenario, human games might, in similar ways, teach important culturally relevant skills. Humans in all cultures play games; however, it is not clear whether variation in the characteristics of games across cultural groups is related to group-level attributes. Here we investigate specifically whether the cooperativeness of games covaries with socio-ecological differences across cultural groups. We hypothesize that cultural groups that engage in frequent inter-group conflict, cooperative sustenance acquisition, or that have less stratified social structures, might more frequently play cooperative games as compared to groups that do not share these characteristics. To test these hypotheses, we gathered data from the ethnographic record on 25 ethnolinguistic groups in the Austronesian language family. We show that cultural groups with higher levels of inter-group conflict and cooperative land-based hunting play cooperative games more frequently than other groups. Additionally, cultural groups with higher levels of intra-group conflict play competitive games more frequently than other groups. These findings indicate that games are not randomly distributed among cultures, but rather relate to the socio-ecological settings of the cultural groups that practice them. We argue that games serve as training grounds for group-specific norms and values and thereby have an important function in enculturation during childhood. Moreover, games might serve as an important role in the maintenance of cultural diversity.

Publications associated with this chapter:

Leisterer-Peoples, S.M., Ross, C.T., Greenhill, S.J., Hardecker, S., and Haun, D.B.M. (2021). Games and enculturation: A cross-cultural analysis of cooperative goal structures in Austronesian games. *PLoS One*. https://doi.org/10.1371/journal.pone.0259746.

Leisterer-Peoples, S.M., Ross, C.T., Greenhill, S.J., Hardecker, S. & Haun, D.B.M. (2021). Games and enculturation: A cross-cultural analysis of cooperative goal structures in Austronesian games (Version 1.0.0) [Data set]. *Zenodo*. https://doi.org/10.5281/zenodo.5608489.

3.1 Introduction

Games are a human invention, but their function might be similar to the function of play in the animal kingdom more generally. As with play, games help children prepare cognitively and behaviorally for life as successful adults (Bock & Johnson, 2004). To assess the possible function of games as training grounds for complex social skills (i.e., shared intentionality (Tomasello & Carpenter, 2007), or complex coordinated actions), we test if the goal structures of rule-based games are related to key socio-ecological factors across cultural groups on the Austronesian language phylogeny. We focus on one of the most relevant, potentially unique features of the human species: cooperation.

Humans stand out in the natural world for their ability to cooperate with unrelated individuals (Henrich et al., 2005) and organize behavior around shared goals (Tomasello & Carpenter, 2007). Such levels of cooperation appear to exceed what can be explained using standard evolutionary models—e.g., based on kinship or reciprocity (Boyd & Richerson, 1988; Gintis et al., 2003). An emerging approach to understanding cooperation in humans proposes that cultural group selection (Cavalli-Sforza & Feldman, 1981; Boyd & Richerson, 1985; Henrich, 2004; Richerson et al., 2016) can explain the high levels of extant cooperation as a function of selection on cultural traits that confer success in inter-group competition—be it direct competition through warfare (Bowles, 2008; Bowles & Gintis, 2013), or indirect competition through processes like differential between-group imitation (Waring et al., 2017).

Within this framework, cultural variants that serve to increase group-level fitness sufficiently are expected to increase in frequency, at least in contexts where inter-group competition is high (Bowles, 2008; Bowles & Gintis, 2013). Here, we explore variation in one such cultural variant—the goal structure of rule-based games. While some games emphasize cooperative behavior among members of a group with a shared intention or goal (e.g., in volleyball), others emphasize solitary behaviors (e.g., in knucklebones), or direct competition between individuals (e.g., in chess). We propose three possible scenarios promoting the emergence and maintenance of cooperative goal structures in rule-based games.

The first proposal links the **foraging niche** of a given cultural group with the goal structures of its games. If there are opportunities for mutual benefits to cooperative action (i.e., there are stag-hunt scenarios; Skyrms, 2004) for adult foragers, then we would expect selection to favor games with goal structures that emphasize social coordination and cooperativeness.

The second proposal links the **prevalence and type of conflict** in a given cultural group

with the goal structure of its games. If there are opportunities for mutual benefits to cooperative action (e.g., in contexts where inter-group warfare is common), then we would again expect selection to favor games with goal structures that emphasize social coordination and cooperativeness.

The third proposal links the **social structure** of a given cultural group with the goal structure of its games. An early study on the distribution of game types across cultural groups indicates that social complexity—operationalized using political integration and the presence or absence of social classes—covaries positively with games of strategy (J. M. Roberts et al., 1959). Additionally, more recent studies suggest that the social structure of cultural groups might be linked with the cooperativeness of the games played therein (Boyette, 2016a; Ager, 1976; Eifermann, 1970). If the unequal distribution of valuable resources (Schwartz, 1999) within a society leads to a breakdown of cooperativeness and egalitarian social norms, then we would expect fewer cooperative games in societies with higher levels of social stratification.

We investigate these possible associations by modeling the relationship between the goal structure (Deutsch, 1949b; Johnson & Johnson, 2011) of games in 25 ethnolinguistic groups within the reconstructed Austronesian language phylogeny (R. D. Gray et al., 2009) and several group-level variables. Specifically, we use data on the goal structure of rule-based games (S. M. Leisterer-Peoples, Hardecker, et al., 2021) and model these data as a function of the presence or absence of conflict, the extent of land- and water-based hunting in groups, and social stratification (Watts, Sheehan, et al., 2015). The cultural groups in our sample share a common linguistic (Greenhill et al., 2008; R. D. Gray et al., 2009) and cultural history (Watts, Sheehan, et al., 2015; Watts et al., 2016), and are part of one of the largest language families in the world. These ethnolinguistic groups exhibit high levels of cultural diversity (Goodenough, 1957a; Watts, Sheehan, et al., 2015), and are generally ethnographically well-documented.

In the following sections, we first review the literature on the role of play in the development of adult competency cross-culturally. Next, we outline our three theoretical proposals for the emergence of cooperative goal structures in games. We then model the data using phylogenetically-controlled multinomial, univariate and multivariate regressions. We conclude with a presentation of our findings and a discussion of the relevance of rule-based games to ongoing questions about cultural group selection and the evolution of human cooperativeness.

Children's play

Play is a ubiquitous and essential activity that is believed to prepare children for their adult lives, both socially and in subsistence related tasks (Bock, 2002; Bock & Johnson, 2004). Play allows children to imitate adults and helps them acquire culture-specific skills, norms, and behavioral repertoires (Bock & Johnson, 2004). Children learn emotional, physical, cognitive, and social skills during play (Krenz, 2001), and play is vital for learning new strategies in unfamiliar situations (Pellegrini et al., 2007). Recent studies on children's activities in both small-scale foragers (Boyette, 2016a) and WEIRD (Henrich et al., 2010) populations (Pellegrini, 2009) suggest that children spend 25–30% of their time playing, making play a potentially substantial driver of the socio-cognitive development observed during childhood.

The specific kinds of play that children engage in, however, varies across cultural groups. For example, children of Aka foragers in the Central African Republic engage predominately in work-pretense play, whereas children of their Ngandu neighbors—living in a more socially stratified context—engage in more competitive forms of play (Boyette, 2016a). Similar cross-cultural differences in children's play have been examined in other studies, contrasting, for example, German and Thai children (Mogel, 2008), or children in Kenya, Mexico, the United States, India, Okinawa, and the Philippines (Edwards, 2000). Children also engage in different forms of play depending on age (Mogel, 2008) and sex (Boyette, 2016a; Gaskins, 2014) across cultural groups.

However, despite its omnipresence across diverse cultural contexts, play has been more thoroughly examined in Western, industrialized cultural groups than in small-scale cultural groups (but see Bock, 2002; Bock & Johnson, 2004; Boyette, 2016b,a; Lew-Levy, Crittenden, et al., 2019; Lew-Levy, Boyette, et al., 2019; J. M. Roberts et al., 1959). This sampling bias reduces the representativeness of the literature (Nielsen et al., 2017) and ignores substantial cross-cultural variation in children's playing behavior (Nielsen & Haun, 2016). In this paper, we will attempt to build a more robust understanding of the potentially functional role that play serves cross-culturally, by investigating the variation in goal structures within a specific type of play known as *games*.

Games

Games are a type of play characterized by predefined rules that structure interactions between players (Whittaker, 2012). Game types (i.e., games of strategy, chance, physical skill, etc.) vary with geographic location (Mogel, 2008), child-rearing practices (J. M. Roberts & Sutton-Smith, 1962), social complexity (J. M. Roberts et al., 1959), and cultural norms (Eifermann, 1970; Ager,

1976; Bonta, 1997). As for the function of games, a study by Eifermann (1970) suggests that Kibbutz children's games reflect cultural values of cooperation and egalitarianism. Ager (1976)'s study on the games played by a small Inuit community in Tununak, Alaska, mirrors these findings: the types of games and the resulting form of social interactions between players reflect Inuit cultural values of non-aggression and autonomy.

As with research on children's play more generally, extant work on games suffers from a sampling bias; wide-ranging comparative studies of the relationship between games and cultural characteristics are lacking. Rule-based games have even been explicitly excluded from previous research on the relationship between phylogeny and ontogeny of play (P. K. Smith, 2005), being regarded as inflexible and "not foster[ing] innovation" in children's behavior (Pellegrini et al., 2007). Moreover, to the extent that games have been studied cross-culturally, research has mainly focused on a single category of games—competitive ones (S. M. Leisterer-Peoples, Hardecker, et al., 2021). For example, J. M. Roberts et al. (1959) offered a commonly used definition of games that numerous subsequent studies (e.g., Avedon & Sutton-Smith, 1971; Barry & Roberts, 1972; Chick, 1998a, 2015; Peregrine, 2008; J. M. Roberts & Sutton-Smith, 1966, 1962; Silver, 1978) then adopted: *organized, competitive, and rule-based play between two or more players, with a winner.* This definition exemplifies the common understanding of games as competitive activities and has excluded other forms of games—such as cooperative or solitary ones—from the lenses of comparative research (S. M. Leisterer-Peoples, Hardecker, et al., 2021). Due to this bias, little is known about how cultural selection pressures (Henrich, 2004; Richerson et al., 2016) on the cooperativeness or competitiveness of games might emerge as a function of variation in the cultural and natural environment.

Possible drivers of cooperative goal structures

Games can vary in their goal structures—some games emphasize cooperative behavior between individuals to achieve a shared goal (e.g., in hacky sack), while other games emphasize competitive behavior between individuals (e.g., in chess). Assuming that games help children acquire the skills needed to be successful as an adult in their local cultural context, and that games vary in the extent to which their goal structures emphasize cooperation, a question arises with respect to the cultural evolutionary drivers of the goal structures of games: which social and ecological forces might cause the goal structure of games to emphasize cooperation in one cultural group, and competition in another? As outlined earlier, we consider three possible explanations for

the emergence and maintenance of cooperative goal structures: one based on the frequency of group foraging, one based on conflict prevalence and structuring, and the third based on social stratification.

Interdependence in foraging

Human groups (Hewlett et al., 2011; Demps et al., 2012; Pacheco-Cobos et al., 2019; Koster et al., 2020), and even some non-human primates (Boesch, 2002; Jaeggi et al., 2010; Barrett et al., 2017), rely on coordination and social learning in their food quests. If coordinated labor (or generalized interdependence in subsistence Silk & House, 2016) is an essential precondition of securing food (e.g., as in Lamalera; Alvard & Nolin, 2002), then we would predict that children who develop elevated competency in coordinated, goal-oriented actions with shared intentions (i.e., as found in cooperative games), would have higher foraging competence as adults. As we outlined earlier, if experience playing cooperative games over developmental time improves adult foraging competency in groups, then the goal structures of rule-based games should covary with the extent of interdependence in foraging.

This leads us to the prediction that:

P1 The frequency of games with cooperative goal structures will be positively associated with the presence of interdependence in foraging.

Intra- and inter-group conflict

Bowles (2008), Bowles & Gintis (2013) and Choi & Bowles (2007) argue that within-group cooperation can be stabilized by inter-group competition. They draw on a more general proof by Price (1970) that selection between groups can overcome individual-level incentives to shirk cooperation, and provide a plausible causal mechanism linking two widely observed facts about human psychology: 1) humans are frequently altruistic (i.e., they often confer benefits on others at a cost to themselves), and 2) humans are frequently parochial (i.e., they often favor ethnic, religious, or group insiders over outsiders). Specifically, Bowles (2008) argues that: "altruism would have facilitated the coordination of raiding and ambushing on a scale known in few other animals, while parochialism fuelled the antipathy towards outsiders." In unison, these forces can lead to strong selection pressures for intra-group cooperation, especially because there is a substantially greater scope for selection to act on cultural drivers of cooperative behavior than genetic ones (Bell et al., 2009; Richerson et al., 2016). Zefferman & Mathew (2015) elaborate on this argument

more explicitly, arguing that: "human warfare meets the two necessary and sufficient conditions for group-structured cultural selection: Variation in cultural traits between groups influences the outcome of warfare and the outcome of warfare influences the spread of these cultural traits."

Success in inter-group conflict depends on effective tactics, large-scale organization, and purposeful goal-oriented coordination between individuals. Again, as we have outlined before, if experience in game play under coordination- and cooperation-based goal structures over the period of childhood development improves adult competence in contexts demanding intra-group cooperation, then we would expect to see selection on the goal structure of games respond to the extent of inter-group warfare.

This leads us to the predictions that:

P2a The frequency of games with cooperative goal structures will be positively associated with the presence of inter-cultural warfare.

and:

P2b The frequency of games with cooperative goal structures will be negatively associated with the presence of intra-group conflict.

Lack of social stratification

Social stratification refers to the unequal distribution and accessibility of valuable resources (e.g., education, income, power) within sub-groups of a given society (Treiman, 1970). Cross-cultural studies have found that social stratification varies with population size (Peoples & Marlowe, 2012), human sacrifice (Watts, Greenhill, et al., 2015), and belief in moralizing high gods (Roes & Raymond, 2003). Recent observational studies also suggest a relationship between social stratification and the types of play that children engage in (Boyette, 2016a; Ager, 1976). In one study, the socially stratified Ngandu were found to play more competitive games than their egalitarian Aka neighbors (Boyette, 2016a). Two other investigations also suggest that egalitarian social structures are reflected in the structure of games (Ager, 1976; Eifermann, 1970), in so far as egalitarian-structured cultural groups engage in more cooperative games than socially stratified cultural groups.

This leads us to the prediction that:

P3 The frequency of games with cooperative goal structures will be negatively associated with the presence of social stratification.

3.2 Methods

Games

Our analysis draws on the goal structure codings provided by the AustroGames database (S. M. Leisterer-Peoples, Hardecker, et al., 2021; S. M. Leisterer-Peoples et al., 2021). This open-access dataset provides detailed information on historical games played by cultural groups across the Austronesian language family. These data cover the ethnographic research period from the 18th to the 20th century.

We use the following game filtering steps in R (R Core Team, 2020) provided by Leisterer-Peoples, et al. (S. M. Leisterer-Peoples et al., 2021): i) games must have been linked to an Austronesian Basic Vocabulary Database code (ABVD; Greenhill et al., 2008), ii) games must be described in enough detail to assign a goal structure code, iii) games must not be of non-local origin, iv) games must occur within cultural groups in the Austronesian language phylogeny (R. D. Gray et al., 2009), v) games must occur in cultural groups with covariate data in Pulotu (Watts, Sheehan, et al., 2015), and vi) the game descriptions must correspond to the same time frame as the covariate data from Pulotu, $\pm$50 years. Additional information on the sample sizes after each filtering step, and the biases that could potentially be introduced by these filters, can be found in the Appendix B.

Due to small sample sizes in several of the goal structure categories (e.g., purely cooperative games; see Table 3.1 for sample sizes and Figure 3.1 for details on the goal structures), we collapse the goal structures of games into three main groups: *cooperative games* (i.e., all games with cooperative interactions: cooperative group, cooperative group versus cooperative group, competitive versus cooperative group), *competitive games* (i.e., games without cooperative interactions, but with competitive interactions: competitive versus solitary, competitive), and *solitary games* (i.e., games with neither cooperative nor competitive interactions: solitary).

Cultural covariate data

Socio-cultural and ecological data from cultural groups in the Austronesian language family were obtained from the Pulotu database (Watts, Sheehan, et al., 2015). The Pulotu database documents both historical and modern-day cultural and religious data from 116 geographically diverse ethnolinguistic groups in the Pacific (Watts, Sheehan, et al., 2015).

Figure 3.1: The goal structure coding of games from S. M. Leisterer-Peoples, Hardecker, et al. (2021) (reproduced under CC-BY 4.0 license). Each dot represents a player. The color of the dot represents the goal of the player; players with differing goals have different colored dots. A dotted line represents competition and a solid line cooperation. The absence of a line represents a lack of either cooperation or competition between players. The number of dots and lines is simplified for illustration (i.e., each goal structure can have more than 2-4 players without necessarily changing the structure of the game). For example, tag is a game with a "competitive vs. solitary" goal structure—a lone competitive player (i.e., the black dot) tries to tap the other players (i.e., the gray dots), who each have the same goal of staying untagged, but are neither cooperating nor competing with one another. The goal structures are grouped into three main categories for the current study: games with cooperation (green label), competitive games (red label), and solitary games (blue label).

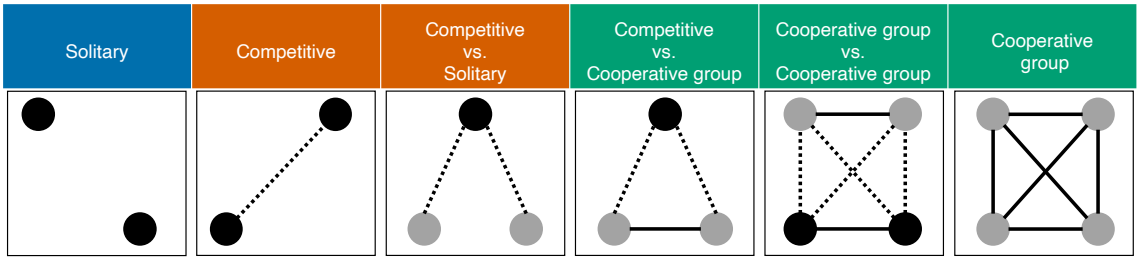


Table 3.1: The distribution of goal structures in the original dataset (after filtering steps; S. M. Leisterer-Peoples, Hardecker, et al., 2021) and in the distribution used in the analyses. The data were grouped into three categories for the analyses in the current study: cooperative, competitive, and solitary (see Figure 3.1 for more details on the goal structure types and the Appendix B for the number of games in each of the 25 ethnolinguistic groups.)

Goal structure	**Original sample size**	**Analysis sample size**
Solitary	23	**23**
Competitive	76	
Competitive vs. Solitary	9	**85**
Competitive vs. Cooperative group	8	
Cooperative group vs. Cooperative group	45	**60**
Cooperative	7	
Total	168	**168**

Interdependence in foraging

The cultural groups included in our analyses are mainly located within the Pacific region; as such, both land- and water-based hunting are vital sources of sustenance for many of the cultural groups. Subsistence activities can vary in the amount of coordination and cooperation they require (Talhelm et al., 2014). We therefore assess the presence of substantial group-based

hunting on land and water.

Land-based group hunting, and water-based hunting and fishing in groups (Watts, Sheehan, et al., 2015), were independently coded as present or absent in each population. Each group-based hunting style was coded as *present* if a substantial portion of the diet was produced under such a hunting style. A given group-based hunting style is considered *absent* if it is either not practiced or if it does not contribute substantially to the typical diet.

For example, the people of Buka, an island in Bougainville, eastern Papua New Guinea, acquire a large portion of their sustenance through water-based hunting in groups; therefore, water-based hunting is considered *present* among the people of Buka. The people of Buka also hunt pigs for special occasions. For example, it is stated that: "Pig being a luxury usually reserved for feasts, and other flesh food being somewhat scarce and hard to come by, the usual relish to a meal of taro consists of fish." (Blackwood, 1935, p. 284). Because a substantial portion of the diet on Buka does not result from land-based hunting in groups, land-based hunting in groups is considered *absent* there.

Conflict

The frequency and intensity of conflict and warfare is measured in three variables in Pulotu (Watts, Sheehan, et al., 2015): i) the frequency of inter-personal conflict *within* local communities of a given ethnolinguistic group, ii) the frequency of conflict *between* local communities of the same ethnolinguistic group, and iii) the frequency of conflict with *other* ethnolinguistic groups. These variables were re-coded for the current study as follows:

Intra-group conflict (i.e., between individuals or small groups within the same local community), was considered *present* if such conflict was frequent and often violent, and *absent* if such conflict was either rare, or frequent but seldom violent.

Intra-cultural conflict (i.e., conflict occurring between two or more villages or sub-populations of the same ethnolinguistic group), was considered *present* if such conflict occurred more often than once in a generation, and *absent* if such conflict took place roughly every generation or never occurred.

Inter-cultural warfare, or conflict with other ethnolinguistic groups, was considered *present* if such conflict occurred more often than once in a generation, and *absent* if such conflict took place roughly every generation or never occurred.

Social stratification

The data on social stratification were provided by Watts et al. (Watts et al., 2016). Social stratification was considered *present* if there were intergenerational differences in wealth, and/or if status and mobility between social positions was restricted. Social stratification was considered *absent* if ethnolinguistic groups were egalitarian or if individuals could feasibly change their wealth, status, or social position.

The Austronesian language phylogeny

The Austronesian language phylogeny used in this study was reconstructed by Gray et al. (R. D. Gray et al., 2009) using 210 basic vocabulary items. The ethnolinguistic groups corresponding to each game were matched to the primary indigenous language of the region in the Austronesian Basic Vocabulary Database (ABVD; Greenhill et al., 2008) and the Pulotu database (Watts, Sheehan, et al., 2015). In many cases, there was no match (i.e., the ethnolinguistic group did not correspond to any branch on the language phylogeny) and those games were excluded from further filtering and analyses. The Austronesian language phylogeny was subsequently pruned to the 25 ethnolinguistic groups included in the analyses.

Statistical analyses

We use univariate and multivariate, multinomial regressions using a Bayesian framework, coded in `Stan` (Team, 2019), with and without phylogenetic controls, to estimate the relationship between the frequency of game goal structures and the presence or absence of cultural variables. In these models, the outcome variable is the count of games in each of the goal structure categories within each ethnolinguistic group. The predictors are binary variables indicating the presence or absence of each cultural variant within each ethnolinguistic group. Full model descriptions are included in the Appendix B. We use weakly regularizing priors to prevent overfitting of the sample, but we do not apply corrections with regard to multiple testing, as we are using a Bayesian analysis framework, as opposed to a null-hypothesis rejection framework (see Gelman et al., 2012). The data used in the analyses, along with our statistical and pre-processing code, are available on GitHub: https://github.com/sarahpeoples/AustroGamesGoalStructures and Zenodo (S. Leisterer-Peoples et al., 2021).

Models without controls based on the Austronesian language phylogeny assume that each ethnolinguistic group can be treated as an independent data point for the purpose of model

fitting. However, these groups arguably share linguistic and cultural ancestry (R. D. Gray et al., 2009) that may have introduced correlations in outcomes. This shared ancestry is caused by the diversification of cultural groups over time whereby daughter cultures inherit many of the traits of their parent cultures before subsequently diverging themselves. Therefore, we use the Austronesian language phylogeny as a proxy for underlying cultural history (e.g., Evans et al., 2021; Watts, Greenhill, et al., 2015; Da Silva & Tehrani, 2016; Jordan, 2013; Levinson & Gray, 2012; Mace & Jordan, 2011). Our models use the language phylogeny to introduce correlated random effects, which help to address Galton's Problem (Tylor, 1889; Mace & Holden, 2005) and account for the potential non-independence of the ethnolinguistic groups in our study.

3.3 Results

Descriptive statistics

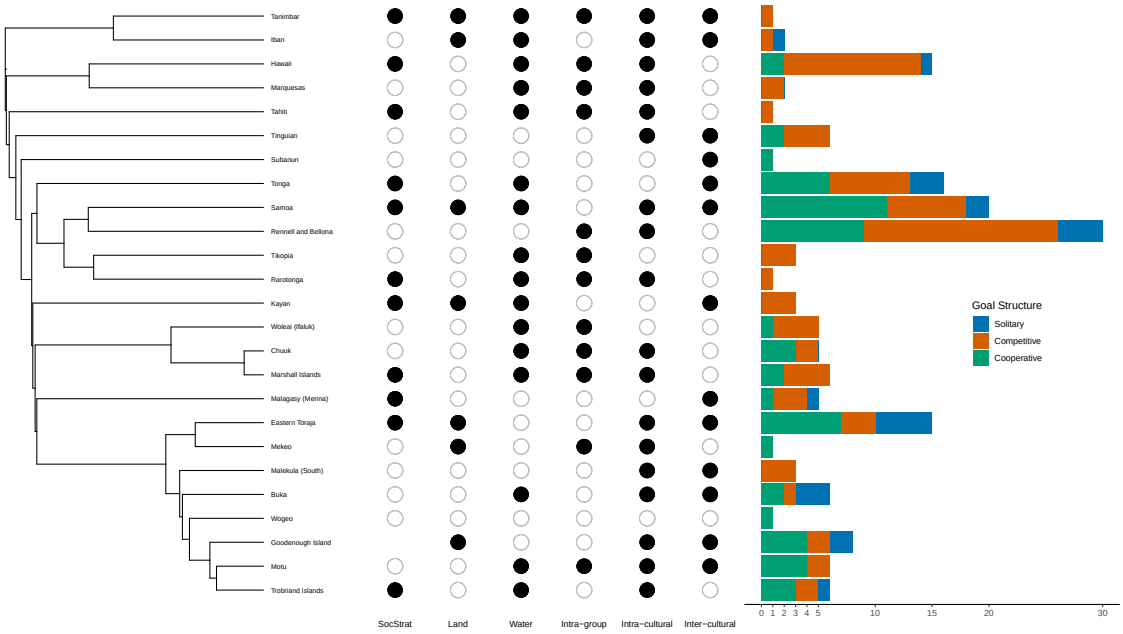
A total of 168 games from 25 ethnolinguistic groups were included in the analyses. Purely competitive games were the most common type of game across ethnolinguistic groups (n = 76), followed by cooperative group versus cooperative group games (n = 45) and purely solitary games (n = 23). The frequency of each goal structure types in our study is given in Table 3.1, and the distribution of cultural variables is visualized in Figure 3.2. In 14 of the 25 ethnolinguistic groups, at least half of the games had competitive goal structures. In 7 of the 25 ethnolinguistic groups, at least half of the games had cooperative goal structures. For 11 of the ethnolinguistic groups, the outcome vector consisted of only 1 to 3 games. More detailed information about the distribution of goal structures across ethnolinguistic groups in our study is included in the Appendix B.

Cultural variables and goal structures

Univariate models

Our univariate regression analyses indicate associations between the goal structure of games and both subsistence and conflict measures. Specifically, we find that, as predicted in **P1**, interdependence in land-based subsistence is associated with increased log-odds of cooperative goal structures ($\beta = 0.92$, 90% CI [0.30, 1.51]), but contrary to our prediction, interdependence in water-based subsistence is not ($\beta = -0.24$, 90% CI [-0.83, 0.32]). Likewise, as predicted in **P2a**, frequent war or conflict with other cultural groups is associated with increased log-odds of games with cooperative goal structures ($\beta = 0.81$, 90% CI [0.22, 1.37]). And as predicted in

Figure 3.2: The distribution of game goal structures and associated cultural variables mapped onto the pruned Austronesian language phylogeny (R. D. Gray et al., 2009). The dots represent the presence (i.e., the black dot), absence (i.e., the white dot), or missing data (i.e., no dot) of each cultural variant (i.e., social stratification, interdependence in land-based hunting, interdependence in water-based hunting and fishing, intra-group conflict, intra-cultural conflict, and inter-cultural conflict). The bar graphs represent the frequency distribution of game goal structures by cultural group (i.e., blue represents solitary games, orange represents competitive games, and green represents cooperative games). The sample sizes of games in each cultural group vary as shown. More details can be found in the Appendix B.

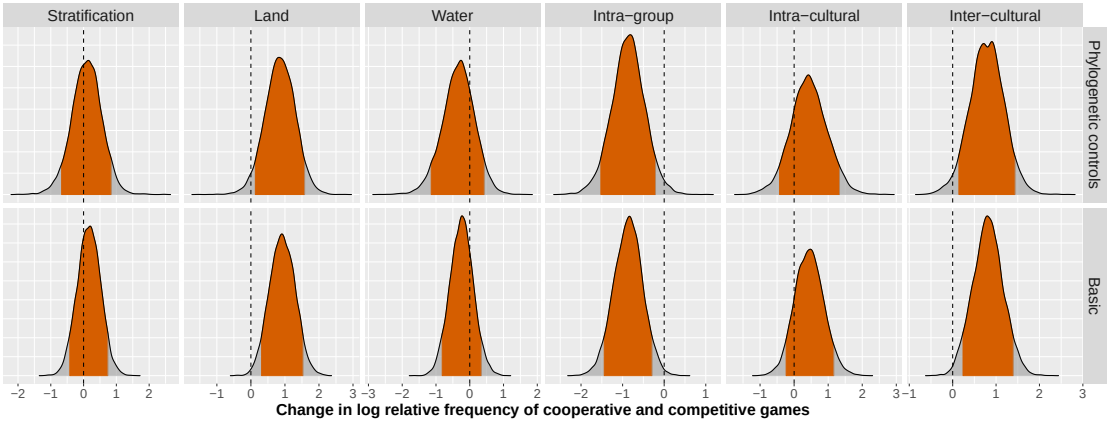


P2b, frequent intra-group conflict is associated with decreased log-odds of games with cooperative goal structures ($\beta = -0.86$, 90% CI $[-1.47, -0.32]$). We find no support for **P3**, as there is no association between social stratification and the log-odds of games with cooperative goal structures ($\beta = 0.17$, 90% CI $[-0.41, 0.75]$). See Figure 3.3 for posterior densities covering each of these cases.

Multivariate models

Given the observed associations between both subsistence and conflict variables and our outcome of interest, and the potential causal connections between these predictor variables, we also fit multivariate models including both predictors. Table 3.2 indicates that accounting for conflict variables substantially reduces the effect of interdependence in land-based subsistence on the log-

Figure 3.3: The change in log-odds of cooperative relative to competitive games as a function of predictor variables, with and without phylogenetic controls included in the model. A positive parameter value corresponds to an increase in the relative frequency of cooperative games to competitive games, while a negative parameter value corresponds to the opposite effect. The shaded areas indicate the 90%-credible intervals. We note positive effects of interdependence in land-based hunting and inter-cultural conflict as predictors of cooperative goal structures in games. Frequent intra-group conflict is associated with a lower frequency of cooperative games. Additional plots are included in the Appendix B.



odds of cooperative goal structures from $\beta = 0.92$ (90% CI [0.30, 1.51]) in the univariate model to $\beta = 0.57$ (90% CI [−0.19, 1.27]) when intra-group conflict is included in the model, and to $\beta = 0.62$ (90% CI [−0.16, 1.35]) when inter-cultural conflict is included in the model; see column labeled *Predictor 2* in Table 3.2. Similarly, the association between intra-group conflict and the goal structure of games reduces when accounting for the association between interdependence in land-based subsistence and goal structure in the model, $\beta = -0.59$ (90% CI [−1.282, 0.036]). A similar pattern is found with the association between inter-cultural conflict and the goal structure of games, $\beta = 0.50$ (90% CI [−0.19, 1.21]).

Additionally, when models include phylogenetic controls, we find support for the association between interdependence in land-based subsistence and the goal structure of games, $\beta = 0.86$ (90% CI [0.12, 1.56]). The models with phylogenetic controls continue to show support for a positive association between frequent conflict with other cultural groups and the log-odds of games with cooperative goal structures, $\beta = 0.79$ (90% CI [0.14, 1.43]) and a negative association between frequent intra-group conflict within a given cultural group and the log-odds of cooperative games, $\beta = -0.86$ (90% CI [−1.51, −0.20]). These patterns are reduced when interdependence in land-based subsistence is included in models with intra-group conflict and inter-cultural conflict (intra-group conflict: $\beta = -0.62$, 90% CI [−1.35, 0.15]; inter-cultural conflict: $\beta = 0.51$, 90% CI [−0.29, 1.23]). Similarly, the effect of land-based subsistence is reduced to $\beta = 0.53$ (90%

CI $[-0.35, 1.30]$) when intra-group conflict is included in the model, and to $\beta = 0.57$ (90% CI $[-0.25, 1.42]$) when inter-cultural conflict is included in the model.

Table 3.2: For each model (*Model*), we present the effect of a given predictor variable on the log-odds of cooperative versus competitive games—positive values indicate variables that are associated with an increased relative frequency of cooperative goal structures. The top block of estimates are from models omitting phylogenetic controls (*Phylo.*), and the bottom block of estimates are from models that control for phylogenetic signal in the outcome using phylogenetically constrained random effects. The top block corresponds with the "Basic" plots in Figure 3.3 and the bottom block with the "Phylogenetic controls" plots in Figure 3.3. In the univariate models, the column *Predictor* gives the effect of the indicated variable. In the multivariate models, the column *Predictor* gives the effect of the indicated variable and the column *Interdependence land* gives the effect of interdependence in land-based hunting. Intervals are central 90% posterior credible intervals. *D* gives the relative WAIC (Watanabe-Akaike Information Criterion) value compared to the best model, and *W* gives the unit normalized WAIC weight across both phylogenetic and non-phylogenetic models.

Model	Phylo.	Predictor	Interdependence land	D	W
Base model				10.018	0.002
Interdependence land		**0.92 (0.30; 1.51)**		5.375	0.02
Interdependence water		-0.24 (-0.83; 0.32)		13.825	0
Intra-group conflict		**-0.86 (-1.47; -0.32)**		1.662	0.13
Intra-cultural conflict		0.44 (-0.25; 1.14)		13.577	0
Inter-cultural conflict		**0.81 (0.22; 1.37)**		4.157	0.037
Social stratification		0.17 (-0.41; 0.75)		14.71	0
Intra-group conflict		-0.59 (-1.282; 0.036)	0.57 (-0.19; 1.27)	3.908	0.042
Inter-cultural conflict		0.50 (-0.19; 1.21)	0.62 (-0.16; 1.35)	6.354	0.012
Base model	✓			1.968	0.111
Interdependence land	✓	**0.86 (0.12; 1.56)**		3.665	0.048
Interdependence water	✓	-0.32 (-1.15; 0.42)		3.604	0.049
Intra-group conflict	✓	**-0.86 (-1.51; -0.20)**		0	0.298
Intra-cultural conflict	✓	0.42 (-0.41; 1.34)		5.948	0.015
Inter-cultural conflict	✓	**0.79 (0.14; 1.43)**		2.08	0.105
Social stratification	✓	0.10 (-0.62; 0.88)		6.14	0.014
Intra-group conflict	✓	-0.62 (-1.35; 0.15)	0.53 (-0.35; 1.30)	2.511	0.085
Inter-cultural conflict	✓	0.51 (-0.29; 1.23)	0.57 (-0.25; 1.42)	4.645	0.029

3.4 Discussion

The current study has investigated associations between group-level measures of interdependence in subsistence, conflict, social stratification, and the goal structure of games. We find evidence of a moderately robust association between the cooperativeness of game goal structures and (i) measures of conflict and (ii) a measure of interdependence in subsistence. In cultural groups with frequent inter-cultural warfare, games tend to be cooperatively structured—an effect driven in large part by games that feature cooperative groups competing with other co-

operative groups (these kinds of games make up 72% of the cooperative games in our sample, see Table 3.1). Similarly, competitive games are played at higher rates in cultural groups with higher levels of intra-group conflict. We also found support for a positive relationship between elevated interdependence in subsistence and the frequency of cooperative games. Our findings are consistent with theories of cultural group selection, which link competition between groups to the evolution of cooperative institutions within groups (Richerson et al., 2016; Bowles, 2008; Zefferman & Mathew, 2015). Though they are an often overlooked cultural institution, we argue that games may play an important role in the acquisition of locally-relevant adult competence by children and teenagers.

Proponents of cultural group selection (CGS; Richerson et al., 2016; Zefferman & Mathew, 2015) have proposed that there are two conditions needed for warfare to cause selection at a group-level: 1) variation in cultural traits must influence the outcome of warfare, and 2) the outcome of warfare must influence the spread of these traits. Our results provide direct support for neither of these two conditions; rather, they establish a simple association between the existence of inter-cultural warfare and the more frequent practice of games that feature cooperative groups competing with other cooperative groups. This positive association, however, is to be expected under the cultural group selection model (Richerson et al., 2016; Zefferman & Mathew, 2015). A causal relationship is plausible for a few reasons: 1a) small-scale warfare is a complex, high-stakes situation, and the success of a given group in such a situation is likely dependent on adaptations that enforce within-group organization and coordination (see Mathew & Boyd, 2011; Gneezy & Fessler, 2012; Henrich & Boyd, 2001; Marlowe et al., 2008, for some examples), and 1b) years of experience playing games with cooperative goal structures over developmental time should help individuals learn to organize behavior around shared goals and deploy coordinated actions, yielding at least some marginal advantage relative to groups with less experience in organizing into cooperative units. Additionally, 2) if groups with cooperative norms do outcompete other groups in direct conflict, the local frequency of such cooperative norms should increase, as territory and resources are generally seized by the victors of inter-group conflicts (however, see Rappaport, 2000, for an example in which this is not the case). As such, we suspect that the association of inter-cultural and intra-group conflict with the goal structure of games may be the result of a causal selection process, as appears to be the case with many cultural norms (Mace & Jordan, 2011). However, our study is only an exploratory first step toward making such a case and further details will need to be validated using additional datasets and methods.

Extant ethnographic research on play lends some support to our arguments. Boyette (2016a),

for example, finds that play in a modern-day foraging cultural group and a modern-day pastoralist cultural group, occupies the majority of children's daily lives. The frequency with which children engage in play highlights the potential importance of play and games in the transmission of cultural norms. Likewise, some experimental research examining the effect of games on German children's prosocial behavior provides evidence that playing cooperative games increases children's willingness to share with third-parties (Toppe et al., 2019). Experiments investigating Western children's understanding of rules show that 5-year-old children understand and enforce norms of cooperation in a game-like setting (Hardecker et al., 2016). In sum, these findings suggest that experience with games that have cooperative goal structures over developmental time may have effects on real-world behavior in more general contexts.

It is important to note that the reliability of the effects of our conflict variables was reduced when land-based hunting in groups was included as a covariates in the models. As such, the goal structure of games does not appear to be robustly linked to conflict in our small dataset. Future studies would benefit from a larger sample of cultural groups, and more precise covariate measures.

Future studies evaluating the plausibility of our arguments might additionally study: 1) if the behavioral, organizational, and strategic practices employed in games mirror generally parallel practices in situations of actual conflict (e.g., in games where individuals on one team cooperate to take resources from a competing team, as is the case with the game of Pirori (also: Porotiti, hoops) among Māori; Best, 1924; Buck, 1949), 2) if individuals or groups with greater experience playing cooperative games are empirically more likely to be victorious in real-world competitive settings (e.g., skilled players of Tolonga (also: O le Tolonga or tologa) in Samoa are renown for their spear throwing skill in combat; Buck, 1930; Stair, 1897; Turner, 1884), and 3) if there is evidence of games with cooperative goal structures actually spreading as a consequence of military conflict (e.g., the Vikings spreading the game of Hnefatafl; Browne, 2018b). Additionally, future studies might investigate the effects of preference for game goal structures at an individual level, as some have criticized the focus of CGS on group-level variation (e.g., Krasnow et al., 2012; R. M. Ross & Atkinson, 2016). Finally, future studies might also investigate whether gender-division plays a role in the distribution of games within cultures. Given that our cultural covariates are activities primarily performed by males, it might be that variation in the sex of game players across cultures has influenced the relationships uncovered here. Unfortunately, the AustroGames database does not currently offer information on the sex of the players as this is under-described in the primary literature. Future studies should focus on gathering further ethnographic materials that mention

such details.

Subsistence activities are often a focus of play in early childhood (Lew-Levy et al., 2017)—children imitate adult behavior in work pretense play, such as nut-cracking, gathering berries, or cooking a meal, before they substantially contribute to sustenance acquisition. Such play is specifically thought to help children prepare socially and behaviorally for life as successful adults in a given socio-cultural context (Bock & Johnson, 2004). Subsistence style has also been shown to vary with child training (Barry et al., 1959) and individual conformity (Berry, 1967). In line with one of our predictions, games with cooperative goal structures are more frequent than competitive games when interdependence in land-based subsistence is present. However, overall, our analyses lend only moderate support for a linkage between subsistence mode (as measured by the specific Pulotu variables used in our models) and the cooperativeness of game goal structures.

First, the association between interdependence in subsistence and the goal structure of games was not replicated in both land and water-based subsistence measures. Given the importance of water-based subsistence in the Pacific, this failure to replicate is important to emphasize. Second, the effect of interdependence in land-based hunting was not reliably positive after including intra-group conflict or inter-cultural warfare as co-variates in the models. Additionally, the interdependence in land-based subsistence models (with and without phylogeny) received little weight in the WAIC comparison in Table 3.2, indicating weaker support for this association. As such, the goal structure of games does not appear robustly linked (Mace & Jordan, 2011) to interdependence in foraging in our small dataset.

Differences in the levels of cooperative behavior needed for success in specific subsistence styles have been suggested in the literature. For example, Talhelm et al. (Talhelm et al., 2014) suggest that differences in the cooperative action required to farm wheat versus rice crops affect group behavior. We used open-access data from Pulotu (Watts, Sheehan, et al., 2015) as a proxy for real-world interdependence in subsistence. It is possible that these simple, group-level binary variables are weak or noisy measures of the importance of sustenance-oriented interdependence behavior. Future studies should aim at defining real-world measures of group-level cooperation in subsistence and in other activities. Given the historic nature of the game data, we were unable to use economic games to measure levels of cooperation among groups of individuals engaging in specific tasks (House et al., 2013; Apicella & Silk, 2019; Apicella et al., 2012), but experimental methods have proven useful in measuring similar constructs in other places (Pisor et al., 2020).

We do not find evidence of a relationship between the level of social stratification in a given

cultural group and the goal structure of games. Previous studies indicating a relationship between social stratification and the cooperativeness of games (Ager, 1976; Eifermann, 1970; Boyette, 2016a) do so descriptively. However, by drawing on a larger set of comparative data, our approach has more power to study the distribution of the goal structure of games as a function of group-level variables. While our study suggests that the distribution of goal structures in games across cultures might not depend on social stratification, we note that our group-level stratification variable is a simple, reductive measure. Future research should explore possible relationships between social stratification and the goal structure of games using more informative variables on the within-group structuring of inequality. Previous studies have argued that causal linkages between group-level variables and social/material inequality can depend not only on the overall level of inequality within a society, but on how such inequality is structured (C. T. Ross et al., 2018).

The current study investigates the relationship between the goal structure of games and associated socio-ecological variables among 25 ethnolinguistic groups in the Austronesian language family. We have focused our initial data collection and coding efforts (S. M. Leisterer-Peoples, Hardecker, et al., 2021) on these groups because of the large cultural and linguistic diversity expressed in this area of the world (R. D. Gray et al., 2009) and the availability of previously published socio-cultural data (Watts, Sheehan, et al., 2015) that could be linked to the game data (S. M. Leisterer-Peoples, Hardecker, et al., 2021). Nevertheless, only 168 games from 25 ethnolinguistic groups were described in enough detail to warrant inclusion into our analyses—leaving our sample fairly small and sensitive to possible false positives (and negatives). In light of recent focus on replication in science, future studies should examine if the goal structures of games played in other parts of the world, including non-Western cultures, show a similar patterning with respect to conflict variables. Such studies would help to evaluate the robustness of the findings presented here across a wider sample of cultural groups. Additionally, future studies could examine the relationship between games played in contemporary cultural groups and group-level cultural variables.

A key limitation of our study beyond sample size is that we model the *count* of games by goal structure. Theoretically, the *amount of time* spent engaging in games of a given goal structure would be a more precise measure of a player's experience with that goal structure. Such fine-scale time allocation data across games and cultural groups, however, does not yet exist. Also, the AustroGames dataset (S. M. Leisterer-Peoples, Hardecker, et al., 2021) does not currently provide information on the typical ages of players of each game. Investigations of adult engagement

in traditional games are limited, but interviews in one Inuit community suggest that games may play a role in young adults feeling "connected" with their cultural group (Dubnewick et al., 2018).

The cultural variables considered in this study were pragmatically chosen based on the availability of corresponding open-access data, and are by no means exclusive. Future studies should investigate additional (theory-driven) explanations for the cooperativeness of games and their distribution throughout the world: though we believe that subsistence and conflict variables capture important group-level characteristic that might influence the evolution of specific cultural practices, other causal paths may be as or more important.

An additional limitation of the current study is the assumption of objectivity and longitudinal stability in the ethnographic record (Denscombe, 2010). The Pulotu and AustroGames datasets are based on published ethnographic and historical accounts, which are reliant on the neutrality (Krefting, 1991) of the ethnographer and the time period during which the ethnographer visited the cultural group. By focusing on a different time period or on different ethnographic accounts, the data and the effects found here could also be subject to change. Future studies should investigate the longitudinal stability (i.e., consistency; Krefting, 1991) of cultural variables (e.g., the extent of conflict between cultural groups) and should explore the relationship between games and cultural variables as cultures adapt to external circumstances (e.g., missionaries, colonists, globalization). For example, how robust is the relationship between the goal structure of games and levels of conflict over time? Do games rapidly change with changes in conflict frequency (or is there a time lag)?

Due to sample size constraints, we grouped the six original goal structure categories of games into three broad categories—solitary, competitive, and cooperative (see Figure 3.1). Cooperative group versus cooperative group games were categorized as cooperative games. However, cooperative group versus cooperative group games could also be seen as an independent kind of goal structure. Cooperatively-structured competition is important in human psychology (Ames, 1981) and cultural group dynamics (Choi & Bowles, 2007), and should therefore be thoroughly examined in future investigations with larger samples.

Aside from cooperation and competition, the current study did not examine the particular skills that are transmitted through games. This leaves the proximate question as to which specific physical, cognitive, emotional, and social skills players learn through games that might increase their success in real-world cooperative dilemmas. Future studies should examine how other aspects of games, aside from their goal structures, might influence cooperative and competitive actions. Games do not only transmit cultural norms to players, but also allow players to practice

and acquire skills that can be useful in warfare or subsistence (e.g., hand-eye coordination, event planning, emotional stability, and strategic thinking). Early cross-cultural examinations of the relationship between the type of games (i.e., games of strategy, physical skill, and chance) and cultural variables suggest that games of strategy frequently imitate war activities (J. M. Roberts et al., 1959; Sutton-Smith & Roberts, 1971). Future studies should re-examine and elaborate on these findings using modern statistical and methodological tools, such as phylogenetic comparative methods (Mace & Jordan, 2011).

3.5 Conclusion

Non-human animals engage in play(ful) behavior (Van Leeuwen et al., 2011; Eckert et al., 2020; Rakoczy, 2007; Sommerville et al., 2017; Kuczaj & Eskelinen, 2014; Vanderschuren & Trezza, 2013), but only humans play rule-based games (Rakoczy, 2007). Rule-based games are more than just child's play. Our study provides evidence for a relationship between the goal structure of games and the social and ecological environments of the ethnolinguistic groups that play them. The type and intensity of conflict, as well as the extent of interdependence in the acquisition of sustenance on land, appear to be correlated with the occurrence of specific types of game goal structures in our dataset. This evidence, though correlational, contributes to a growing body of literature which suggests that games may play a functional role in human culture by mimicking overt real-world behavior, thus serving as training grounds for norms and behaviors that are relevant for a particular socio-ecological context. However, future experimental studies with larger sample sizes would be needed to verify such predictions.

PART II

Games and Cooperation in Modern-Day Cultural Groups

Chapter 4

Study populations

In this chapter, I describe the three foci populations for the second part of this dissertation: Hai||om and Ovambo in Namibia, and Germans in Germany. First, I elaborate on why I selected these three populations for the subsequent research presented in the remaining part of this dissertation. Then, in section 4.2, I describe the methods I used to conduct interviews with three ethnolinguistic groups on the degree of social stratification and the frequency, intensity, and types of conflict in their communities. Finally, in section 4.3, section 4.4, and section 4.5, I give an overview of the three cultural habitats more generally, along with the community-level information gathered through the interviews.

4.1 Selecting these three cultural groups

When selecting cultural groups to compare on any given phenomena, it is important that they vary on some aspects relevant to the research question, while sharing other aspects that are not directly relevant to the research question (Norenzayan & Heine, 2005). I used a mixture of hypothesis-driven selection and opportunistic sampling to select these three cultural groups.

I initially aimed to investigate the games in a cultural group with an egalitarian social structure and in a cultural group with a hierarchical social structure to replicate the findings from previous research (e.g., Boyette, 2016a; Ager, 1976; Eifermann, 1970)[1]. The Hai||om and the Ovambo have different social structures, but live in a similar physical environment. Despite living in similar physical environments, the Hai||om and the Ovambo differ in their subsistence styles and parenting styles. Societies with high food-accumulation (i.e., agriculture and animal husbandry; the Ovambo) tend to emphasize responsibility and obedience, while societies with low food-accumulation (i.e., hunter-gatherers; the Hai||om) tend to emphasize achievement, self-reliance, and independence (Barry et al., 1959).

Based on the findings of chapter 3, I decided to also investigate the relationship between games and cultural levels of conflict in modern-day groups. The Ovambo and the Germans have similarities in their social structures and levels of inter-personal and inter-group conflict, but live in different physical environments. The Hai||om and the Germans also differ in their social structures, levels of conflict, and several other aspects of daily life (e.g., food acquisition, family structure, parenting styles). Also, the German population was included as a proxy for societies in the global North, given that the majority of developmental studies (Nielsen & Haun, 2016; Nielsen et al., 2017) are conducted there (Henrich et al., 2010). Previous research comparing German and Hai||om cultural groups show variation in cultural sharing norms (Schäfer et al., 2015), social motivation to over-imitate behavior (Stengelin et al., 2019), and trust and deception (Stengelin et al., 2020b), among these groups.

I also selected these three groups by opportunistic sampling. My colleagues previously established the research infrastructure and organized local expertise (i.e., research assistants) at the two sites in Namibia, allowing me to investigate my hypotheses in these two ethnolinguistic groups. I also conducted my research in Germany, given the available research infrastructure provided by the Max Planck Institute for Evolutionary Anthropology and the Leipzig Research Center for Early Child Development.

[1] I have reviewed this research in the General Introduction, and kindly point interested readers to that chapter.

4.2 Semi-structured interviews

I conducted three separate interviews with the three ethnolinguistic groups. The results of these interviews are integrated into the subsequent sections describing the three ethnolinguistic groups, and a summary of the results from the interviews is presented at the end of this chapter, in Table 4.1.

4.2.1 General information

The first interview, on a broad range of topics, was conducted in Namibia with Hai||om and Ovambo participants between February and April of 2019, and between May and June 2020 with German participants. Topics of this interview included questions about living situation, migration patterns, within-group diversity, between-group relations, food sharing, subsistence style, childcare, social stratification, intra-group and inter-group conflicts, socio-economic status, and leisurely activities. The interview was designed in a question-answer structure. The interviews were voluntary and participants were informed that they could leave any question unanswered and that they could end the interview at any time. Depending on the literacy of the interviewee, informed verbal and/or written consent was obtained before participants partook in the interviews. The interviews were audio recorded.

The interviews were conducted with a local research assistant (DT) and myself with the Hai||om communities. I asked the questions in English and DT translated them into Hai||om. DT translated the respondent's answer back into English. Follow-up or clarifying questions on either side (i.e., the respondent's side or mine) were handled in the same manner. Forty-two Hai||om adults were interviewed (Location one: $N = 22$, $n_{female} = 13$, $M_{age} = 42.8$, $SD_{age} = 18.5$; Location two: $N = 20$, $n_{female} = 10$, $M_{age} = 51.8$, $SD_{age} = 17.2$). Due to incompletion of the interview, the interview data from one adult (Location two: 23 year-old female) were excluded.

I conducted the interviews with Germans in the German language. Thirty German adults were interviewed ($n_{female} = 15$, $M_{age} = 42.7$, $SD_{age} = 4.9$). All of the interview data were used for the analyses.

Twenty-two interviews ($n_{female} = 13$, $M_{age} = 32.1$, $SD_{age} = 10.9$) were conducted in an Ovambo community. Due to a communication error with a research assistant, some of the interviews with the Ovambo were not conducted with a research assistant nor audio recorded, but rather were given to the adults to fill-out. Four interviews (two females and two males) could be identified as being conducted without a research assistant and were excluded from the analyses. Additionally,

two of the 22 interviews completed in the town were completed by people who do not identify as being Ovambo (two males), and thus, were excluded from further analyses. After accounting for experimenter error, the sample size for the interview was reduced to 16 adults (n_{female} = 11, M_{age} = 32.5, SD_{age} = 11.7).

This interview posed several challenges: the sheer length of the interview, researcher errors in the methodology, and the types of questions asked. First off, as mentioned earlier, the interview aimed to capture a broad range of topics and included up to 100 questions. This may have hindered the willingness of participants to answer questions thoroughly. Second, I am unfortunately unable to check the reliability of the Ovambo interviews, due to a lack of audio recordings. Similarly, several interviews were given to the Ovambo participants to fill-out without a research assistant—a different method than was conducted in the other two cultural groups. I was able to visibly identify four interviews that were filled-out by the participants, but there may be others. Additionally, the responses from the Ovambo interviews were less elaborate than the responses in the other two cultural groups. This could be due to the difference in interview methods for the Ovambo group. Finally, the interview consisted of mostly closed question-answer questions. The Hai||om noted difficulties answering some of the questions and often told the research assistant that he knows the answer because he has been there before, and thus can answer the question for them. The conversational technique of asking a question to a single person and getting one's opinion or a personal response is common in Western(ized) societies, but less so among the Hai||om (Hoymann, 2010). Taken together, I determined that a focused, more flexible, and conversation-like interview would be more appropriate to assess the variables that I was interested in. I aimed to address these shortcomings in the subsequent two interviews.

4.2.2 Social stratification

The second interview, on social stratification, was conducted in Namibia with one of the Hai||om communities at the beginning of March 2020, and between May and June 2020 with German participants. Unfortunately, due to the COVID-19 outbreak at this time, I was unable to conduct this interview with the second Hai||om community, nor with the Ovambo community. I therefore supplement this missing information with previous research and my own research experience.

Previous research has defined social stratification in terms of differences in wealth and status (Peoples & Marlowe, 2012; Murdock, 1967), the inheritability of wealth (Murdock, 1967), the rigidness of social classes (Murdock & Provost, 1973) and occupational differences (Murdock,

1967). I based the interviews on the more recent categorization of social stratification from Watts et al. (2016, p.1): egalitarian societies "lack inherited differences in wealth and status", moderately stratified societies have "inherited differences in wealth and social position with the potential for status change", and highly stratified societies have "inherited difference[s] in wealth and social position with little or no possibility of status change within a generation. This categorization does not account for age-related hierarchy, which is present in Ovambo culture, and should be considered in future research on social stratification.

Semi-structured interviews on the presence or absence of differences in wealth and social status were conducted with several Hai||om at location one (N = 12, n_{female} = 4, M_{age} = 38.7, SD_{age} = 12.4) and with a German population (N = 30, n_{female} = 15, M_{age} = 45.6, SD_{age} = 6.4). Participants were asked a series of questions regarding their own observations and experiences with potential differences in wealth and status of the society they live in (see Appendix C for the full interview). Participants were encouraged to tell stories and talk openly about their perception of the society they live in. The interviews were voluntary and participants were informed that they could leave any question unanswered and that they could end the interview at any time. Depending on the literacy of the interviewee, informed verbal and/or written consent was obtained before participants partook in the interviews. The interviews were audio recorded and were reliability coded by one person blind to the study background. Each reliability coder listened to the audio recording of the interview and filled-out a series of questions about the interview. If the two coders disagreed in their coding, they listened to the interview again and discussed what was said in the interview, until they came to an agreement. The interview from one participant (Hai||om 46-year-old male) was excluded from the study due to low reliability and non-agreement among the coders on all of the questions.

4.2.3 Conflict

The third interview, on conflict, was conducted in Namibia with one of the Hai||om communities at the beginning of March 2020, and between May and June 2020 with German participants. Unfortunately, due to the outbreak of the COVID-19 pandemic, I was unable to conduct this interview with the second Hai||om community, nor with the Ovambo community. I therefore supplement this missing information with previous research and my own research experience.

Semi-structured interviews on the frequency, intensity, and types of conflict within and between societies were conducted with the Hai||om at location one (N = 12, n_{female} = 4, M_{age} = 38,

SD_{age} = 12.5) and with Germans from Leipzig (N = 32, n_{female} = 17, M_{age} = 45.7, SD_{age} = 6.4; see Appendix C for the full interview). Participants were asked a series of questions regarding their own observations and experiences with conflict among the people of the society they live in and with other societies. Participants were encouraged to tell stories and talk openly about their perception of the conflicts in the society they live in. Participation was voluntary and informed consent was obtained before each interview. The interviews were voluntary and participants were informed that they could leave any question unanswered and that they could end the interview at any time. Depending on the literacy of the interviewee, informed verbal and/or written consent was obtained before participants partook in the interviews. The interviews were audio recorded and were reliability coded by one person blind to the study background. Each reliability coder listened to the audio recording of the interview and filled-out a series of questions about the interview. If the two coders disagreed in their coding, they listened to the interview again and discussed what was said in the interview, until they came to an agreement. The interview data from two German females (40 and 38-years-old) and one German male (45-years-old) were excluded due to difficulties answering the questions and low reliability in response coding of the interview questions.

I based the interviews on the categorization of conflict from Watts, Sheehan, et al. (2015). In the Pulotu codebook, Watts, Sheehan, et al. categorize conflict and warfare into three broad categories: conflict within the local community (i.e., intra-group conflict), internal warfare (i.e., intra-cultural conflict), and external warfare (i.e., inter-cultural conflict). As mentioned in chapter 3, conflict within the local community "can include both interpersonal and intergroup conflict" and "must [pose] a realistic threat to the cohesiveness of the community" (Watts, Sheehan, et al., 2015, p.4 of the codebook). Internal warfare is lethal conflict that "takes place above the community level, but within the culture being coded" (Watts, Sheehan, et al., 2015, p.4 of the codebook). And external warfare is lethal conflict "between members of the culture being coded and any group that is not considered part of the culture being coded" (Watts, Sheehan, et al., 2015, p.4 of the codebook). These definitions encompass several factors of conflict (i.e., level, frequency, intensity). For example, "external warfare" may be at a multi-national, anonymous, and highly-lethal level for industrialized societies, which differs gravely from the external warfare typically experienced by small-scale societies. As such, I try to differentiate between these different factors when describing the conflict experienced by these three cultural groups. The frequency with which these conflicts occur (i.e., frequent, common, occasional, rare or never) and the frequency of violence (i.e., always, often, rare, never) are also based on the Pulotu database codebook. For

the frequency of conflicts, "frequent" refers to daily or weekly conflicts, "common" refers to conflicts that occur monthly or multiple times a month, "occasional" refers to seasonal or annual conflict, "rare or never" refers to conflicts that occur less than once a year (e.g., >1-5 years).

Table 4.1: The levels of social stratification and conflict within the three cultural groups of interest. Codes are based on the interview data (see main text). The frequency of conflict corresponds with the Pulotu codebook (Frequent, Common, Occasional, Rare or Never) and is followed by the frequency of violence: Always, Often, Rare, or Never.
*The Ovambo data listed in the table are based on previous literature and personal experience in one Ovambo town. It was not possible to conduct the interviews with the Ovambo due to the outbreak of the COVID-19 pandemic. The interview data from the interview #1 on general information are presented in the main text.

	Social stratification	**Intra-group conflict**	**Intra-cultural conflict**	**Inter-cultural conflict**
Hai||om	Egalitarian	Common & never or rarely violent	Common & never violent	Never & never violent
Ovambo	Highly stratified*	Common & rarely violent*	Occasional & never violent*	Rare & rarely violent*
German	Highly stratified	Frequent & never or rarely violent	Occasional & never or rarely violent	Occasional & never or rarely violent

4.3 The Hai||om of Namibia

General information

The Hai||om[2] (also: Hai//om, Hai||um, Heikom, Haikom) are a former hunter-gatherer group, who, due to relocation and privatization of land, now live a semi-sedentary lifestyle. The Hai||om are one of several groups belonging to the San (formerly: bushmen) that are spread throughout the Kalahari Desert. The Hai||om were previously estimated at roughly 10,000 people (Malan, 1995), and unfortunately, more recent estimates do not exist[3]. The Hai||om speak ǂAkhoe and Hai||om, both of which are variants of Hai||om, and belong to the Khoekhoe language family (Hammarström et al., 2021a).

The environment in which the Hai||om traditionally lived in consisted of the dry savannah area near what is now considered Tsumeb, Otavi, Outjo, and the Etosha National Park (Malan,

[2]There are four clicks in the Hai||om language. '||' is pronounced by making a lateral click sound, as if one is calling a horse (Widlok, 1999).

[3]National census data lump the Hai||om and other San groups together, making it difficult to obtain a recent estimate of the current population size.

1995). Annual rain fall is low in this area (approx. 150 mm) and main vegetation in the area consists of baobab trees (*Adansonia digitata*), marula trees (*Sclerocarya caffra*), wild date trees (*Berchemia discolor*), makalani palms (*Hyphaene ventricosa*), mangetti trees (*Ricinodendron rautanenii*), and other shrubbery (Malan, 1995).

Traditionally, the Hai||om were organized in small bands[4] with frequent interaction and exchange (Widlok, 1999; Steyn, 1989; Malan, 1995). Residence within these bands is flexible and inter-changeable (Widlok, 1999). As with other hunter-gatherer groups, owning property was limited to tools related to hunting, gathering and carrying, and food processing (Malan, 1995). Conflicts and other issues were discussed as a group, as no one person had authority over another (Widlok, 1999; Malan, 1995). As with other hunter-gatherer groups, the Hai||om emphasize autonomy, egalitarianism, and sharing-on-demand (Stengelin, 2019; Schäfer et al., 2015; Widlok, 1999; Malan, 1995). Hai||om children have high psychological and action autonomy (i.e., exploration and reflection of one's own desires, and one's ability to perform complex behaviors independently; Stengelin, 2019; Keller & Kärtner, 2013; Widlok, 1999). Similar to other hunter-gatherers, the Hai||om do not emphasize direct, child-centered pedagogy (Stengelin, 2019); rather, children learn through observation, experimentation, and teaching by peers in mixed-age groups.

Today, as a part of a governmental relocation program, the Hai||om have moved to the northern and eastern regions of Namibia or have been relocated to "resettlement farms" (Hitchcock, 2016). The Hai||om gather food from shrubbery, buy food, receive occasional food aid from the government, and they cultivate crops in small gardens (although with little yield, Widlok, 1999). Aside from a few exceptions, the Hai||om no longer frequently engage in hunting due to prohibition from the government and difficulties with the ownership of the land (Stengelin, 2019). Despite several prohibitions on their traditional lifestyle, many Hai||om living in rural areas maintain their cultural identity by engaging in gathering (Stengelin, 2019), occasionally hunting, and sharing on-demand.

Information from the interviews

The Hai||om communities investigated for this dissertation were located in two locations in the Oshikoto region of Namibia. Throughout this dissertation, I will refer to the two groups as the "Hai||om at location one" and "Hai||om at location two" to protect the identities of this marginalized cultural group.

[4] Widlok emphasizes that Hai||om "bands" (Hai||om: ||gãus) are the "co-residents of a house" (Widlok, 1999, p.135).

Approximately 300 permanent residents live at Hai||om location one, an operating cattle farm where some of the local Hai||om residents are also seasonally employed (Stengelin, 2019). The Hai||om at location one report foraging (72%; wild berries, roots, insects, nuts), hunting (23%; small game such as birds and lizards), buying their food (91%), and having access to produce grown by oneself or by others (82%). Residents also report receiving food aid from the Namibian government (68%). The reported possessions of the Hai||om interviewed include a cell phone (45%), TV (9%), computer or laptop (5%), car (5%), and animals (41% overall; cattle: 5%, goats: 14%, chickens: 27%, dogs: 32%). Children at location one can attend a local school up to grade 5, although teacher reports of student attendance are low (Stengelin, 2019). Of the 19 adult respondents, 12 report not attending school (63%), 6 reported attending primary school (32%), and one person reported finishing the 10th grade. Two of 22 adults interviewed reported having work (9%) and 17 reported struggling financially in the past year (77%). Respondents report owning zero (5%) or one (86%) house; while two respondents report owning two houses (9%). None of the houses are equipped with electricity and running water (0 of 22 respondents), but residents do report having access to communal ground water taps. Residents travel to and from nearby towns on foot or by opportunistic hitchhiking. The nearest town is approximately 45 km away and location two is roughly 50 km away. Residents of location one and two report visiting each other frequently, typically by walking through the bush.

As part of a governmental resettlement project (Hitchcock, 2016), the Hai||om at location two were relocated to a farm in northern Namibia, approximately 40 km away from the nearest town. Hai||om at location two frequently travel to and from the farm on foot or via opportunistic hitchhiking, and some residents report owning their own vehicle. There are approximately 500 to 1,200 permanent residents at Hai||om location two (Stengelin, 2019). The Hai||om at location two report foraging (47%), hunting (5%), buying their food (100%), and having access to produce grown by oneself or by others (53%). The majority report receiving food aid from the Namibian government (84%). In addition to small, individual gardens at the farm, a large field does provide some sustenance; however, at the time of my research visit, the field did not provide any form of sustenance due to a lack of seeds. The reported possessions of the Hai||om interviewed include a cell phone (74%), TV (42%), car (16%), and animals (79% overall; cattle: 5%, goats: 17%, chickens: 63%, dogs: 58%, cats: 5%). Children can attend a local school up to grade 7, although student attendance, as reported by teachers, is low (Stengelin, 2019). Of the 19 adults interviewed, 14 report not attending school (74%), 3 report attending school up to the 7th grade (16%), one reported finishing the 10th grade (5%). Six of 19 adults interviewed reported having work (31%) and 16 of

17 (94%) reported struggling financially in the past year. Respondents report owning zero (5%) or one (84%) house, while two respondents report owning two or three pieces of real estate (10%). Roughly half of the houses are equipped with electricity (58%) and a majority of households have their own ground water tap as well as access to communal ground water taps.

According to interviews conducted at location one, the Hai||om of Namibia have an egalitarian social structure. A majority of respondents (n = 8 of 11, 73%) report no differences in wealth and status among the people of the community. Those who report differences in wealth or status (n = 3, 27%) either mentioned the social grants or pensions that the government provides the Hai||om community with, or that people who are employed have a higher status. Elderly people and households with young children receive social grants; thus, depending on the size and makeup of each household, financial status may differ within the community. Additionally, two respondents reported that people who own goats or chickens have higher wealth than others in their community. A majority of participants report being able to change their wealth or status (n = 10, 70%) by getting an education, finding a job, and by buying and selling goats.

According to interviews conducted at location one, 45% of Hai||om respondents (n = 5) report at least one instance of inter-cultural conflict with neighboring Ovambo communities. These inter-cultural conflict occurred on a monthly or twice-yearly basis and were reportedly verbally and physically violent, but were not grave enough to be considered warfare. A majority of respondents report an absence of conflict with other cultural groups (55%).

Most of the conflicts reported at this particular Hai||om village were among community members. Eleven of twelve participants (92%) report at least one instance of intra-group conflict among the people within the community (e.g., with neighbors or family members). A majority of the conflicts reported between community members were within families and with neighbors, and pertained to pension payouts, alcohol consumption, or fights among neighboring children. Inter-personal conflict occurred on a monthly or yearly basis (i.e., common; 60%), depending on the reason for the conflict, and was reported to be never (47%) or rarely violent (40%).

Respondents (92%) report intra-cultural conflict among people of the same community or with Hai||om from another community. These conflicts were frequently described as occurring between different cultural groups living in the same community (i.e., Kavango and Hai||om), between different sides of the village (i.e., sunrise vs. sunset side of the village), and between soccer teams. Reports suggest that intra-cultural conflict mostly occurred on a monthly basis (i.e., common; 33%) and was never violent (67%).

4.4 The Ovambo of Namibia

General information

The Ovambo (also: Owambo, Oshiwambo, Oshivambo, Vambo, Aaumbo) make up roughly 49% of Namibia's population (Namibia Statistics Agency, 2011). Namibia has a democracy, a president, and a hierarchically structured political system. The Ovambo can be divided into eight sub-groups[5]; each of which has its own dialect; however, Oshindonga (also: Ndonga) is becoming increasingly accepted as the common dialect (Malan, 1995). Oshindonga belongs to the Kunene language family (Hammarström et al., 2021b).

The environment in which the Ovambo traditionally subsided consists of the Kalahari Basin, a sandy plain located in northern Namibia (Malan, 1995; Brown, 2013). Annual rain fall in the region is between 350 millimeters and 550 millimeters (Malan, 1995). Main vegetation in the area consists of mopane (*Colophospermum mopane*), marula trees (*Sclerocarya caffra*), and makalani palms (*Hyphaene ventricosa*) (Malan, 1995). Today, Ovambo also live in Windhoek, the capital of Namibia.

Traditionally, Ovambo kinship was determined through the matrilineal line, as such, the mother's clan determined children's clan and lineage (Brown, 2013; Malan, 1995). Intermarriage within a clan was avoided, as the clan members shared a common ancestress (Malan, 1995). Each sub-group consisted of twenty to thirty clans (Malan, 1995). Individuals within a clan within the same generation refer to each other as "brother" and "sister", while the generation above them is considered "father" and "mother", and the subsequent generation "grandfather" and "grandmother" (Malan, 1995).

The handling of property was traditionally determined by one's lineage. Men's cattle and other possessions were passed on to his younger brother, then to his sister's son (Malan, 1995). If a man wanted to pass on his possessions to his own children, he must have sought the permission of the senior members of his lineage (Malan, 1995). As Malan (1995, p.19) notes, "it is [...] not the father, but the mother's brother who occupies the most important position in relation to [a woman's] children". The maternal uncle passed on his property to his nephews (i.e., his sister's children). Traditionally, a man lived with his wife or wives and property in a homestead (*ongandjo*) that was surrounded by cultivated land (for more information on traditional residing patterns, see Malan, 1995).

[5] Malan (1995) refers to these sub-groups as "tribes".

In recent times, after marriage, some men establish a new household (i.e., neolocal) instead of living with their matrilineal or patrilineal relatives (Malan, 1995). The man thus has more authority over his own children and his own children are more involved with their father's property (Malan, 1995). This recent shift toward patrilineality is not accepted by all Ovambo and has been the cause of conflict withing the Ovambo community in recent years (Malan, 1995).

A shift in residing patterns has also developed in recent years due to the scarcity of land near permanent water-supplies (Malan, 1995). As such, people have moved away from their traditional homesteads and into cities where they are able to make a living trading, engaging in migratory labor, or being employed locally (Malan, 1995). This shift in residence also brings a shift toward monogamous relationships living neolocally (Malan, 1995).

Today, the Ovambo are agro-pastoralists and engage in the market economy; that is, they engage in cattle herding and cultivation of crops, and engage in trading, selling, and buying goods such as meat, milk, millet, crafts, and labor in larger towns and cities. Cultivated crops include millet (*omuhango* or *omohango*), maize, beans, pumpkins, and watermelons (Brown, 2013; Malan, 1995). Aside from cattle herding, Ovambo also keep goats, sheep, horses, donkeys, and mules (Malan, 1995; Brown, 2013). Cattle are considered a status symbol and are thus rarely slaughtered for consumption (Malan, 1995). Catepillars (*mopane worms*) and fish are also an important part of the Ovambo diet.

Traditionally, each Ovambo sub-group was headed by a chief (*omukwaniilwa*), whose position was passed on matrilineally (Malan, 1995). A council of headmen (*omalenga*) assisted the chief in his governing duties (Malan, 1995). Today, the headmen are divided into an appointed senior headmen (*elenga enene*) and sub-headmen (*elenga eshona*) (Malan, 1995). The senior headman is in charge of a district, while a sub-headman is in charge of a sub-division of a district (Malan, 1995).

Alloparenting (i.e., child fosterage) is a common and normative practice in Ovambo culture (Brown, 2013). Children are reared by other biologically related families for a multitude of reasons, such as teaching discipline, opportunities for a better education, shaping social ties, and to improve parents' opportunities to find a job or a partner (Brown, 2013). Women play an important role in the caretaking of foster children and orphans, and often gain respect within their communities for fostering children (Brown, 2013). Foster children are treated equally to one's own biological children (Brown, 2013).

Information from the interviews

The Ovambo community investigated for this dissertation live in the Oshikoto region in northern Namibia. The community is estimated to have roughly 2,000 inhabitants that engage in a market economy and traditional agricultural methods (Stengelin, 2019). Oshikwanyama and Oshindonga are the main dialects spoken in the community described in this dissertation. In addition to an appointed headman, the police have a governing presence in this community.

In this town, the Ovambo report buying their food from a nearby grocery store (100%) and having access to produce grown (by oneself or by family members living in other villages, 69%). The reported possessions of the Ovambo interviewed include a cell phone (100%), TV (60%), car (26%), and animals (69% overall; cattle: 25%, goats: 50%, chickens: 25%, pigs: 19%, dogs: 13%, cats: 7%). Of the 16 adults interviewed, 4 reported finishing the 10th grade (25%), 10 reported finishing the 12th grade (62%), 2 reported completing a higher education (12%). Fourteen of 16 adults interviewed reported having work (87%) and eight of ten (80%) reported struggling financially in the past year[6].

Ovambo in this town typically live with or near their family members (i.e., direct kin, foster children, siblings, parents, grandparents, cousins). Typical daily activities of the Ovambo in this town include working roughly 6-10 hours in various environments (e.g. field work, sales, government) and sustenance acquisition. The majority of households in this town are equipped with running water and electricity (69%). Modes of transportation include walking short distances and opportunistic carpooling for long-distance travel. Ovambo children can attend a local school from kindergarten up to grade 12 and teachers report near to daily student attendance (Stengelin, 2019).

Unfortunately, due to COVID-19, I was unable to conduct the interviews on conflict and social stratification with the Ovambo community. I therefore supplement this missing information in the following paragraphs with information from previous research and my own research experience.

I consider the Ovambo to be a highly socially stratified cultural group. As mentioned in previous research (e.g., Brown, 2013; Malan, 1995), one inherits the status and wealth from one's family members. However, one can also change one's wealth, and thereby the wealth of subsequent family members, throughout one's lifetime by having a good paying job and owning livestock. A good paying or highly-recognized job is often acquired through personal connec-

[6]Six of the 16 adults interviewed preferred to leave this question unanswered.

tions. Changing one's status takes more effort, but can also be done by gaining a recognized position in the government (e.g., headman), one's family (e.g., by fostering children), or one's job (e.g., police man, school principal).

In terms of conflict and warfare, my literature research has revealed little in terms of warfare between the Ovambo and other cultural groups in recent times. However, there are smaller-scale conflicts with other cultural groups. For example, within the community I worked in, there were verbal and sometimes physical conflicts between the Ovambo and the Hai||om; however, the majority of the interactions were peaceful between the two groups. These conflicts were by no means grave enough to be considered warfare. Therefore, I estimate the degree of conflict between the Ovambo and other cultural groups to be rare and rarely violent.

I estimate the frequency of intra-cultural conflict (i.e., with other Ovambo communities or sub-groups) to be occasional and never violent. There are conflicts among political groups (e.g., the SWAPO), but I was not aware of any detrimental conflicts between the community I worked with and another Ovambo community.

In terms of intra-group conflict within the Ovambo community, I estimate this to be common and rarely violent for the community I worked in. During my research visit, conflict among family members regarding child fostering, child rearing, inheritance, and due to alcohol consumption occurred on a daily to weekly basis.

4.5 The Germans in Leipzig, Germany

General information

Germany has a population of 83.1 million inhabitants, 86.3% of which identify as being German nationals (Statistisches Bundesamt, 2021). Germany is made up of 16 states, six of which previously belonged to the former Eastern bloc. There are several dialects of the German language in Germany; however, standard German (*Hochdeutsch*) is understood in all regions. German belongs to the Indo-European language family.

Germany is located in middle Europe and contains mountainous regions, flat lands, forests, and coastline. Annual rain fall is estimated to be 500 mm on average (Koptyug, 2021), but varies among the mountainous and flat land regions. Main vegetation consists of oak, beech, spruces, and pine trees (Federal Ministry of Food and Agriculture, 2021). Wildlife consist of deer, wild boar, foxes, wild birds (e.g., storks, eagles), and fish (e.g., perch, carp, pike) (Bekkler, 2005). Ger-

mans live in both small towns and cities.

Germans typically obtain their sustenance from local grocery stores and markets. Some Germans have access to small plots of land, where they can grow fruits and vegetables. Germany has a market-economy and engages in wage labor. Germany has a democracy, a chancellor, and a hierarchically structured political system.

Property and possessions (e.g., land, real estate, automobiles, and money) are typically passed on to kin through the family line. In the former Eastern bloc, property and possessions were often owned by the state; thus, wages and property owned by people with ancestry in the former East Germany is still typically lower today than for people with ancestry in the former West Germany.

A nuclear family traditionally consisted of a monogamous couple and zero to three mutual children, which was patriarchally structured (Otto & Keller, 2015). Additional family members (e.g., grandparents, siblings) assisted in childcare if they resided nearby. Women typically engaged in childcare at home, and occasionally wage labor, while men engaged in wage labor, but not typically childcare (Otto & Keller, 2015).

In recent decades, the social organization of families has been changing (Otto & Keller, 2015). A nuclear family often consists of two partners and children from either partner (and other partner(s); a so called "patchwork family"). Family members outside of the nuclear family may live near by or may live in other regions of Germany, and typically assist in childcare to a lesser degree than was common in the past. Both women and men typically engage in wage labor and childcare, although women still engage in childcare more than men (Otto & Keller, 2015).

As with other cultural groups in western societies, German parents invest copious amounts of time, money, and effort into their children's upbringing and education (Otto & Keller, 2015). From a young age, parents frequently interact with their children dyadically, in face-to-face interactions, and engage in frequent joint attention toward objects (Keller et al., 2005; Keller & Kärtner, 2013). Children are required by law to visit school on a daily basis and are required to finish the tenth grade (in Saxony), after which they often continue on to the twelfth grade, visit a vocational school, or get a higher education. The psychological autonomy of children (i.e., exploration and reflection of one's own desires) is a highly-valued socialization goal by German parents (Stengelin, 2019; Keller & Kärtner, 2013), while action autonomy (i.e., one's ability to perform complex behaviors independently) is not prioritized until late childhood (Stengelin, 2019).

Information from the interviews

The German community investigated for this dissertation live in a mid-size city in the eastern part of Germany. The population of the city is estimated at roughly 600,000 inhabitants that engage in a market economy. Saxonian (*Sächsisch*) is the main dialect spoken in this community.

In this city, the Germans report buying their food from a nearby grocery store (100%) and half (53%) report having access to produce grown by oneself or by family members. The reported possessions of the Germans interviewed include a cell phone (96%), computer or laptop (96%), TV (87%), car (77%), and animals (50% overall; dogs: 17%, cats: 10%, rabbits: 13%, birds: 7%, fish: 13%). Of the 30 adults interviewed, 4 reported finishing the 10th grade (13%), 5 reported finishing the 12th grade (17%), 21 reported completing a higher education (*Ausbildung* or university degree 70%). Twenty-seven of 30 adults interviewed reported having work (90%) and 11 of 30 (37%) reported struggling financially in the past year. Germans report owning zero (47%) or one (47%) piece of real estate (i.e., apartments or brick houses). Only two respondents report owning two pieces of real estate (6%). All houses are equipped with electricity and running water (100%).

Germans typically live in small families with two adults (traditionally one male and one female) and zero to three children. Typical daily activities of the Germans in the city include working roughly 6-10 hours in various working environments (e.g. desk jobs, sales, schools), sustenance acquisition, and childcare. All houses in the city are equipped with electricity and running water. Modes of transportation include walking short distances, riding personally owned bicycles or cars, car sharing, and public transportation (bus, train, metro, street car). German children can attend local schools up to grade 12 and daily student attendance is required by law.

Ninety-six percent of Germans interviewed report a class system with an average of either three or four classes and 100% of respondents report differences in wealth. Many respondents report that these classes are not officially and strictly separated, but rather they are socially observed within society. Respondents report the classes are based on one's net income and amount of debt, level of education, reputation, titles (e.g., Dr. or Prof.), material belongings (e.g., type of car), residential neighborhood within the city, career (e.g., politicians, medical doctors), and the amount of influence on and initiative toward making important decisions for the city. Two respondents reported that some people in society define high status as level of happiness and freedom, as opposed to the amount of money they have, and therefore, according to these respondents, there are no classes. All respondents report that wealth is inheritable, while only 80% report that status is inheritable. All respondents report being able to change their status and

wealth. Generally, respondents report that it is easier for people with high status and wealth to "lose" it by getting in debt, getting divorced, or by falling chronically ill, rather than for people of low status to "gain" high status or wealth. Most commonly, respondents report that through education and career choice, one can earn more money and gain higher reputation, and thus, can gain a higher status and more wealth than other members of the society. I therefore consider the German population to have a highly social stratified society.

Two-thirds of Germans report inter-cultural conflict with another cultural group or society (n = 23). For example, a majority of the conflicts are reportedly with foreigners living in Germany, with people with different religious beliefs, and with various countries (i.e., China, USA, Russia, other nations within the EU). All reported inter-cultural conflicts took place within the last two years. Inter-cultural conflicts are reportedly occasional (67%) and never (49%) or rarely violent (22%).

Participants report intra-group conflicts (e.g. with neighbors or family members; 97%) and intra-group conflicts within the same city or with other German cities (97%). Inter-personal conflicts were reportedly among family members (i.e., parent-child, partners), with neighbors, colleagues, friends, or strangers in everyday situations (i.e., motorists and cyclists on the street, parents and teachers at school). Intra-group conflicts occur frequently (i.e., on a daily, weekly, monthly, or roughly every three months basis; 50%) and are never (78%) or rarely violent (18%).

Intra-cultural conflicts mostly occur between political groups (i.e., liberal vs. conservative parties), the former Eastern and Western parts of Germany, religious groups (i.e., Christian and Muslim), or between groups associated with climate protests, COVID-19 protests, differing views regarding the education system in Germany, or companies progressing the development of the city. The intra-cultural conflicts are mostly never or rarely violent; with the exception of the conflict between the extreme political left and right wings—these are reportedly violent conflicts in which often times the groups throw stones and police use armored water cannon vehicles. Intra-cultural conflict is reportedly occasional (72%) and never (32%) or rarely violent (32%).

Chapter 5

Hai||om and Ovambo games

In the following chapter, I describe the games I observed during my research trip from February to April 2019 (three months) and March 2020 (two weeks) to Namibia. I document the games played in two cultural groups: the Hai||om and the Ovambo of northern Namibia.

5.1 Introduction

Only a handful of information is known about the games played in societies that primarily forage and hunt. It is important to document such leisurely activities at multiple time points, as games are borrowed, transformed, and abandoned by cultural groups.

In the current chapter, I document the games played in two cultural groups: the Hai||om and the Ovambo of northern Namibia. I describe who plays the games, the rules of the games, the procedure of playing, and any potentially relevant information on the game that I could collect during my research visits.

5.2 Methods

Observations and interviews were conducted using opportunistic sampling (i.e., when community members were seen playing a game). In some cases, if no games were being played, I asked groups of individuals to show me a game that they play. I initially observed the game and then asked questions about the game. The questions were asked in English and translated into Hai||om by a research assistant (DT). In the Ovambo community, I conducted the interviews in English. If possible, I also participated in the game play. With verbal permission of the players, I recorded videos and pictures of the games. Following the gameplay, I asked the players several questions about the rules of the game, the origin of the game, frequency of game play, and information about the players of the game. The full game questionnaire can be found in the Appendix D of the appendix.

5.3 Results

First, I provide information on the goal structure of the games I observed. In the subsequent sections, I provide a brief description of each game as I observed it, the rules of the game, and a visual aid of the game as it is played.

Sixteen games were observed in the Hai||om communities and seven games in the Ovambo community (see Table 5.1). The majority of games in the Hai||om and Ovambo communities had competitive goal structures. Games with the goal structure “Competitive vs. Solitary” were observed in neither community.

Table 5.1: The number of games of each goal structure observed in each cultural group. Games with the goal structure "Competitive vs. Solitary" were observed in neither community. Sol. = Solitary, Coop. = Cooperative.

	Solitary	Competitive	Sol. vs. Coop.	Coop. vs. Coop.	Cooperative	Total
Hai||om	2	9	1	4	0	16
Ovambo	0	6	0	0	1	7

5.3.1 Hai||om games

Game of 6-5

A frequently observed game was the game of "6-5" (spoken: "six five"). Confidants were unsure of why the game is called "6-5". The goal structure of the game is cooperative vs. cooperative (2 vs. 2). Six-five is played with four players—two teams of two adults. It is reportedly only played by men, but observations suggest that women play the game as well, although separately from men. The goal of the game is for two players of one team to get their pieces into the middle of the board before the other team.

Each player has 4 pieces of an object; teams have the same colored, but differently shaped, objects. For example, players may have four red circles and four red stars, and play against players with four blue circles and four blue squares. The pieces are usually made out of paper or plastic. The players with the same colored pieces sit diagonal to each other. The pieces are moved in a clockwise direction on the outer edges of the board (only the squares on the edges, but not the ones in the middle of the column of three where there are no stars). The players sit in-between the board's "arms" and each player has a starting square to the right of the player, marked with a stars. The dice are passed on in a counter-clockwise direction.

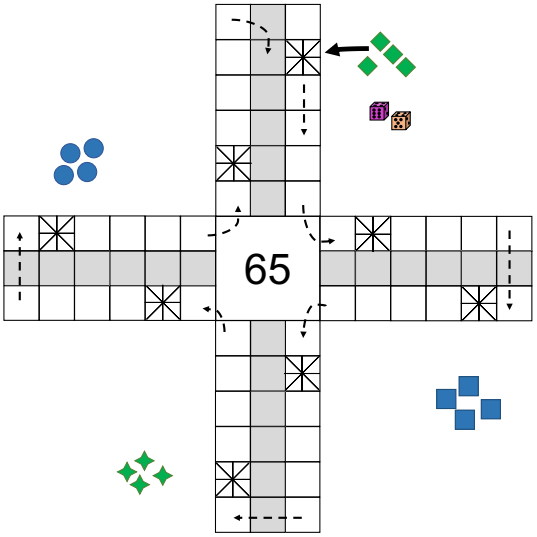
The cruciform board is drawn on a tarp with three columns and six rows in each extension of the cross (see Figure 5.1). The squares with a star are considered "safe", in that when a piece is on that square, it cannot be removed from the board by the opponents. The middle column of each side is for each respective player, whose pieces start and end on that side. The middle column is used to reach the middle of the board once a piece goes around the whole board. The game is played as follows:

1. Each player rolls one die to see whether they get a six. If they get a six, they start. If not, the highest die starts.

Figure 5.1: The game of six-five with pieces for four players and four dice. In the illustration on the right, the player with the green squares, at the top right, starts the game. The thick arrow indicates where the player places their pieces. The dashed arrows indicate the direction of movement for the player with green squares. The "safe" squares for all players are indicated with eight-pointed stars. The gray shaded areas are shaded for illustration—none of the squares on the board are colored.

(a) Four women playing six-five.

(b) An illustration of the game of six-five.



2. The starting player rolls two die. In order to put their pieces onto the board, players have to roll a six with one die. They have four attempts to roll a six with either of the die.

3. If a player rolls a six, the player puts one of their pieces onto the square marked with a star to the right of them. That piece (or any piece, if their other pieces are already on the board) is then moved for the number of spaces on the other die, in a clock-wise direction.

    - If no six is rolled in the four rolls, it is the next player's turn. Contrary to moving the pieces, the dice move in a counter-clockwise direction.
    - If two sixes are rolled, then either two pieces can be placed onto the board, or one piece can be placed and another moved for six squares.

4. A player continues rolling the die as long as a six is rolled or if that player removes/knocks-off another player's piece from the board.

5. The number on the die cannot be split. If a four and a two is rolled, the player's pieces can be moved either six (one piece) or two & four (two pieces), but not three and three spaces.

6. Knocking-off other pieces: If a piece lands on a square that has a different colored piece on it, this other piece is removed from the board (from the opponent).

7. Carrying other pieces: If two pieces of the same color, but different shape (team member's piece), land on the same square, they can carry each other, meaning when one piece moves, the other can piggy-back or also be moved.

8. Once a player makes it around the outside board (making the outline of the cross), and returns back to their side of the board, they move their piece into the middle of their side (the middle column). No other players can remove that piece once they are past the first square (bottom) of the middle column.
9. If a player's piece is in the middle column of their side, they have to roll the exact number of squares to enter the middle of the board. For example, there are six squares (but seven are needed to get into the middle), so if a player's piece is in the first square and they roll a four, the piece is moved up four squares. Then the player has to roll a three in order to put that piece into the middle.
10. Once a player has all of their pieces in the middle of the board, they can then help their teammate by rolling the die. The teammate's piece(s) are then moved those numbers on the dice.
11. The game ends when two teammates' pieces are in the middle of the board.
12. Subsequent games are then played with the winners of the game and two other people (if others are around).

||Hus (Version 1)

Another frequently observed game was ||Hus. ||Hus means "to poke a hole in something". The goal of the game is to obtain the majority of the nuts onto one's side of the board, thus making the opponent unable to move their nuts (i.e. when there are only holes with one nut). The goal structure of the game depends on the number of players of the game—it can either be competitive (1 vs. 1) or cooperative group vs. cooperative group (2 vs. 2 or 3 vs. 3). ||Hus is played by two to six adult players (male and/or female) with either single players or teams of two to three people. The number of players per team depends on the number of holes on the board (the longer the rows, the more players that are needed to move the nuts). The board consists of four rows of holes dug into the sand with either 12 or 26 holes per row. Children tend to play with rows of 12, while adults play with rows up to 26 holes. Each hole in the two outer rows contains two Mangetti nuts (or stones). Only two less than half of the holes in the two other (middle) rows are filled with 2 nuts each (see 5.2). The nuts are moved in counter-clockwise directions on each side. The game is played as follows:

1. A player/team picks the nuts from their half of the board they want to move. They take the nuts and move them into the subsequent holes in a counter-clockwise direction. One nut is placed in each hole.
2. If the hole a player lands in is empty, then it is the other player/team's turn.
3. If there is at least one nut in the hole a player lands in, then either:
    - the player leaves their nuts in the hole they land in and takes the opponent's nuts (from the opposite two holes) and continues with those.

- if there are no nuts in the opponent's holes, the player/team takes the nuts from the hole they landed in and continues with those.

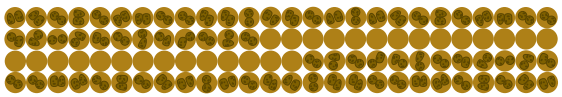
4. Players can only take the nuts on the opponent's side if they land in the middle rows.
5. Players can only take the nuts on the opponent's side if they either have some nuts in both of their rows, or if they have nuts in their middle row, but not if the opponent just has nuts in the back row.
6. Players can only move the nuts from holes that have at least 2 nuts.
7. Counting the nuts in a hole is allowed.
8. Players count the nuts in the holes and remember where their opponent will clear out their holes (so if they cheat, they will know it).
9. The loser can stop the game if they see that their opponent will win (i.e. by process of elimination of their possible moves).

Confidants report playing ||Hus on a daily basis and more often than the game of 65. The game is played during the day and confidants report playing it the whole day with a break for lunch. A common first move for players is to move the nuts from the last hole of the middle row. Confidants report being aware of what their opponents next two moves will be. The confidants interviewed report learning the game by watching adults play when they were kids. The game has reportedly been played for generations by the Hai||om.

Figure 5.2: ||Hus, version one

(a) Two women playing ||Hus.

(b) The set-up of ||Hus with 26 holes per row. The nuts are moved in a counter-clockwise direction.



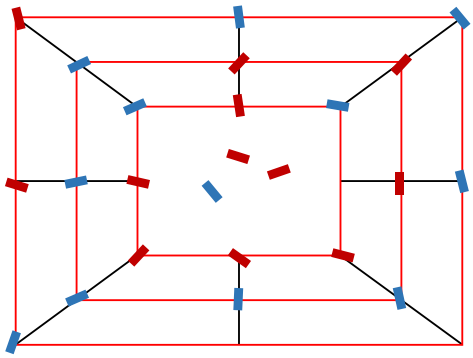
||Hus (Version 2)

There is another game with the name ||Hus. The goal of this game is to remove one's opponents pieces until they have three pieces left or until they cannot move their pieces any further. Two or four adult players play the game. The goal structure of this game is competitive (two players) or cooperative vs. cooperative (four players). If two players engage in the game, each player gets

12 pieces (two different colors). With four players, each player has six pieces (two colors). The game is played on a board with intersecting red and black lines (see Figure 5.3). The small pieces are made of plastic or occasionally bottle caps are used. Both sexes engage in this game at any time of the day and year. Confidants report that it is a new game. There is no particular way to determine who starts the game. The game is played as follows:

1. Taking turns, the players put all of their pieces on the board (on the corners, where the red and black lines meet). All 12 pieces have to be placed before players can move them.
    - While placing pieces on the board, any time a player has three pieces in-a-row, they can remove an opponent's piece of their choice.
2. Once all 24 pieces are placed, the players can move their pieces, one at a time, to make three in a row. If there are three in-a-row of the same color, that player can remove any piece from their opponent.
    - Pieces can only be moved to neighboring intersections.
    - Three in-a-row is only on one straight line, not around the corners.
    - If a piece is removed, it gets put into the middle of the board.
3. The game ends when a player either only has three pieces left or if a player cannot move any of their pieces.

Figure 5.3: The ||Hus (version 2) board. Pieces are located on the intersections of the black and red lines. The pieces in the middle of the board have been removed by the opponents.



Chick-a-lee

Chick-a-lee is a game with 12 small nuts (Marula *(Sclerocarya birrea)* or Mangetti *(Schinziophyton rautanenii)*), one large nut (Makalani, *Hyphaene petersiana*), and a small hole dug into the ground. The game can also be played with stones. The area around the hole should be free of sticks, rocks, and other objects. The game is played with one to six (or more) players of any age, who sit in a

circle around the hole. Confidants report that the game is played by children and adults, however, we only observed the game being played by children. Both boys and girls play the game, but they do not play it in mixed-sex groups. The goal of the game is to get through all rounds of the game. The goal structure is solitary—each player tries to get through the rounds by themselves, but doesn't do this in a competitive manner. Each round has a different set-up. There is no particular way to determine who starts the game and no clear end to the game—players play as long as they want and the game ends whenever they get bored. There are multiple games played after another (continuous play without a clear end for all players). You can "win" the game, but the players keep playing until they are bored. There is a "winner", but they don't announce it or count out loud how many times they won. The game is played as follows:

Round 1:

1. All twelve smaller nuts are placed in the hole. The player holds the large nut in their hand. The player removes all smaller nuts, one by one, out of the hole by throwing the Makalani nut into the air and removing one small nut from the hole. The player has to catch the large nut before it touches the ground.
2. Once all twelve nuts are removed individually, the player removes two small nuts at a time, until they remove all 12 nuts at once.
3. After successfully removing all 12 nuts, the nuts are placed back into the hole and the player continues with removing the next number (i.e. after successfully removing each nut individually, the nuts are placed back in the hole and then removed in pairs, etc.).
4. If the large nut is dropped/not caught in this round, there are no consequences.
5. If more nuts than needed are removed (e.g. 3 instead of 2), then the extra nut(s) can be placed back into the hole by throwing up the large nut, placing the small one back into the hole, and then catching the large nut again.
6. If too few nuts are removed (e.g. 3 instead of 5), then it's the next player's turn.

Round 2:

1. The nuts are placed on the side of the hole. After a player has successfully removed all 12 small nuts at once, each player designates "their nut" by pointing to it (e.g. for 3 players, 3 nuts total). Then the player has to put only those nuts individually back into the hole. Then those nuts have to be taken out of the hole and put back in together.
2. If the large nut is dropped/not caught in this round, there are no consequences.

Round 3:

1. Following this, the nuts are lined up around the rim of the hole (see Figure 5.4). The player has to put the designated nuts (from round 2) individually back into the hole first, and then the rest of the nuts are placed individually into the hole.

Additional rules:

1. If the large nut is dropped in the first game, it is not considered a mistake (it's not the next player's turn). As soon as one player completes rounds 1 and 2, the players cannot drop the large nut. As soon as a player completes rounds 1 and 2 again, then the players are able to drop the large nut again. It switches back and forth every time a player completes rounds 1 and 2.

2. If two players are in the same round, they pinch the player whose turn it is until that player says "stop". If multiple players are in the same round, only one of them pinches the player playing.

3. If a player makes a mistake, it is the next player's turn. When it is their turn again, the player starts from the same number where they made a mistake.

Figure 5.4: The game of chick-a-lee

(a) Three girls playing round one of chick-a-lee.

(b) The chick-a-lee set-up during round three. The twelve Marula nuts are lined up on the rim of the hole. *Note:* The Makalani nut was placed in the hole for this picture.

Cards (Version 1)

There are two versions of card games. The first is called "The game of cards". Two to eight players can play the game at a time. The cards include four of four to eight kinds of cards (e.g., four Kings, four 3s, four 8s, and four 10s). If four players play the game, then four different kinds of cards are needed. The numbers on the cards have little meaning in terms of winning the game. The objective of the game is for a player to collect four of a kind (e.g., four 3s) before the other players. Players sit in a circle and cards are given in a clockwise direction. Confidants report that the game is played by children and adults and in mixed-sex and age groups. Confidants also report the game is new to the community. The game of cards is played as follows:

1. Four cards are dealt to each player. Each player can look at their cards.

2. One player (player A) picks a card to give to their neighbor (player B).

3. That player (player B) looks at the card and decides which card they want to give to the next player (player C).
4. When a player has 4 of the same card, they win.
5. This winner starts the next game and deals the cards in the next round.

Cards (Version 2)

This is the second game of cards and is simply called "Cards". Cards is played with two or more players of both sexes and all ages, although adults and children weren't observed playing cards together. Objects needed for the game include: cards (lowest to highest value: 8, 9, 10, Jack, Queen, King, Ace) and "money". Children play the game with pieces of glass instead of money, while adults play with real money (see Figure 5.5. Confidants report that it is no problem if cards are missing from the deck. The goal of the game is to win all of the pieces of glass or money. Each player has their own pile of money. For children, one piece of glass is equivalent to one Namibian dollar. Each bet is five pieces of money and both the dealer and the players bet the five pieces on the piles of cards. The dealer changes throughout the game. If the dealer doesn't have enough money, they can sell the deck to another player and continue playing. The game is played as follows:

1. The dealer shuffles the deck, removes one card from the bottom of the deck, and then creates piles (of any amount of cards) in the middle of the playing area. The dealer decides how many piles of cards they want to make based on the amount of money they have (more money = more piles) and the amount they want to bet (i.e., risk). The dealer keeps a pile of cards for themselves and puts the removed card on the bottom of their deck (face up so the value of the card is not visible from below).
2. The players each claim as many piles as they want (and have money for) by putting 5 pieces of money on a pile of cards. Only one player can bet on each pile.
3. The dealer places 5 pieces of money on each pile.
4. The players flip over their pile(s) of cards to reveal the value of the bottom card.
5. The dealer flips over their deck and removes the bottom card to reveal the value of the second to last of the bottom cards.
6. The dealer collects the money from a pile if: (otherwise the player keeps it)
    - the dealer's card is of higher value than the value of the uppermost card on a pile.
    - the dealer's card is of the same value than the value of the uppermost card on a pile.
7. If a player has an ace, they are the new dealer in the next round.
8. If two players have aces, the dealer stays the same for the next round.

9. If the dealer runs out of money, they can "sell" the deck to another player for money.
10. The game ends if one player collects all of the money. If a player runs out of money, they are out of the game.
11. If the game doesn't end before one player has all of the money, the dealer is the same the next time they play.

Figure 5.5: The game of cards, version 2. The players removing their bets from the piles of cards. The dealer's deck (bottom left corner) is higher than all piles except the pile with the ace. The dealer keeps the money from the piles except for the pile with the ace. The new dealer for the next round is the player with the ace.

Dice

The game of dice is a fast-paced, competitive gambling game. Two or more adult players are needed to play the game. The goal of the game is to win money by rolling two dice. Each player needs money (NAD), in the form of coins or bills, and 2 dice. Players sit or stand around a common "pot" (see Figure 5.6), where players place their bets. The game ends when all the money is gone. The game of dice is played as follows:

1. All players that want to join the round place their bets in the common pot.
2. One player rolls the die.
3. Players can place bets against each other. (For rules on betting, see "Betting" section below.)
4. The player rolls the dice again, until they either win or lose the common pot. (For rules of when the player stops rolling the die, see "Rolling the die" section below.)
5. When the common pot is empty, steps 1-4 are repeated with the next player.

Figure 5.6: The game of dice. The common pot and a players rolled die. The die on the bottom right-hand corner of the pictureare not in play.

Betting. There are several types of bets allowed. The first type of betting is in the common pot. All players bet the same amount of money (e.g. four NAD), including the player rolling the die. In another type of betting, one player can bet against another player or against the person rolling the dice, independent of the money in the common pot. Also, bystanders that haven't put money into the common pot can also bet against the player rolling the dice. For example, player two and three can bet against each other that the player rolling the dice (player one) will not roll a total of six in the second round. The bets placed in this scenario are separate from the common pot.

Rolling the die. If a player rolls a total of seven, or a combination with six and five in the first round, they immediately win the money in the common pot. If a player rolls either a combination of one and one, two and one, or six and six, in the first round, they immediately lose and the other players split the money in the common pot. These are also the losing numbers for the remainder of the game. Otherwise, the total of the first roll of the die determines the desired amount for the player's second roll. For example, if a player rolls a five and a three, the total of which is eight, then the goal of the second roll is to roll any combination of die that equals eight. If the player rolls a combination of eight, they win the money that was bet in the pot. If a player rolls a total of seven in the second round, they lose the round and the common pot is split. A player

keeps rolling the die until either: 1) they roll the losing numbers, or 2) they roll the winning combination (i.e., the total from their first round).

Even Fought

This mixed-sex and age team game is played any time of the day and anywhere there is enough space. At least ten players are needed to play the game, and no extra equipment is needed. The players create same-sex, mixed-age teams (five to seven players each) and face the other teams in an open circle (see Figure 5.7). Each team stands in a line, trying to keep the space between the players as small as possible by holding onto each others waists or shoulders. Confidants report that the game was taught to them by a woman from Germany. The game is played as follows:

1. One person from one team (i.e., a line) is picked by the "game master" to try to break through another line of players. Only girls try to break through girl lines and boys try to break through boy lines.
2. If the player breaks through the line, their team gets a point.
3. If the players doesn't break through the line, nobody gets a point.
4. The "game master" decides when the game is over.

Figure 5.7: In the picture on the left, three teams are visible. On the left hand-side of the picture is a boys team, preparing to prevent the boy in the middle of the picture from getting through their line. The game master is standing next to the boy in the middle of the picture. Behind the game master are the two girls team. Not pictured is the second boys team (on the very far right). In the picture on the right, a boy from another team is attempting to break through the team line of other boys.

(a) The set-up of even fought.

(b) Boys playing even fought.

U Ma

This solitarily structured children's game requires a long string (approx. 2-3 meters long) tied together to form a large loop. The loop is placed around different body parts from two players

to form an oval through which other players can jump (see Figure 5.8). At least two players are needed to play the game. If only two or three players play the game, the loop is secured onto objects (e.g., tree, pole). The game is only played by girls.

The goal of the game is to jump through the strings without stepping on the string or jumping in the wrong place. In terms of moving the string to different parts of their bodies, confidants told us two variants: the string (one large loop) is placed around both knees in the first round, then the hips, then armpits, then one leg, one thigh, then the knees of both legs again. In the other variant, the players move the string from the knees, to hips, then armpits, and then it is the next round. If a player steps on the string or steps in the wrong place, it is the next player's turn. However, the player who made a mistake can try that particular round again on their next turn. There is no winner of the game, but rather if they count the number of rounds, they "win" or complete the game.

During play, children sing a song and report counting in Portuguese (i.e., u ma, du ma, tres, quatro, cingu, au ma, stress). The rounds are played in the same order (from one to 16). Each player gets a chance to jump through the strings before the string is placed on the next body part. After all players jumped through the strings , the players engage in the next round of moves. It remains unclear whether the last three rounds are alternatives to the first round, as the moves are identical, but the songs are different.

For example, to start the game, the string is placed around the knees of two players and the remaining players engage in round one of moves. After all players attempt round one of moves around the knees, the string is moved up to the hips. This continues until the players attempt to jump through the strings with moves from round one, while the string is at the height of their armpits. Then the string is placed around the knees and the players do round two moves. This is continued until the string is at their armpits, then round three starts, and so on. The rounds proceed as follows:

1. A player starts with one leg in and one leg out of the loop. Then they jump to the other string so the other leg is out of the loop, then jump back to the original string. Then the player puts the outside foot in to tap the ground between the strings, and back out and back in, then jumps out of the same side as they started.
2. Start with two legs on one side. Jump to the other side, in the middle of both strings, then out on the starting side.
3. Start with two legs on one side. One foot in and out, then both out, then both in and back out.
4. One foot in and one out, then both out, then straddle the other string, then jump out on the starting side.

5. One leg in and out, jump up twice, then switch the legs that are straddling that string.
6. Jump with both legs inside, both out and back in, back out.
7. Jump with both legs in, straddle the string, back in with both, then jump out on the starting side with both.
8. While straddling the string, take the string with the legs to cross the other string with both legs. Then jump back while still straddling the original string. Then both legs in and out two times, then jump out on the original side.
9. With both legs outside, take the string and jump to the outside of the other string, jump into the middle of both strings, then out.
10. With one leg, take the string to jump to the other side of the other string, then both legs to take the string to the other side, then jump out.
11. Start with both legs on one side. With one leg, take the string and jump onto the other side of the other string. Then jump back to the starting side. Switch legs and repeat. End on the starting side with both legs.
12. Starting with both legs on one side, take the string with both legs and jump to the other side of the other string. Repeat.
13. Starting with both legs on one side, take the string with both legs and jump to the other side of the other string. Take left foot out of the string and back in. Jump out to the original side.
14. Repeat number one (with a different song, the days of the week in English).
15. Repeat number one, a bit longer (with a different song, the months in English).
16. Repeat number one, a bit longer (with a different song).

Figure 5.8: Girls playing U Ma. The girl on the far left and far right have the strings around their knees. The girl in the middle is jumping through the strings. The other two girls are waiting their turn to jump through the strings.

Boti

This competitive game can be played by two to four male players. Players of all ages who can count play the game. The game is played when many men gather, for example on school holidays. Each player throws 16 rings at a board with the aim of getting the rings to hook on the board (see Figure 5.9). If a ring hooks two numbers at the same time, the points do not count and the ring is not thrown again. Children stand behind a line roughly five steps away from the board, while adults stand behind a line ten steps away. If a player steps over or on the line, the play can throw the ring again. The game is played as follows:

1. Players agree upon the number of points needed before starting to play (e.g., 300).
2. Players throw the rings toward the board from behind the line. If the ring gets hooked, the points corresponding with that hook are added together.
3. Add up the points scored on a table drawn in the sand.

(player)	1	2	3	4
(points)	20	25	10	5

4. If a person reaches the set number of points, they win.
5. If a person goes over the set amount, the player has to hook a ring onto the number 1. If a ring hooks onto another number other than 1, it's the next player's turn. When it's that player's turn again, the player tries to throw a 1.

Figure 5.9: The Boti board and one ring hanging on the 5.

Dominoes

Dominoes is played in teams of two, with team members sitting opposite of each other (see Figure 5.10). Each player gets seven dominoes. Confidants reported the dominoes played with were bought at a local grocery store. Both men and women, and children and adults play the game together.

A team can win when one player gets rid of their dominoes. "Box" is when the last card a player plays can be played on either end of the domino rows. The game is played as follows:

1. Mix the dominoes. Each player picks seven dominoes.
2. The player with double-sixes starts. The subsequent dominoes are placed on the "board" in only two lines, starting at the double-sixes.
3. The next player (counter-clockwise direction) plays a piece with a six. If they don't have a six, it's the next player's turn.
4. The dominoes are placed so that the same numbers touch (e.g., two-four domino on a four-six domino). Doubles (e.g. two-two domino in Figure 5.10) are placed perpendicular to the previous domino.
5. When a player has one domino left, they knock on the table.
6. If a player cannot play any of their dominoes, they tap two dominoes together.
7. If nobody can play a domino, the player who plays the last 7th domino then picks someone to challenge. If their domino has fewer dots than the other person they challenge, they win. If the players have equal numbers of dots, the challenger loses.

Figure 5.10: The board and the hand of two of the four players playing dominoes.

5.3.2 Ovambo games

Akadela

This hand-clapping game is played by a large group of players (min. 2 players). According to confidants, "akadela" means "crocodile". The game is played by children in mixed-sex and age groups. Confidants report the game was created by teachers at their school. Players can win the game if they are the last surviving player (i.e., the only one not to get shot). Players sit in a circle with their right hand on top of the hand from the person sitting on their right, and their left hand below the hand from the person sitting on their left. While playing the game, the following song is sung (English pronunciation in parenthesis): "Akadela u(ooh) a gi(chi) ka, gi(chi) ka, u(ooh) a, oh my lord. My lord say, one, two, three, four, five, six, seven, eight, nine, ten."

Figure 5.11: Children playing Akadela. In the picture on the left, players are shown seated in a circle. One player is slapping the player's hand to their left. In the picture on the right, a girl is deciding who to "shoot". (After long contemplation, she decided to "shoot" the ground.)

(a) Children playing Akadela.

(b) A girl deciding who to shoot.

The game is played as follows:

1. One player starts by slapping their neighbor's hand and all children begin singing. Each syllable constitutes one slap.
2. The player whose hand is hit when "ten" is sung, chooses who they want to "shoot". The player can either shoot themselves, shoot another player, or shoot the ground (see Figure 5.11).
3. The player who was shot is out of the game and moves out of the circle.

4. The player who decided to shoot starts with step one and the game continues until two players are left.

5. The last two players have one hand together (their right hand) and flip them back and forth. The player whose hand is on the bottom can either shoot themselves (they lose and the game is over), shoot the other player (they lose and the game is over), or shoot the ground (after which all players get back into the game and start again).

Broken Telephone

This game is played in large groups (min. 3 players, Figure 5.12). Children play the game in mixed age and sex groups. There is no winner of the game. The game starts with an introductory song: "Broken telephone, broken telephone. No otherwise, no excuse, no repeating. Starts with you and ends with you." The final step of the game was not observed. The game is played as follows:

1. Sing the introductory song and clap along. When "starts with you" is sung, everyone points to somebody (majority rules if multiple people are pointed to). When "ends with you" is sung, everyone points to someone else (majority rules if multiple people are pointed to).

2. The starting person thinks of something to say and then whispers it to the person sitting on their left.

3. The message travels around the circle and the last person says the secret message out loud.

4. The person who messes up (breaks the telephone) sits in the middle of the circle. The others pretend to cook that person.

Figure 5.12: Children playing Broken Telephone. In the picture on the left, players are clapping and singing the introductory song. In the picture on the right, one player is passing the secret message to the next player.

(a) Children playing Broken Telephone.

(b) Two boys playing the game.

My dear darling

Two to four players can play this hand-clapping game. Both boys and girls play the game. All players can win if no one makes a mistake; the person who makes a mistake is exchanged with another player, but is not considered the loser (i.e., they can join the game again). Players stand opposite of each other (two players), in a triangle (three players), or in a circle (four players) (see Figure 5.13. While clapping their hands, players sing the following song: "My dear, my darling. Oh, dear, I want to show you. You promised to marry me sometime in July. You promised to marry me sometime in July. Sometime in July. I call my boyfriend to take me shop, to buy me ice cream, he took me home with a BMW. Mama, mama, I feel sick, call the doctor. Quick, quick, quick. Doctor, doctor, count up to (five/ten). I say one, I say two, I say three, I say four, I say five, I'm alive." The game is played as follows:

1. *For two players:*
    (a) Before starting to sing, hold the pinkies of the other player(s) and swing the hands back and forth singing "een, twee, en drie".
    (b) Start singing.
    (c) Clap your own hands, then the right hand of the other player with your right hand.
    (d) Clap the left hand of the other player with your left hand.
    (e) Clap both hands with the other player's hands.
2. *For three players:*
    (a) Before starting to sing, hold the pinkies of the other player(s) and swing the hands back and forth singing "een, twee, en drie".
    (b) Start singing.
    (c) Clap your own hands, then two players clap hands with each other (the third player claps their legs). Then two other players clap hands with each other (the other player claps their legs). Then the two other players clap hands with each other (and the other player claps their legs). And so on.
3. *For four players:*
    (a) Before starting to sing, hold the pinkies of the other player(s) and swing the hands back and forth singing "een, twee, en drie".
    (b) Start singing.
    (c) Clap your own hands, then the hands of the player across from you (either below or above the other players' hands).
    (d) Clap the hands of the player across from you (if you were above previously, now below an vice versa).
    (e) Clap the hands of your neighbor. Then the hands of the other neighbor.

Figure 5.13: Children playing the game of My dear darling.

(a) My dear darling with two players.

(b) My dear darling with four players.

Policeman

The game of "Policeman" is clapping game played in a large group (min. 2 players). Children sit in a circle with their right hand on top and their left hand on the bottom of the players' hands sitting next to them. Both male and female school children of all ages engage in this game. Confidants were unclear whether or not there is a winner of the game, but they do report there being a loser of the game. The game ends when there is only one player left. During the game, children sing the following song: "Knock, knock, knock. Who is it? Policeman, let me write a letter for you. Please hug or shoot someone out." While singing "knock, knock, knock", one child slaps the hand of the child on their left three times, and then the subsequent children slap each other's hands. The game is played as follows:

1. Children sit in a circle with their hands on top of/below their neighbor's hands.
2. A player starts by slapping their neighbor's hand and all players sing the song.
3. When the song is over, the last player's hand to be hit can choose to either shoot or hug someone. If they shoot someone, that player moves out of the circle. If they hug someone, both of them stay in the circle.
4. Continue until there are two players left.
5. When there are two players, either a player can shoot themselves out (then the other player gets pinched) or the last player (to lose) gets pinched until they say 5 colors. If the players hug, everyone pinches both of them (they both lose and have to say 5 colors).

Shooting Marbles – Fish

The first of two marble shooting games is called "Fish". Confidants report a minimum of two players and a maximum of 20 players—smaller groups of five to six children were most frequently observed. For this game, a fish is drawn in the sand/dirt (see Figure 5.14). Each player places a marble in the fish—the number of marbles depends on the number of players playing the game. The more players and marbles in the game, the bigger the fish. The marbles should be roughly evenly spread out within the fish. The goal of the game is to shoot the marbles out of the fish and to prevent other players from shooting the marbles out of the fish. The game ends when all of the marbles are outside of the fish. The player who shoots the most marbles out of the fish wins the game. Players keep the marbles they knock out of the fish. Marbles can be shot in any way—from the back of the hand, from the sand, flicked, thrown, etc. The game is mostly played by children and by boys; although a confidant reported that girls and adults can also play the game.

Figure 5.14: The game of shooting marbles (fish) with large marbles lined up inside of the fish.

The game is played as follows:

1. Each player places a marble on the fish.
2. Players stand roughly five feet (1.5 meters) away from the fish and throw their marbles toward the fish one after another with the aim of hitting a marble. (A confidant reports: "It is good to either be the first or the last thrower. There is no particular order for throwing the marbles; they just say 'I throw first.' 'I throw second."')
3. If someone hits a marble in the fish, they start the game. If not, the player with the marble closest to the fish starts.
4. "clicks"– re-throw the marbles if they hit each other when throwing them
5. If a person hits a marble in the fish, they continue shooting until there are no marbles left in the fish to hit. If they miss, it is the next player's turn.
6. The players aim to shoot the marbles in the fish out of the fish. When a marble is hit out of the fish, the player keeps it.

7. Players can hit other players' marbles to prevent them from getting the marbles in the fish (but they do not keep those marbles).

Shooting Marbles – Hole

The second version of a marble shooting game is called "Hole". Two to ten male, children players can play the game at a time. Girls can also play the game, but there were only observations of boys playing the game. To play the game, each player needs one marble (rocks are sometimes used if players do not have marbles), and a hole is dug into the ground (the size of the hole is created based on the size of the largest marble). Players differentiate between a "real" and a "fake" game—real games are when the players keep the marbles they hit; fake games are when they do not keep the marbles they hit (especially if one child does not have any marbles and has to borrow one from another player). Players can shoot the marbles any way they want—from the back of their hand, on a fist, on the sand, etc. Some players "click" their fingers when they throw or flick the marbles (see Figure 5.15). Terms used while playing the game include "the game is broken", meaning a player does not have any marbles left, and "maak alles", which is said when the sand should be cleaned away from the marble or surrounding the hole area. The game is also sometimes played with a lane leading toward the hole (see Figure 5.16).

Figure 5.15: Players playing shooting marbles with marbles and rocks.

(a) A player flicking their marble toward the hole.

(b) A player measuring four fingers' width and drawing a line in the sand (top). Another player is also waiting to shoot their "marble" (bottom).

The game is played as follows:

1. All players stand a similar distance from the hole and throw their marbles toward the hole.

2. The player with the marble closest to the hole tries to shoot their marble into the hole. If two players throw it into the hole, players re-throw the marbles (i.e., restart the game).
3. If a player's marble lands in the hole, the player measures 4 fingers width away from the hole (figure 20) and draws a line in the sand. Then they place the marble on the line and try to hit another player's marble.
    - If they hit another player's marble, they win.
    - If they do not hit another player's marble, it's the next player's turn. If that player already shot their marble into the hole, they also try to hit other marbles. If not, they try to get it into the hole first.
4. If the hand doesn't fit between the hole and another marble, the player moves the marble to the opposite side of the hole and draws a line to shoot.

Figure 5.16: The lane with a hole at the end. Players stand on the end of the lane without a hole and throw or roll their marble toward the hole. After throwing their marble, boys go to the other end of the lane to watch whether marbles hit each other.

There's a party around the corner

For this game, children sit in a circle with their right hand on top and their left hand underneath their neighbor's hand (see Figure 5.17). At least three players are needed to play the game, although a confidant reported that it is sometimes played with two players. A player can win the game by surviving in the game until only two player are left, and then slapping the hand of their opponent (or not getting slapped). Both girls and boys play this game. There are three parts and two songs in the game. Children slap each others hands in a consecutive order while singing the songs. The following song is sung during the first part: "There's a party around the corner, could you please, please come. Bring your own caterpillar, bring your own sister. So what is your boyfriend's name or girlfriend's name?" The person whose hand is slapped at the end of part one says a name. This name is then the beginning of the second part/song: "[Name] will

be there with the dirty underwear. So how many kisses do you want in a year or in a month?" The person whose hand was slapped at the end of part/song two then calls out a number. This number is then used in part three of the game. The game is played as follows:

1. Sing part one and hit the hand of the next player (i.e., neighbor to the left).
2. The player whose hand is hit after part two says a name. The name is sung at the beginning of part two.
3. The player whose hand is hit after part two says a number.
4. The hands are hit in the circle for that number. The second to last person has to try to hit the last person's hand. (For example, if ten is the number called out, then the ninth player tries to hit the tenth player's hand.)
   (a) If they are successful, the player whose hand was hit goes into the middle of the circle.
   (b) If they miss the other player's hand, the player trying to slap goes into the middle of the circle.
5. This is continued until there is only one player left (the winner).

Figure 5.17: Children playing There's a party around the corner.

(a) Players sitting in a circle with their hands on top of each other's.

(b) The final player attempting to slap the hand of their neighbor.

5.4 Discussion

In this chapter, I elaborated on the games I observed being played by the Hai||om and Ovambo communities during my research visits. I presented the rules and additional background information on these games. To my knowledge, this is the first detailed record of the games played by these two cultural groups[1]. As this record of games is limited, I will focus on the limitations of these observations and ideas for future research.

[1] Loeb (1962) published brief descriptions of play and a few games among the Ovambo.

I was able to observe 16 games played by the Hai||om and seven games played by the Ovambo. A majority of these games were competitive (9 vs. 6), while only one purely cooperative game ("cooperative group" in Figure 2.1) was observed in the Ovambo community. As with ethnolinguistic groups in the Austronesian language family, purely cooperative games are rare. When grouped into the same three sub-categories as in chapter 3, the Hai||om would have two solitary games, nine competitive games, and five cooperative games, and the Ovambo would have zero solitary games, six competitive games, and one cooperative game. This distribution of cooperative and competitive games in these two cultural groups mimics the distribution of games found in a majority of the ethnolinguistic groups in the Austronesian language family. When all three categories of games are present in a given cultural group, competitive games tend to be most frequent, followed by cooperative games, and subsequently solitary games.

However, the numbers presented in Table 5.1 should be interpreted with caution. The games described here were opportunistically observed during my research visit and should not be taken as a full representation of the games played by these two communities. Future research should aim at gathering the rules of the games played by similar communities, during multiple seasons (i.e., wet and dry seasons) as objects available for games may vary depending on the season. For instance, during Makalani nut season, Makalani nuts may be used to play Chick-a-lee, but outside of this season, Chick-a-lee may either not be played or other objects might be used to play it. Future research should investigate the games over a longer period of time and during multiple seasons.

Several games that I describe in this chapter were also described in other recent texts on games. For example, the game ||Hus (Version 1) that is played by the Hai||om is similar to games played by the Ju|'hoan of Namibia and Botswana (de Voogt, 2017), the !Ko of Botswana (Sbrzesny, 1976), the Yoruba of Nigeria (Ajila & Olowu, 1992), the Shona of Zimbabwe (Tatira, 2014), is described as being played in parts of the Philippines (Culin, 1900), and by other historical groups (de Voogt, 2021). ||Hus (Version 2) that is played by the Hai||om is also described as being played by Shona adolescents in Zimbabwe (called 'Fuva'; Tatira, 2014) and in South Africa (commonly known as Morabaraba; Nkopodi & Mosimege, 2009). The prevalence of these games in other cultural groups raises the question of the origins of these games. Research on the origin of ||Hus (Version 1) notes that it is difficult to trace the origins of the game back to ancient civilizations due to the nature of the board (i.e., holes dug in sand or wood), which are seldom preserved with historical time (de Voogt, 2021). Future research could approach this endeavor ethnographically, by gathering game descriptions, and the exact time period(s) a game was played, from various

areas of the world. Alternatively, large-scale projects that combine archaeological and historical information on games, such as the Digital Ludeme Project (Browne, 2018a), could be a promising avenue to trace the origins of games back into historical time.

During data collection, I asked players to indicate where and from whom they had learn the game. Some of the games could be identified as being introduced by cultural outsides (e.g., German volunteers), but the origin of a majority of the games was unknown. Future researchers could use a snowball sampling technique to trace the origin of the game among living game players.

Another limitation of this chapter is the reliability of the frequency of game play. Upon my arrival to the Hai||om and Ovambo communities, my interest and inquisition of games may have artificially increased the frequency with which individuals actually played games. Although I cannot present evidence to support this idea, it should be taken into consideration in future studies on the frequency of any human behavior. I therefore did not present the frequency with which I observed each game.

Future research should try to minimize these limitations and use a range of methods from various disciplines to investigate rule-based games. As more research is conducted on games across disciplines, we will be able to gain an understanding of the distribution of games, goal structure types, and game rules across cultures. This chapter not only documents the games played by these two cultural groups, but also proposes several avenues for future research on games.

Chapter 6

Cross-cultural variation in the preference of cooperative and competitive games

Games are a special kind of play that is only played by the human species; however, few studies have focused on the role of games in human ontogeny and the influence culture might have on game preferences. This study experimentally investigates the relationship between cultural levels of cooperation with the preference for games in three diverse cultural groups (the Hai||om and Oshiwambo in Namibia, and Germans in Germany). Children between the ages of 7 and 14 (n = 438) and caretakers (n = 56), engaged in a cooperative and a competitive game. Game preferences were measured during play (i.e., visible enjoyment) and in participants' choice of the game they wanted to play again. Social stratification, and frequency and levels of conflict were used as a proxy for levels of cooperation at the cultural level. Caretakers were also interviewed on their attitudes towards children's play and games. I found cross-cultural variation in the game preferences of children, but not adults. Game preferences did not vary systematically with the reported levels of conflict or social stratification. The findings do not provide reliable support for the hypotheses about the relationship between the preference for games and cultural levels of cooperation, but open interesting questions for future research. Interviews with caretakers show an interesting pattern that corresponds with cultural levels of action autonomy. Results are discussed in terms of potential driving factors of the cultural variation in game preferences and directions for future research are proposed.

6.1 Introduction

Play is an important activity for many aspects of human life. Despite the high energetic costs and seemingly few immediate benefits of play (Pellegrini et al., 2007), children spend a large portion of their daily lives engaging in play (Lew-Levy, Boyette, et al., 2019). During play, children learn and practice physical, social, emotional, and cognitive skills (Krenz, 2001; P. Gray, 2014) that they need to be competent adults (Bock & Johnson, 2004). For instance, babies learn about their physical environments by playfully interacting with surrounding objects. As toddlers, children begin to actively engage and play with similar-aged peers. And around the age of six, children begin to regularly engage in rule-based games (Mogel, 2008). Games are a type of play that is specific to humans (Rakoczy, 2007); however, little is known about the role of games in human ontogeny.

On the one hand, as with other types of play such as rough-and-tumble, games are governed by implicit rules while allowing individuals to explore social and physical boundaries. Children as young as three years of age understand the normativity of rules (Rakoczy et al., 2008) and can selectively enforce them around age five (Hardecker et al., 2017). On the other hand, only games are goal-oriented actions with explicit, pre-defined rules that can be taught to new players. As such, rule-based games have a stronger normative aspect to them than other forms of play.

Games are also one of the only types of play that both children and adults spontaneously engage in. Although the function of adult play is still debated (P. Gray, 2014), games are an important aspect of human social life. While developmental studies on other types of play are plentiful (e.g., Pellegrini et al., 2007; P. K. Smith, 2005), developmental studies focusing on rule-based games are limited. As such, little is known about the function of games in human development. It might be that games reflect and reinforce the human predisposition for social rules and norms.

Previous research on games shows that they are not distributed randomly (Chick, 2015), nor equally across the world's cultures. Historical records show that some cultures in the Pacific have over 40 recorded competitive games and an array of other cooperative and solitary games, while other cultures have only a single cooperative game on record (S. M. Leisterer-Peoples, Hardecker, et al., 2021). Also, the frequency of game types (i.e., physical skill, strategy, chance; J. M. Roberts et al., 1959) varies with attributes of cultures, such as political stratification (J. M. Roberts et al., 1959), child-rearing practices (J. M. Roberts & Sutton-Smith, 1962), and religious beliefs (J. M. Roberts et al., 1959). Games have also been shown to be sensitive to cultural change (Chepyator-Thomson, 1990)—new games belonging to one culture are often adopted or

introduced to another culture. These new games can either "overwrite" the traditional games, thus eliminating the old ways of playing, or can be merged with similar traditional games, thus creating a fusion of the old and the new games (Chepyator-Thomson, 1990). The process by which games are adopted or fused, and why only some games are adopted, remains unknown.

On a cultural level, previous studies examining the relationship between rule-based games and aspects of cultures suggest that the cooperativeness of games varies with a culture's social structure (Eifermann, 1970; Ager, 1976). Previous studies suggest that in egalitarian societies, more cooperative games are played than in hierarchical societies (Eifermann, 1970), and in hierarchical societies, more competitive games are played (Boyette, 2016a). A study comparing the play behavior of Aka hunter-gatherers and the Ngandu farming community of the Central African Republic showed that the Ngandu played more competitive games than the Aka (Boyette, 2016a). The authors attribute this finding to the hierarchical social structure of the Ngandu community.

Further studies measuring game preferences and cultural norms show mixed results. In one study investigating the game preferences of seven to nine-year-old children in the UK and Jordan, there were no cross-cultural differences in the enjoyment of tablet-based video games (Sim et al., 2012). A separate study on games in a school context showed that seven and nine-year-old children in the USA preferred competitive over non-competitive games (J. C. Roberts, 2016). Similarly, in a separate study with four-year-old German children, participants either had to compete or cooperate in an experimental "game" to receive a reward (Grueneisen et al., 2017). German children performed better (i.e., received more rewards) in the competitive condition compared to the cooperative condition. When looking at games in hunter-gatherer populations, previous observational research suggests that some groups put little emphasis on competition (Bonta, 1997) and winning (Ager, 1976), but no studies to date have investigated game preferences in hunter-gatherer contexts.

Taken together, previous cross-cultural research on games indicates that games vary with cultural attributes and that preferences for games may differ with cultural attributes. However, previous studies reporting this relationship have yet to combine developmental, cross-cultural, and experimental perspectives. It might be that preferences for cooperative and competitive games are related to cultural levels of cooperation and competition. Games might be transmitting these norms while providing a safe space for players to practice these norms without repercussions. However, there is a lack of experimental evidence that directly tests the relationship between the preference for cooperative and competitive games, and cultural levels of cooperation

across cultures.

Children learn how to and when to be cooperative or competitive through vertical and oblique transmission. In the global North, children engage in frequent dyadic interactions with their parents from an early age (Tamis-LeMonda & Song, 2013; Keller & Greenfield, 2000). However, such explicit forms of adult-child teaching are rare outside of the global North (Lancy, 2010; Boyette & Hewlett, 2017, 2018). From five years of age on, children from non-Western societies spend a majority of their time with peers, and as autonomy increases around age seven, children spend less time around primary caretakers (Broesch et al., 2021). In some societies, children learn subsistence skills from multi-aged peers through play (Lew-Levy, Kissler, et al., 2020; Lew-Levy, Boyette, et al., 2019; Lew-Levy, Crittenden, et al., 2019). It is around this same age (i.e., 6-8 years) that children in both Western and non-Western societies begin to play rule-based games with peers (Mogel, 2008). Games can incorporate both cooperative and competitive elements and allow children to probe both domains within a normatively-structured setting.

The current study investigates whether preferences for cooperative and competitive games relate to cultural levels of cooperation and competition in three diverse cultural groups. I want to know whether children and adults prefer (i.e., choose and enjoy) games that coincide with their cultural norms of cooperation. I use two observable measures of cultural levels of cooperation and competition: the social stratification of groups and the frequency, intensity, and type of conflict present within and between groups. As mentioned earlier, previous studies suggest that the cooperativeness of games varies with the social structure of cultural groups (Eifermann, 1970; Ager, 1976; Boyette, 2016a)—cooperative games are more frequent in egalitarian societies, while hierarchical societies tend to play competitively. However, a recent study found no support for this relationship in Austronesian ethnolinguistic groups (S. M. Leisterer-Peoples, Ross, et al., 2021). While the generalizability and underlying mechanisms of this relationship remain unclear, I aim to test this observed relationship empirically, and in modern-day cultural groups.

Cultural groups vary in their frequency and mode of conflict (Zefferman & Mathew, 2015) and games vary with these modes of conflict (S. M. Leisterer-Peoples, Ross, et al., 2021). As has been found in previous research, the cooperativeness of games correlates positively with modes of conflict in Austronesian ethnolinguistic groups (S. M. Leisterer-Peoples, Ross, et al., 2021). When there's a perceived threat to one's group (e.g., conflict or war with another group(s)), cooperation with one's in-group is detrimental and more cooperative games are played. However, when the perceived threat is within one's group (e.g. conflict between members of a community), competition with one's in-group may be the more adaptive behavior and more competitive

games are played. The effect driving this finding remains unclear—it may be that cooperation elicits a sense of responsibility (Tomasello, 2020), cooperative activities could be more socially rewarding, or group-level selection for the adaptive behaviors may be at play (Richerson et al., 2016). I conducted interviews to evaluate cultural levels of inter-group and intra-group conflict to investigate the relationship between games and conflict in modern-day cultural groups, and I present a summary of this data in the Participants section. Due to a lack of variation in the measures of conflict across the three cultures of interest, the relationship between game preferences and levels of conflict will not be analyzed or discussed in the study discussion.

In a previous study investigating children's game preferences, children were asked to rank a list of 20 games (Dickinson et al., 1983). This method can work well if the participants are familiar with all of the games, play them in a similar fashion, and are familiar with such ranking methods. However, such scaling and ranking methods provide challenges in cross-cultural research (Hruschka et al., 2018). An alternative method to investigate preference is to measure the 'wanting' and 'liking' (Berridge, 1996; Berridge et al., 2009; Chevallier et al., 2012) of games. In terms of rewards, 'wanting' refers to the incentive motivation of a reward, while 'liking' refers to the hedonic pleasure of a reward. Wanting and liking have different neural origins (Berridge, 1996; Berridge et al., 2009) and therefore arguably measure different aspects of preferences. Importantly, as in Stengelin et al. (2020a), the measures of 'wanting' and 'liking' do not fully converge, indicating the importance of measuring the two separately. In terms of games, 'wanting' could be measured by selecting a particular game to play with a partner (i.e., choosing), while 'liking' could be measured in the amount of visible enjoyment or smiling during the game. In previous studies, with increasing age, children smiled more during cooperative interactions than parallel interactions with their peers (Bainum et al., 1984; Stengelin et al., 2020a). Across cultures, children also differ in their 'wanting' behavior for collaborative vs. parallel actions (Stengelin et al., 2020a).

The predictions for the quasi-experiment are two-fold. If the social stratification of a cultural group influences game preferences, I predict that individuals in egalitarian societies should prefer the cooperative game more than individuals in hierarchical societies (who should prefer the competitive game; **P1**). Furthermore, if the presence of conflict and warfare influence game preference across cultures, I would expect individuals in cultural groups with high levels of intercultural conflict to prefer cooperative games more than individuals in societies with high levels of intra-group conflict (who should prefer the competitive game; **P2a** and **P2b**).

Thus, the predictions are as follows:

P1 If social stratification is related to game preference, then participants from hierarchical cultures should prefer the competitive game, whereas participants from cultures with an egalitarian social structure should prefer the cooperative game.

P2a If conflict and warfare are related to game preference across cultures, then participants from cultures with higher levels of intra-group conflict should prefer the competitive game.

P2b If conflict and warfare are related to game preference across cultures, then participants from communities with higher levels of inter-cultural conflict should prefer the cooperative game.

This study also investigates whether game preferences develop with age to be more similar to the preference of adults of the same culture. When given a choice of how to set-up a tea party table, children conform to social norms over their own preferences (Li et al., 2021). Around middle childhood, children's normativity reflects the norms of adults in their group (House et al., 2013; House, 2018). Therefore, it is possible that as children reach adulthood, their game preferences reflect those of the adults in their cultural group. I examine this relationship in 7-14-year-olds and adults.

Additionally, this study explores caretakers attitudes toward children's play and games. Little is known about the attitudes of adults toward children's play and games. Do adults in different cultures play with their children? Do caretakers think their children prefer to play cooperatively or competitively? I conducted an interview investigating the frequency of caretaker-child play, the games that caretakers think their children *would* play, and the games that caretakers *want* their children to play.

6.2 Participants

The following sections describe the cultural groups in the studies. I use ethnographic and other information to describe the cultural groups. In addition to the ethnographic information, I conducted semi-structured interviews on the magnitude of social stratification, inter-personal conflict, inter-group conflict, and inter-cultural conflict in the Hai||om and German communities. Interviews with the Ovambo could not be conducted due to the outbreak of the COVID-19 pandemic. Additional information on the semi-structured interviews is provided in Appendix C.

Hai||om in Namibia

The Hai||om are former hunter-gatherers with an egalitarian social structure (Widlok, 1999). Hunter-gatherer children are raised to be highly autonomous (Widlok, 1999; Hewlett & Roulette, 2016) and spend a majority of their free time playing in mixed-age groups (Widlok, 1999; Hewlett & Roulette, 2016). The Hai||om were tested in two different locations in northern Namibia. The residents of each location are familiar with each other and also travel between the two locations (Stengelin, 2019). According to interviews, the Hai||om report lacking differences in wealth and status (n = 8 of 11, 73%), and do not inherit wealth or status (n = 7 of 10, 70 %). Conflict with other cultural groups reportedly never occurs (n = 9, 69%) and conflict with members of their own community is reportedly common (n = 9, 60 %).

Approximately 300 permanent residents live at Hai||om location one, an operating cattle farm where some of the local Hai||om residents are also employed (Stengelin, 2019). The Hai||om at this location gather wild berries, roots, insects, and various nuts in the surrounding area and report buying maize meal and other supplies from the nearest store (approx. 40 km away). Some Hai||om report hunting small game (e.g. birds, lizards). Additionally, some households have small gardens, but they vary in their production of sustenance. The Hai||om at location one have access to communal water taps and occasionally have access to electricity. Residents travel to and from nearby towns on foot or by opportunistic hitchhiking. Children can attend a local school up to grade 5, although teacher reports of student attendance are low (Stengelin, 2019).

As part of a governmental resettlement project (Hitchcock, 2016), some Hai||om were relocated to a farm, approximately 45 km away from the nearest town. There are approximately 500 to 1,200 permanent residents at Hai||om location two (Stengelin, 2019). Hai||om at location two gather some of their sustenance, but also report a lack of wild berries and nuts in the surrounding area. Small, individual gardens and store-bought maize meal are the main sources of food. In addition to small, individual gardens at the farm, a larger field does provide some sustenance; however, at the time of the study, the field did not provide any form of sustenance due to a lack of seeds. At the time the study was conducted, there were two locally elected hunters who were given permission to hunt by the Namibian government. I estimate that roughly half of the houses at location two have electricity and a majority of houses have their own water tap, as well as access to communal water taps. Hai||om at location two frequently travel to and from the farm on foot or via opportunistic hitchhiking, and some residents report owning their own vehicle. Children can attend a local school up to grade 7, although student attendance, as reported by

teachers, is low (Stengelin, 2019).

Ovambo in Namibia

The Ovambo in the sample are an agro-pastoralist population that live in a similar physical environment as the Hai||om, but have a hierarchical and embedded, or interdependent, social structure (Vedder, 2016). Ovambo in the town report mostly buying their food from a nearby grocery store and typically have access to produce grown by family members living in other villages. Ovambo in this town typically live with or near their immediate family members (direct kin, siblings, parents) and sometimes distant family members (grandparents, cousins, sibling's children). Typical daily activities of the Ovambo in this town include working roughly 6-10 hours in various environments (e.g. field work, sales, government) and sustenance acquisition. The majority of households in this town are equipped with running water and electricity. Modes of transportation include walking short distances and opportunistic carpooling for long-distance travel. Ovambo children can attend a local school up to grade 12 and teachers report near to daily student attendance (Stengelin, 2019).

I consider the Ovambo community to have a stratified social structure (Brown, 2013; Malan, 1995). I estimate the levels of conflict in the Ovambo community to be common with members of their own community and rare with other cultural groups.

Germans in Leipzig, Germany

The German population was included as a proxy for societies in the global North, given that the majority of developmental studies (Nielsen & Haun, 2016; Nielsen et al., 2017) are conducted in WEIRD cultures (Henrich et al., 2010). The Germans in the sample live in an urban city in the Eastern part of Germany (city population: approx. 600,000). Germans mostly buy their food from nearby grocery stores and occasionally have access to small gardens or balconies that can be used to produce edible plants (e.g. pumpkins, apples, melons, cabbage, tomatoes). Germans typically live in small families with two adults (traditionally one male and one female) and zero to three children. Typical daily activities of the Germans in the city include working roughly 6-10 hours in various working environments (e.g. desk jobs, sales, schools), sustenance acquisition, and childcare. All houses in the city are equipped with electricity and running water. Modes of transportation include walking short distances, riding personally owned bicycles or cars, car sharing, and public transportation (bus, train, metro, street car). German children can attend

local schools up to grade 12 and daily student attendance is required by law.

According to interviews, the Germans in Leipzig are a socially hierarchical society. Respondents report differences in wealth (n = 29 of 30 respondents, 96%) and status (n = 30 respondents, 100%), and report that wealth and status are inherited (n = 24 of 30 respondents, 80%). Conflict with other cultural groups reportedly occurs occasionally (n = 34 of 51 instances, 68%) and conflict with members of their own community is reportedly frequent (n = 46 of 92 instances, 50%).

6.3 Methods

6.3.1 Quasi-experimental game KoKo

KoKo Participants

A total of 438 children between the ages of seven and 14 (219 dyads, M_{age} = 10.4, SD_{age} = 2.2) and 56 adults (28 dyads, M_{age} = 37.6, SD_{age} = 10.2) participated in the experiment. Child participants were from three different populations: Germans from a mid-sized German city (n = 140 children, 74 females, M_{age} = 10.4, SD_{age} = 2.3), Hai||om from two rural villages in Namibia (Hai||om: n = 166, 88 females, M_{age} = 10.3, SD_{age} = 2.2), and Ovambo participants from a small town in Northern Namibia (n = 132, 68 females, M_{age} = 10.4, SD_{age} = 2.2).

The forced-choice data from 13 child participants were excluded due to external disruptions (Hai||om: two 10-year-old females, Oshiwambo: two 12-year-old males, German: two 7-year-old females), experimental error (Hai||om: one 12-year-old boy, German: one 13-year-old female and one 14-year-old female), and misunderstanding how to play the game (Hai||om: two 8-year-old females, Ovambo: two 10-year-old females). In addition to these 13 individuals, the smiling data from five additional participants were excluded due to missing video recordings (Hai||om: one 14-year-old male and one 14-year-old female, German: three 9-year-old females).

Adult participants were from the same three populations: Germans from a mid-sized German city (n = 16 adults, 8 females, M_{age} = 43.8, SD_{age} = 2.3), Hai||om from two rural villages in Namibia (Hai||om: n = 24, 12 females, M_{age} = 43.4, SD_{age} = 2.2), and Ovambo participants from a small town in Northern Namibia (n = 16, 8 females, M_{age} = 36.3, SD_{age} = 2.3). All of the adult data were included in the analyses.

This project was approved by the Ethics Committee of the Leipzig University, the Ministry of Home Affairs and Migration of the Republic of Namibia, the Regional Council of Oshikoto Region

in Namibia, and the Working Group of Indigenous Minorities in Southern Africa (WIMSA). Participation in the study was voluntary. Prior to participation in the study, caretakers gave their informed, verbal or written consent (depending on the literacy of the caretaker). Participants were tested in their respective primary school or pre-school, or at the child lab facilities (German participants only). Participants received candy rewards for their participation. Dyads of same-sex, similar-aged children (max. difference 365 days) were formed based on their availability for participation and were familiar with one another prior to their participation. Adults were paired into same-sex dyads.

KoKo set-up

The participants played a game called 'KoKo' (Toppe et al., 2019) in a cooperative and competitive manner. KoKo is a game that consists of a wooden box with a removable plexiglass lid. Inside the box is a wooden plane with two holes. Strings are attached on the corners of the box so it can be lifted and tilted. Marbles can be put into the box through a hole in the plexiglass lid. The goal is to maneuver the strings such that the plane is tilted and marbles fall into a hole. During the competitive game, each player had the goal of scoring more points than their opponent by maneuvering the marble into their own hole (i.e., either blue or red hole). One player won the competitive game, while the other player lost the game. During the cooperative game (see Figure 6.1), both players had the goal of getting the marble into a shared hole (i.e., the green hole), while avoiding a bigger "other" hole (i.e., the black hole). Both players either won or lost the cooperative game. Each KoKo variant was played with five marbles and points (foam balls) were gathered in clear tubes, visible to the participants throughout the game.

Each dyad was pseudo-randomly assigned to one of two conditions: cooperative game first or competitive game first. The game played first was counterbalanced across sex, age, and location. The outcomes of the games were not manipulated by the experimenter.

To increase the familiarity with the situation and experimenters, local experimenters conducted the study. The two Namibian experimenters were familiar to the participants prior to the experiment and spoke the respective language fluently (Khoekhoe or Oshindonga). In Germany, the experimenter was not familiar to the participants prior to the experiment, but was a native German speaker.

Figure 6.1: Two participants playing the cooperative KoKo game. Both players have green strings and share the goal of getting the green marble into the green hole. If the marble goes into their hole, they get a point (i.e., a green ball is placed into the transparent tube; filled with three balls in the picture). If the marble goes into the black hole, players do not get a point. Players need three or more points to win the cooperative game.

KoKo procedure

The experimenter explained the first game to the participants and asked questions to ensure that both participants understood how to play the game (see Appendix E for a detailed procedure). The experimenter then prompted the participants to hold their strings and dropped a marble into the game. The players moved the strings to tilt the playing field until the marble dropped into one of the two holes. If the marble dropped into a blue, red, or green hole, a same-colored ball was placed into the respective tube. If the marble dropped into the black hole (i.e., during the cooperative game), no ball was placed into a tube. After the dyad played the first game five times (i.e., with five marbles), the experimenter declared the winner(s) and/or loser(s) of the game. The same procedure was repeated for the second game. The participants won and lost the cooperative game together; whereas, during the competitive game, one player won while the other player lost.

After playing both games, one participant was asked to wait outside. The remaining participant was then asked which game they wanted to play again and were asked to give a reason why. The same procedure was repeated for the second participant. Both participants then returned to the room, played the games one final time, and were given their candy reward.

Choice coding

The participants' choice of game was coded by SMLP and the respective local experimenter (DT, NW, EM) via video recordings post experiment.

Smiling coding and reliability

Two coders coded children's smiling (yes/no) for each 5 seconds of a trial (i.e., an interval). A smile was defined as the corners of the mouth being drawn up, with or without teeth showing, and with or without a narrowing of the eyes (Sarra & Otta, 2001; Williams et al., 2001). Five-second clips in which the face of the child was not visible (e.g., a hand was blocking the face) were excluded from analyses. Reliability coding of smiles was calculated in R (R Core Team, 2020) using the IRR package (Gamer et al., 2019). Reliability coding of smiles was moderate $\kappa = .645$ (see Appendix E for more details).

Statistical analysis

All analyses were conducted in R (R Core Team, 2020) using the brms package Bürkner (2017, 2018), following a Bayesian approach. The data processing and analysis code is available at https://github.com/sarahpeoples/KoKoPo. I conducted four separate, main analyses: children's choice for games across cultures, children's hedonic preferences for games across cultures (i.e., smiling behavior), adult choices for games across cultures, adult hedonic preferences for games across cultures. I also analyzed whether smiling behavior predicted choosing behavior for children and adults. Predictors were contrast coded (i.e., -0.5, 0.5) or index coded (i.e., 1,2,3) whenever possible. Age was calculated in days and z-scored for statistical computation. For more details on the raw data and analyses, see Appendix E.

Logistic regressions with a bernoulli outcome distribution were conducted for the choice data. Main analyses included the following fixed effect predictors for choice behavior: sex, age, child choice order, order of the games played, the game on the left while choosing, and the outcome of the games. Varying intercepts for dyads, and group level age slopes varying by culture were included in the main model.

Logistic regressions with a binomial outcome distribution were conducted for the smiling data. Trial length varied for each game and for each dyad; thus, the binomial outcome distribution was used to account for both the number of intervals (i.e., 5 seconds) with smiles and the total number of intervals for each game. Main analyses included the following fixed effect predictors for smiling: sex, age, game, order of the games played, trial number, and trial outcome. Varying intercepts for dyad and ID, group level age slopes varying by culture, and group level slopes for each game varying by culture, were included in the main model.

The models predicting participants choice with smiling behavior were identical to the choos-

ing model, with the addition of a fixed effect of binary smiling behavior (i.e., whether they smiled more during the cooperative as compared to the competitive game).

Model comparisons were conducted using the widely applicable information criterion (WAIC). Models with a lower WAIC score have greater predictive power (i.e., "weight") in comparison to models with a higher WAIC score. In the main text, I report the raw values (i.e., *M*, *SD*) and predicted probability parameters from the statistical models (i.e., predicted mean: M_{mod}, difference in predicted means: ΔM_{mod}, 90% credible interval in square brackets), and report the model comparisons in Appendix E.

6.3.2 Caretaker interview on games

To learn more about adult beliefs and attitudes toward children's play, following the KoKoPo game, adults were asked a series of questions post-experiment (Hai||om: N = 24, Ovambo: N = 16, German: N = 16; see KoKo Participants for more details on the participants). The questions investigated the frequency of caretaker-child play, the games that caretakers think their children would like to play, and the games that caretakers want their children to play. The full interview sheet can be found in Figure E.11. The interview consisted of eight questions and was conducted by the local experimenters (DT, NW, EM).

6.4 Results

6.4.1 KoKo

Children

Forced-choice Children's choice of game differed across cultures (see Table E.13 for the model comparison). German children had a tendency to choose the cooperative game (M = .73, SD = .45; M_{mod} = .64 [.41, .85]), Hai||om children had a tendency to choose the competitive game (M = .37, SD = .49; M_{mod} = .44 [.22, .69]), and Ovambo children had no clear game preference (M = .58, SD = .5; M_{mod} = .54 [.32, .77]). Contrasts showed that German and Hai||om children's game preferences differed (M_{mod} = .2 [.006, .39]), but neither German and Ovambo (M_{mod} = .1 [-.03, .25]), nor Ovambo and Hai||om children's game preferences differed (M_{mod} = -.1 [-.26, .04]).

Children's choice of game varied slightly with age across cultures (see Figure E.4 for the raw mean proportions, Figure 6.2 for posterior predictions, and Table E.15 for the model comparisons). Around eleven years of age, Hai||om children's game choices shifted from reliably

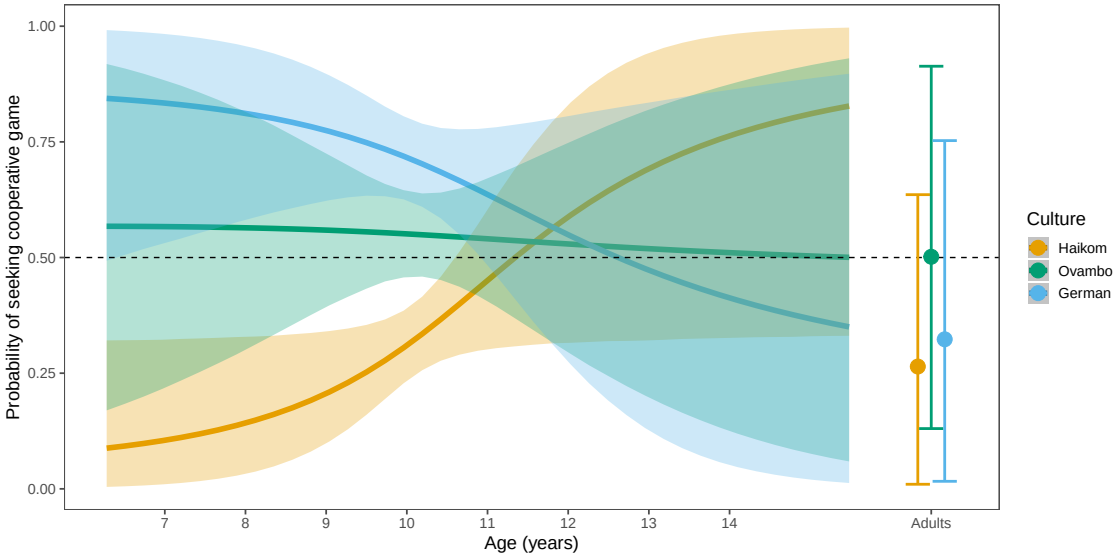
choosing the competitive game to having a tendency toward choosing the cooperative game around age thirteen. Around age twelve, German children's game choices shifted from reliably choosing the cooperative game to having a tendency toward picking the competitive game. The Ovambo children showed no clear preference for choosing the cooperative nor competitive game irrespective of their age.

Children's choices also depended on whether they won or lost the games (see Table E.17 for model comparison). Children who lost the competitive game, but won the cooperative game were more likely to pick the cooperative game (M_{mod} = .7 [.52, .85]). Children's seeking behavior did not vary with the other possible game outcome combinations (lost both games: M_{mod} = .49 [.25, .73]; won both games: M_{mod} = .51 [.31, .7]; won competitive, lost cooperative: M_{mod} = .46 [.23, .7]).

Moreover, children's choices depended on the game they played first (Table E.18 for model comparison). Children who played the cooperative game first were more likely to choose the cooperative game (probability of choosing cooperative game >0.5 with posterior probability 0.85), while children who played the competitive game first were more likely to choose the competitive game (probability of choosing competitive game >0.5 with posterior probability 0.71).

Children's choices did not depend on age (Table E.14), dyad (Table E.16), sex (Table E.19), the order in which children within a dyad picked a game (Table E.20), nor the game that was on the left while choosing (Table E.21).

Figure 6.2: The model posterior probability and 90% credible intervals of children and adults choice behavior for the cooperative game (1) and the competitive game (0).



Smiling Children's smiling during the games varied for each game across cultures (see Table E.24 for model comparison), such that the Hai||om and German children smiled more during the competitive game (respectively: $\Delta M_{coop\text{-}comp}$= -.08, [-.11, -.05]; $\Delta M_{coop\text{-}comp}$= -.39 [-.43, -.34]), while Ovambo children smiled more during the cooperative game ($\Delta M_{coop\text{-}comp}$= .09 [.06, .13]; see Figure 6.3). Children's smiling also differed with age across cultures (see Figure E.6 and Table E.26 for model comparison), such that smiling increased as children got older. Children also smiled less as the game progressed ($\Delta M_{trial5\ -\ trial1}$= -.26, [-.45, -.13]; see Table E.28 for model comparison), and depending on the outcome of the trial (won: M_{mod}= .4, [.22, .64]; lost: M_{mod}= .48, [.29, .71]; see Table E.27 for model comparison).

While the majority of trials were shorter than 20 seconds long (93%, *M* = 16.08, *SD* = 20.35, *range* = 1 - 251), a minority of trials ran for substantially longer (4% trials lasting 120 seconds or longer; *N* = 21 trials). The cooperative game was shorter on average than the competitive game (cooperative: *Median* = 7, *M* = 11.3, *SD* = 13.2, *range* = 1 - 124; competitive: *Median* = 12, *M* = 21.1, *SD* = 24.9, *range* = 1 - 251; see Appendix E for more information). Given this positive skew in the length of game trials, the model fit is most strongly informed by these long trials. The effects of the trial outcome should be interpreted cautiously, given this positive skew in trial length (see Appendix E for more information).

Children's smiling during the games did not differ with the game that was played first (see Table E.29 for model comparison), with the sex of the children (see Table E.30 for model comparison), nor with age alone (see Table E.25 for model comparison).

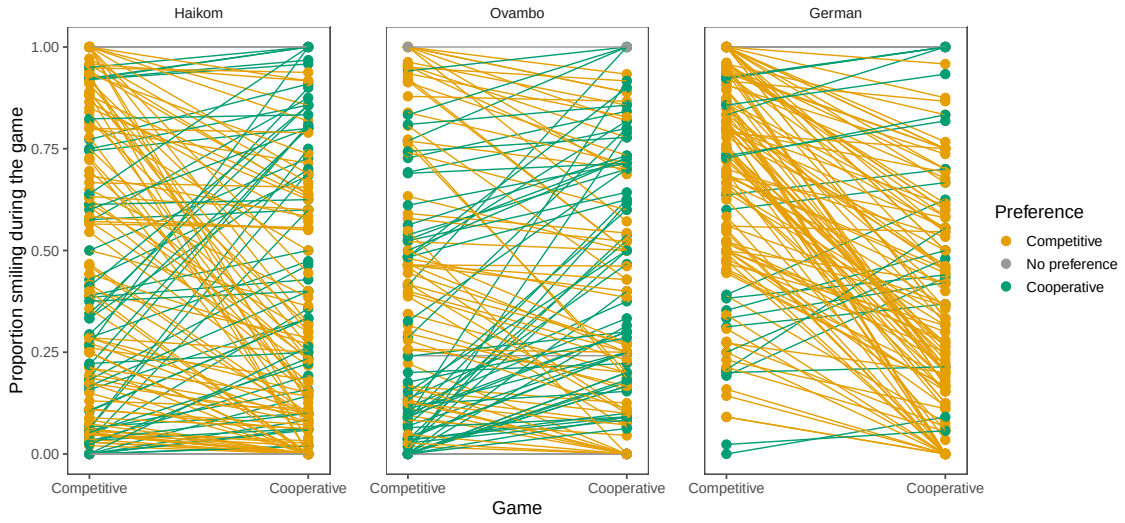
Choosing & smiling There was no effect of children's smiling during the games (i.e., smiling more during the cooperative or competitive game) on children's choices (see Table E.31 for model comparison).

Adults

Forced-choice There were no differences in adults' game choices across cultures (see Figure E.4; see Table E.32 for model comparison). Adults showed no clear preference for games in all the three cultural groups (Hai||om: *M* = .42, *SD* = .5; Ovambo: *M* = .63, *SD* = .5; German: *M* = .38, *SD* = .5).

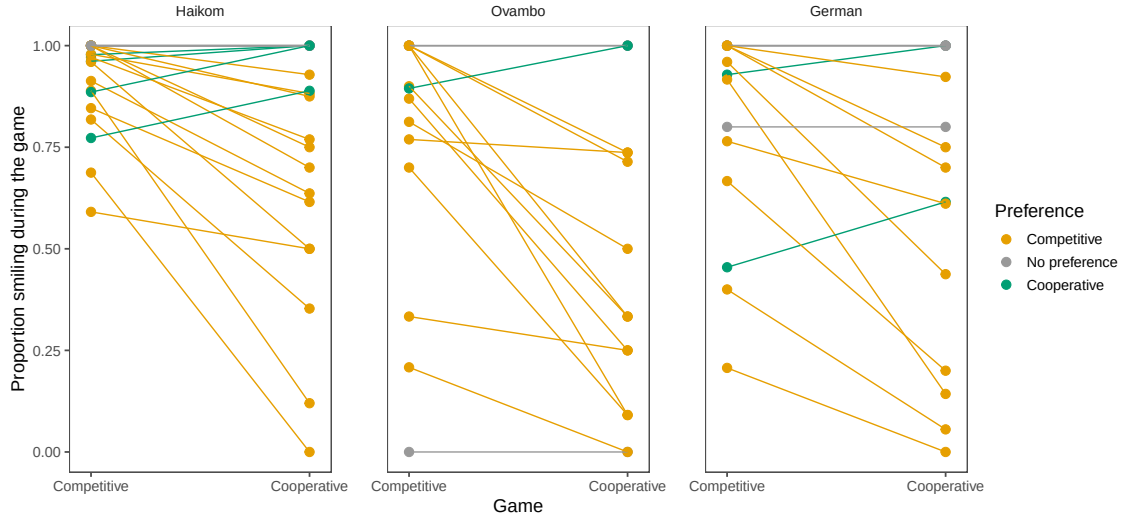
Adult game choices did not differ with age (see Table E.33 for model comparison), nor with age across cultures (see Table E.34 for model comparison). There were also no effects of game outcomes (see Table E.35 for model comparison), the order in which participants picked a game

Figure 6.3: Children's raw smiling behavior in the three cultural groups. Each line and dot combination corresponds to a child in the sample. Green dots and lines correspond to a child smiling more during the cooperative than competitive game, an orange dot and line corresponds to a child smiling more during the competitive than the cooperative game, and a gray dot corresponds to no differences in child smiling between the cooperative and competitive games.



within a dyad (see Table E.36 for model comparison), the game played first (see Table E.37 for model comparison), the sex of players (see Table E.38 for model comparison), nor the game that was on the left while choosing (see Table E.39 for model comparison).

Figure 6.4: Adults' raw smiling behavior in the three cultural groups. Each line and dot combination corresponds to a adult in the sample. Green dots and lines correspond to an adult smiling more during the cooperative than competitive game, an orange dot and line corresponds to an adult smiling more during the competitive than the cooperative game, and a gray dot corresponds to no differences in adult smiling between the cooperative and competitive games.



Smiling Adults generally smiled for 75% or more of the time they played the games. Adult smiling behavior didn't vary substantially among cultures (see Table E.40 for model comparison), but adult smiling behavior did depend on the game being played. On average, adults smiled more during the competitive game (M = .85, SD = .32) than during the cooperative game (M = .65, SD = .45; see Table E.41 and Table E.42 for model comparisons, Table E.4 for raw mean proportions for each culture, and Figure 6.4). Adult smiling also differed with the outcome of trials (see Table E.45 for model comparison). Adults smiled less when they won a trial and more when they lost a trial (won: M_{mod}= .79 [.36, .98]; lost: M_{mod}= .8 [.38, .99]).

Adults' smiling behavior did not differ with sex (see Table E.43 for model comparison), the game played first (see Table E.44 for model comparison), nor with trial (see Table E.46 for model comparison).

Choosing & smiling There was no effect of adult's smiling during the games (i.e., smiling more during the cooperative or competitive game) on adult choices (see Table E.47 for model comparison).

6.4.2 Caretaker interview

Of the caretakers asked, 100% of German caretakers and 88% of Ovambo caretakers report playing with their children, while 50% of Hai||om caretakers report playing with their children (see Table E.1 and Appendix E). When asked which game *caretakers want* their children to play, a majority of Hai||om caretakers answered "competitive" (71%), while a majority of Ovambo caretakers answered "cooperative"(56%), and the German caretakers had no clear preference (37.5% competitive, 43.8% cooperative, 18.8% either game). When asked which game caretakers think *their child(ren) would like* to play, a majority of caretakers in all three cultures answered "competitive" (67% Hai||om, 62.5% Ovambo, 75% German).

6.5 Discussion

The current study investigated cross-cultural variation in game preferences of 7-14-year-old children and adults in three diverse cultural groups. Children and adults played a cooperative and a competitive game and then chose which game they wanted to play again. I also measured and compared players' smiling behavior during game play, as a proxy for which game they enjoyed more. The study provides novel evidence from a controlled quasi-experimental setting showing

Table 6.1: An overview of the results of the quasi-experiment in relation to the hypotheses (i.e., P1, P2a, P2b). ✓ indicates support for the hypothesis and "o" indicates no support. The game that children and adults chose and smiled more during are listed in the respective rows. Hai||om social stratification was reportedly low, intra-group conflict was common, and inter-cultural conflict never occurred. Ovambo social stratification was estimated to be high, intra-group conflict was common, and inter-cultural conflict was rare. German social stratification was reportedly high, intra-group conflict was frequent, and inter-cultural conflict was occasional. See the main text for the hypotheses.

	Hai||om		**Ovambo**		**German**	
	Choice	**Smiling**	**Choice**	**Smiling**	**Choice**	**Smiling**
Children	comp.	comp.	no pref.	coop.	coop.	comp.
Social stratification (P1)	o	o	o	o	o	✓
Intra-group conflict (P2a)	✓	✓	o	o	o	✓
Inter-cultural conflict (P2b)	✓	✓	o	o	o	✓
Adults	no pref.	comp.	no pref.	comp.	no pref.	comp.
Social stratification (P1)	o	o	o	✓	o	✓
Intra-group conflict (P2a)	o	✓	o	✓	o	✓
Inter-cultural conflict (P2b)	o	✓	o	✓	o	✓

that children in three different cultures vary in their preferences for competitive and cooperative games. I detected differences in the types of game children chose to play again and how much they enjoyed the games. Interestingly, these differences in children did not align with the preferences of the adults. Adults smiled more during the competitive game in all three cultural groups, but picked both games equally often. The findings do not support the hypotheses regarding a relationship between game preferences and cultural levels of cooperation (see Table 6.1).

Game preferences and cultural levels of cooperation

The primary goal of this study was to investigate the relationship between game preferences and cultural measures of cooperation. Based on previous findings, I predicted (**P1**) that if social stratification is related to game preference, then participants from hierarchical cultures should

prefer the competitive game and participants from egalitarian cultures should prefer the cooperative game. I also predicted that if conflict and warfare are related to game preference, then participants from communities with high levels of inter-cultural conflict should prefer the cooperative game (**P2b**), while individuals from communities with high levels of intra-group conflict should prefer the competitive game (**P2a**). Game preferences, as measured by game choice and smiling during the games, varied across the three cultures for children, but not for adults. The three cultures varied only slightly in their levels of social stratification, and intra-group and inter-cultural conflict. In the following sections, I will state the findings from the quasi-experiment and the corresponding levels of cooperation for each culture, relate them to the hypotheses, and then summarize the findings in terms of whether they indicate a broader relationship between game preferences and each of the cultural measures of cooperation.

Social stratification

The current study provides very weak evidence for a relationship between social stratification and game preference. The Hai||om are an egalitarian cultural group, for which **P1** would predict a preference for cooperative games; however, our data showed the opposite pattern—Hai||om children preferred the competitive game over the cooperative game. Thus lending no support to **P1**. Evidence from the Ovambo and German children was mixed. Both cultural groups are considered to have social stratification, for which **P1** would predict a preference for competitive games. The two cultural groups showed mixed and nearly opposite patterns in their game preference. Ovambo children smiled more during the cooperative game, but chose both games equally often. The German children showed the opposite pattern in their smiling behavior—they smiled more during the competitive game—and they chose the cooperative game more often over the competitive game. Thus, there is no identifiable pattern in children's game preference behavior in these two socially stratified groups. In sum, the current study provides no evidence for the predicted relationship between social stratification and children's game preferences for cooperative and competitive games.

Evidence from the adult data differs from that of the children. Adults from all three cultures had no clear preference in their game choice, which does not support **P1**. However, adults from all three cultures smiled more during the competitive game, which aligns with the predictions made in **P1** for two of the three cultures. Namely, Ovambo and German adults live in socially stratified cultures and smiled more during the competitive game, the combination of which would

be predicted by **P1**. However, Hai||om adults live in an egalitarian culture, but also smiled more during the competitive game, which does not support the **P1** prediction. Overall, the evidence from adults and children in the three cultures provides very weak evidence for a relationship between social stratification and game preference.

Previous research on the relationship between social stratification and cooperative and competitive games is mixed. Some previous research supports the notion of a relationship between social stratification and aspects of games (e.g., Eifermann, 1970; Ager, 1976; Bowers, 1990; Boyette, 2016a). For example, Eifermann (1970) suggests that Kibbutz children's games are more cooperative than their Moshav children neighbors, who play more competitively. Eifermann (1970) suggests that this difference in games is related to the cultural values of cooperation and egalitarianism in Israeli kibbutzim. Additional evidence comes from Ager (1976)'s early research with the Inuit children in Alaska, suggesting that children's games lack competitiveness due to the cooperative nature of their group. However, one limitation of these studies is that they examined one or two cultural groups and examined this relationship qualitatively, thus limiting the generalizeability of their findings to a broader range of cultural groups. On the other hand, a study examining this potential relationship in 25 cultures in the Pacific, and using modern-day statistical methods, finds no evidence of a relationship between social stratification and cooperative aspects of games (S. M. Leisterer-Peoples, Ross, et al., 2021). Previous studies investigating this relationship vary in their methodological and statistical approaches. It therefore remains unclear whether the difference in support for this relationship is due to the different methodological approaches, differences in geographical location of the cultural groups in question, or whether there is truly no relationship between these social stratification and games.

Intra-group and inter-cultural conflict

The current study provides mixed support for a relationship between intra-group and inter-cultural conflict, and children's game preferences. The children from the Hai||om community, a cultural group with common intra-group conflict and no inter-cultural conflict, preferred the competitive game. This supports the **P2a** hypothesis, which predicts a preference for competitive games when intra-group conflict is high, and the **P2b** hypothesis, which predicts a preference for competitive games when inter-cultural conflict is low. However, the Ovambo children, whose community is believed to have similar rates of intra-group and inter-cultural conflict as the Hai||om, smiled more during the cooperative game and chose both games equally often, thus

lending no support to **P2a** nor **P2b**. Similarly, children from the German community, where intra-group conflict is reportedly frequent and inter-cultural conflict is occasional, smiled more during the competitive game and chose the cooperative game. The German children's smiling behavior provides support for **P2a**, which predicts a preference for competitive games when intra-group conflict is high, and **P2b**, which predicts a preference for competitive games when inter-cultural conflict is low; however, German children's choice of the cooperative game does not support either hypothesis. Thus, there is conflicting evidence for a relationship between children's game preferences and cultural levels of conflict.

Evidence from the adult data differs from that of the children. Adults from all three cultures had no clear preference in their game choice, which does not support **P2a** nor **P2b**. However, there is support from the adult smiling data in all three cultures for **P2a**, which predicts a preference for competitive games when intra-group conflict is high. There is also support from the adult smiling data in all three cultures for **P2b**, which predicts that cultural groups with low levels of inter-cultural conflict should prefer the competitive game. Overall, evidence for a relationship between intra-group conflict, inter-cultural conflict, and game preference is mixed in both the child and adult data, and is therefore very weak.

Previous evidence for a relationship between the cooperativeness of games and levels of conflict and warfare comes from S. M. Leisterer-Peoples, Ross, et al. (2021). The study found a positive relationship between intra-group conflict and competitive games, and a positive relationship between inter-cultural conflict and cooperative games. Previous research on the historical games of hunter-gatherer groups also suggests that the physical skills needed to be successful in warfare were practiced in games (Scalise Sugiyama et al., 2018, 2021). The evidence from the current study is not as clear of an indicator for these relationships. The results in the current study lend mixed support to the proposed hypotheses, and thus, do not provide support for a broader relationship between game preference and levels of conflict as proposed by the hypotheses. However, there are methodological considerations that may explain this mixed evidence and deem a cautious interpretation.

First, there was a lack of variation in the conflict measures. All three cultural groups were estimated to have high levels of intra-group conflict and low levels of inter-cultural conflict (see section 6.3 for information on the categories). The current study lacks cultural groups with low levels of intra-group conflict and with high levels of inter-cultural conflict, which would be necessary to make general statements about the relationship between game preference and cultural levels of conflict. Reported conflict levels in the German sample varied slightly from the two

Namibian communities, but the variation among the three groups was not substantial enough to investigate the relationship between game preferences and low and high cultural levels of conflict. Future research should measure the frequency and types of conflict in communities through ethnographic materials and through interviews prior to conducting quasi-experimental research. This may require substantial resources and collaboration between research laboratories and the scientific community, which has been a recent focus in some areas of psychology (e.g., Many Primates et al., 2019; Frank et al., 2017).

Second, in the current study, I measured the levels of everyday cooperation using interviews on social stratification, intra-group, and inter-cultural conflict in everyday life. Respondents reported self-perceived differences in status and wealth within their communities, the frequency of intra-group and inter-cultural conflicts, the parties involved in the conflicts, and the intensity of the conflicts. These first-hand self-reports may vary from externally observed levels of social stratification and conflict by ethnographers and when using economic games. In contrast to the current study, previous research often measures cultural levels of cooperation and competition in adults cross-culturally using economic games (i.e., individual decision making tasks, Sutter et al., 2019). In these tasks, subjects are asked to allocate valuable resources between themselves and a partner(s). In some tasks, the recipient(s) can reject or accept the allocation (for an overview see Sutter et al., 2019). For example, in a study with the Hadza (Apicella et al., 2012), a hunter-gatherer group in Tanzania, participants received four honey sticks and were told that they could decide to keep them for themselves or donate some into a common pool; this common pool would then be tripled and divided equally among the participants. Participants donated similarly to members in their in-group, but differed from out-group members. In these tasks, the degree of cooperation is measured by the amount allocated and whether the recipient accepts or rejects an offer. These decision-making tasks measure one aspect of cooperation: individual preferences for resource allocation. Future studies should continue to develop a breadth of reliable methods to measure various aspects of everyday cooperation that expand beyond the already existing economic games that measure cooperation in terms of resource-allocation.

Cultural variation in game preference

As mentioned earlier in the discussion, the study provides evidence that children in three different cultures vary in their preferences for competitive and cooperative games. The postulated explanation for this variation, namely a relationship between game preference and cultural levels

of cooperation, does not thoroughly explain this variation.

The focus of the current study was on the preference for games with cooperative and competitive goal structures (S. M. Leisterer-Peoples, Hardecker, et al., 2021). However, if the norms of a cultural group de-emphasize winning and losing, which has been suggested for some hunter-gatherer groups (e.g., Lewis, 2002; Ager, 1976), then the goal structure of the game (i.e., whether the game is cooperative or competitive) might not be important to the players as other aspects of the game. It might be that the Hai||om children had more fun playing the competitive game, given that the game was more physically activating than the cooperative game, which required less effort. This speculation would be consistent with Hai||om children's choice and smiling behavior during the competitive game. Simultaneously, in other groups such as Germany, the norms surrounding competition might be different, such that one generally *does* openly celebrate one's victory, but without gloating, and one *should* be a "good" loser. Depending on the cultural level norms surrounding winning and losing, various games might be preferred by children or considered "good" for children by parents. Future research should further investigate the cultural norms surrounding winning and losing games, and focus on other aspects of games that might capture the influence of cultural norms on game preferences, such as the psychological interdependence of players (Eifermann, 1970).

Game preference across human development

An additional focus of this study was to investigate the developmental trajectory of children's game preferences and whether they relate to adult game preferences. There are differences among the three cultural groups in children's choices of games from seven years of age until middle childhood. The younger Hai||om children chose the competitive game, Ovambo children chose both games roughly equally, and German children chose the cooperative game. At eleven to twelve years of age, there was a shift in choice behavior in two of the three groups—Hai||om children began to pick the cooperative game more often and German children began to pick the competitive game more often. The differences between the three cultural groups seemed to weaken with age; however, since there are few studies on the game preference of adolescents, I can only speculate as to the motivation behind this shift in behavior. This behavioral shift in game choice coincides with a shift in prosocial behavior around the same age (House, 2018). Cross-cultural studies on children's prosocial behavior suggest that children showed a shift in their prosocial choices around the onset of middle childhood (House et al., 2013, 2019). The authors

argue that as children become integrated members of their communities around middle childhood, they may begin to conform to the cooperative social norms of their communities (House et al., 2013). However, it is unclear from the results of the current study whether this shift in game preferences is a shift toward adult game choices, as there was no variation in adult game preferences.

Adults in all three cultural groups smiled more during the competitive game and chose both games equally often. This raises the question of whether as children get older, their game preferences become more like those of the adults in their communities, whether differences in game preference across cultures disappears as children reach adulthood, or whether the lack of variation in adult game preference is an artifact of the game used to measure game preference. For instance, the game used in the current study did not control for the effort exerted by the participants, the winner and loser of the game, how fun or difficult it may be for children and adults of various ages, nor the amount of time required to play each game (see Appendix E for more information). Future studies investigating this relationship should consider choosing a game that controls for these additional aspects of gameplay.

Measures of game preference

Children chose different games than they visibly enjoyed—the smiling behavior and the choice behavior of child participants did not coincide in two of the three cultural groups. Previous research investigating children's preferences for social interactions shows a similar pattern (Stengelin et al., 2020a). In the study by Stengelin et al. (2020a), children in the same three cultural groups had the choice between a collaborative and an individual task, with the aim of retrieving rewards for themselves. Hai||om children preferred (i.e., showed more positive affect during and chose) the individual option, Ovambo children had no clear preference in their choice, but showed more positive affect during the collaborative task, and German children preferred the collaborative task over the individual task. These findings are similar to the findings using the competitive and cooperative games in the current study, and indicate that smiling and choosing may be indicative of different aspects of preference (Berridge, 1996; Berridge et al., 2009; Chevallier et al., 2012). Forced-choice paradigms (i.e., choosing between two options) have been used in various previous developmental and psychological research (e.g., Toppe et al., 2019; House et al., 2013); therefore, I will focus on the novel smiling measure used in the current study.

Smiling during gameplay might not only be indicator of enjoyment (Chevallier et al., 2012),

but may signal a variety of experienced internal-states. For example, smiling could signify accomplishment (Matsumoto & Willingham, 2006), embarrassment (Kraus & Chen, 2013), or appeasement (Goldenthal et al., 1981). Alternatively, individuals could be employing smiling as a conciliatory gesture to their game partner. Smiling is a social cue (Schneider & Josephs, 1991; Ruiz-Belda et al., 2003) that may increase willingness to cooperate and curtail punishment (Mieth et al., 2016), and have positive effects on the response to stressful situations, such as lowering heart rate (Kraft & Pressman, 2012). In adults, smiling and laughter following a emotionally-stressful event are related to the dissociation of emotional distress from the event (Keltner & Bonanno, 1997). Additionally, expressed emotions also have culture-specific perception (Gendron et al., 2014) and usage (Kärtner et al., 2013; Mui et al., 2017). There are cross-cultural differences in the smiling behavior of adults toward infants (Kärtner et al., 2013), indicating different developmental trajectories of smiling behavior for children across cultures and the norms surrounding these behaviors. Taken together, smiling behavior may be an unreliable indicator of the intended aim of the measure—enjoyment. Future studies are needed to understand the effects of competitive and cooperative games on expressed emotions in cross-cultural settings.

Caretaker interview

The aim of the caretaker interview was to assess caretakers' perspectives on children's play and games in three diverse cultural groups. Cross-culturally, adults differed in whether they reportedly play with their children (German >Ovambo >Hai||om) and the game they wanted their children to play (Hai||om: competitive, Ovambo: cooperative, German: no preference). This interview was exploratory and I postulated no hypotheses. Interestingly, the amount that caretakers reported playing with their children corresponds with the action autonomy of the three cultural groups—namely, in cultural groups where children's action autonomy is high (i.e., Hai||om), caretakers reported playing less with their children, and in cultural groups where children interact frequently with caretakers and have low action autonomy (i.e., Germany), caretakers reported playing frequently with their children (Keller & Kärtner, 2013). Action autonomy, or the capability to fulfill obligations in a self-controlled manner (Keller, 2012), is high in the Hai||om sample, middle in the Ovambo sample, and low in the German sample (Stengelin, 2019). Only the responses from the German caretakers correspond with the psychological autonomy (i.e., no preference for children's games and high psychological autonomy). Psychological autonomy, or the ability to make one's own choices (Keller, 2012; Keller & Kärtner, 2013), is high in the German

and Hai||om sample, and low in the Ovambo sample (Stengelin, 2019).

A majority of caretakers in the three cultural groups *thought* their children would like to play the competitive game. This finding does not follow the same pattern as what parents *want* their children to play, nor the findings of the quasi-experiment. It could be that the adults assumed that their children would prefer the same game as they did, namely the competitive game. As shown in the quasi-experiment, caretakers in all three cultural groups preferred the competitive game over the cooperative game and adults could have been influenced by their own experience playing the games. As the KoKo game was new to the cultural groups, and it was necessary that adults had experience with the games prior to the interview, I decided to have the caretakers play the games before participating in the interview. Future studies should investigate caretaker attitudes toward children's games independent of the caretaker's own experience with the games, or experimentally control for the experience of playing the games by counterbalancing the order of the quasi-experiment and the interview. Alternatively, the question could have been misunderstood by some of the caretakers. It is unclear whether caretakers understood that the question pertains to what *they* think *their children* would *like* to play. Given the limited levels of speech about inner states in hunter-gatherer and subsistence-based farming groups (Keller, 2012), it could be that this question is confusing and less reliable for people from non-Western communities. Additionally, given that only 50% of Hai||om caretakers and 88% of Ovambo caretakers report playing with their children, it is also questionable whether caretakers are aware of the games that their children (like to) play.

A limitation of this interview is the polar question-answer format of the caretaker interview (e.g., "Do you want to play competitively or cooperatively?"). Conversations with polar questions are common among Western cultural groups, but are used less frequently by the Hai||om (Hoymann, 2010). Instead, Hai||om questions are often content questions (e.g., "What is this?" Hoymann, 2010). Future studies should investigate caretaker attitudes toward children's play and games using additional culturally-appropriate methods (e.g., content questions, observational methods).

6.6 Conclusion

Children begin playing rule-based games around six to eight years of age (Mogel, 2008). If games are one avenue for children to learn and practice cultural norms of cooperation, then children's game preferences should reflect these cultural norms as children reach adulthood. The current

study provides evidence that young children's game preferences vary and change throughout development; however, the current study did not find conclusive evidence to support the hypotheses that children's game preferences relate to cultural levels of cooperation. However, as discussed, methodological shortcomings may explain the mixed results and the lack of support for the hypotheses. Future research should investigate this relationship further with the methodological considerations discussed here. More research is needed on the relationship between games and cultural levels of cooperation to be able to come to a reliable conclusion and to understand the motivation and influential factors behind game preferences across cultures.

General Discussion

In this chapter, I summarize the findings of my research, elaborate on the contribution of this research to the general understanding of games in the context of culture, and offer several limitations with corresponding improvements and directions for future research on games.

7.1 Research contributions

In this dissertation, I investigated the relationship between cooperative and competitive aspects of culture and the cooperativeness of games. I used a wide-range of methodological approaches to examine this potential relationship. In the final section of the general introduction to this thesis, I listed several shortcomings of previous research on games, which I have addressed in diverse ways throughout this dissertation.

In chapter 2, I defined games in terms that would allow for variation in their cooperativeness and competitiveness. I created a database of historical games played in a multitude of ethnolinguistic groups on the Austronesian language phylogeny. I searched through several hundreds of ethnographies, journal articles, and historical accounts of ethnolinguistic groups in the broader Pacific region to gather information on the games played by these groups. I gathered over 1200 text excerpts that described 909 games played by various ethnolinguistic groups. I then categorized these games using a novel typology of the goal structure of games. I show that there is variation in the distribution of the cooperativeness of games and the frequency of games across cultures. The AustroGames database, along with the goal structure coding, is open-access (CC-BY 4.0) for future research use.

In chapter 3, I used the AustroGames database and cultural attributes from the Pulotu database (Watts, Sheehan, et al., 2015) to test the relationship between the cooperativeness of games and cultural levels of cooperation (i.e., interdependence in subsistence styles, social stratification, conflict and warfare). I showed that the frequency of cooperative games correlates positively with the presence of frequent inter-group conflict and warfare, positively with the presence of frequent land-based hunting in groups, and negatively with the presence of frequent intra-group conflict. The frequency of cooperative or competitive games did not correlate with social stratification nor frequent water-based hunting and fishing in groups. These findings suggests that games are not randomly distributed throughout these cultures, but rather relate to the socio-ecological settings of groups. As such, games might be one way for individuals to learn and maintain the cooperative norms of their cultural group.

In chapter 4, I described the three foci populations for the second part of this dissertation: Hai||om and Ovambo in Namibia, and Germans in Germany. I elaborated on the interviews I conducted with three ethnolinguistic groups on the degree of social stratification and the frequency, intensity, and types of conflict in their communities. The interviews are provided in the appendix for future research.

In chapter 5, I described the games played by two ethnolinguistic groups in Namibia. This is the first detailed description of games played by the Hai||om and Ovambo. The Hai||om played an array of games with varying goal structures, while the Ovambo played games that were either cooperatively or competitively structured. Additionally, the games questionnaire that I used is available for future data collection on games. In this chapter, I proposed several improvements for future game observations, as well as limitations of the game observations in these two ethnolinguistic groups.

In chapter 6, I examined the ontogenetic relationship between the preference for cooperative and competitive games and cultural attributes in three modern-day ethnolinguistic groups. I found evidence for variation in children's preferences for cooperative and competitive games across the three groups. Adults showed a clear preference for the competitive game, regardless of their cultural group. I did not find evidence for a relationship between the preference for cooperative and competitive games and levels of inter-group conflict, intra-cultural conflict, nor levels of social stratification. I discussed several possible explanations for these findings and improvements for future studies on this relationship.

7.2 Implications: Games in the context of culture

The aim of this dissertation was to answer one overarching question: Do games vary with cultural levels of cooperation? I approached this question using a variety of methods and by focusing on three main proxies for cooperation—social stratification, intra-group conflict, and inter-cultural conflict. I also focused on one aspect of games: their goal structure. The findings in this dissertation pertaining to the relationship between game goal structures and these proxies for cooperation are mixed. In chapter 3, I found evidence for a relationship between intra-group conflict, inter-cultural conflict, land-based hunting in groups, and the presence of cooperative and competitive games. In Austronesian ethnolinguistic groups with intra-group conflict, more competitive than cooperative games were played, whereas when inter-cultural conflict and land-based hunting in groups was present, more cooperative than competitive games were played. There was

no evidence for a relationship between games and social stratification, nor water-based hunting and fishing in groups. On the other hand, the findings from chapter 6 provide no evidence for a relationship between the preference for games and cooperative cultural attributes. In this study examining three diverse cultures, I found no support for a relationship between social stratification, intra-group conflict, and inter-cultural conflict, and cooperative game preferences. I did find variation in game preferences across cultures that also varied with the age of participants. However, as discussed in chapter 6, methodological challenges might explain these findings and a cautious interpretation of the results is advised.

So what can we conclude about the relationship between games and cultural levels of cooperation? To answer this question, one has to consider the likely possibility that other factors are influencing the distribution of games across cultures. In the following sections, I first go into the causal assumptions underlying the studies presented in this dissertation and other potential factors that might be influencing the distribution of games across cultures. Then, I discuss several post-hoc explanations for the differences in study findings.

Causal assumptions

The studies presented in chapter 3 and chapter 6 test for correlative relationships between the goal structure of games and cultural levels of cooperation; however, there are causal assumptions underlying the models tested here, which I would like to make explicit. Namely, I assumed a direct relationship of cultural levels of cooperation on games, and an indirect relationship between cultural levels of cooperation and phylogeny on games. As discussed in chapter 3, there is reason to believe that this relationship may be the result of a causal selection process, as is common with cultural norms (Mace & Jordan, 2011). In other words, games might be distributed across cultures according to cultural norms, and in turn, be transmitting and maintaining culturally-relevant skills and norms to the players (e.g., Scalise Sugiyama et al., 2021).

Why should games vary with cultural levels of cooperation? Games probably do not promote innovative behavior to the same extent that has been suggested for other forms of play, such as object play (Riede et al., 2021) and pretense play (Lew-Levy, Milks, et al., 2020). Games might rather be safe-spaces for children to learn, practice, and enforce culture-specific skills and norms. Scalise Sugiyama et al. (2018) scanned the ethnographic record for examples of coalitional play fighting (i.e., team games) in hunter-gatherers and found that the motor patterns needed in lethal warfare are often practiced in these games. These games are "an adaptation that

functions to develop skills related to lethal raiding" (p.91, Scalise Sugiyama et al., 2018). Other mono-cultural research suggests that games influence children's prosocial behavior—when children played competitively, they shared fewer resources than when they played cooperatively (Toppe et al., 2019). Children start playing games during middle childhood, specifically between six to eight years of age (Mogel, 2008). This is also a time in which acquiring cultural knowledge generally shifts from vertical transmission (e.g., parent to child) to the horizontal transmission of knowledge (e.g., child to child; Garfield et al., 2016; Lew-Levy, Milks, et al., 2020). Thus, games might be one form of social interaction in which children at this age begin to acquire, practice, and enforce culture-specific norms with their peers. Similar to other forms of social learning, learning and teaching of cultural knowledge through games is likely not explicit nor does it have to be salient to the players of the game. This is a theme present in other forms of play—children do not engage in play and games with the intent of actively learning culture-specific skills or norms. Rather, play and games mimic aspects of human culture.

Games are arguably one of many ways in which children and adults can learn, practice, and enforce important aspects of their culture. Music (Lewis, 2021), story-telling (Scalise Sugiyama, 2021), play (P. Gray, 2014; Lew-Levy, Boyette, et al., 2019), and other forms of social interaction are additional means for individuals to learn about, practice, and participate in acquiring cultural norms and skills. These different leisurely forms of social learning are likely influenced by aspects of the environment, such as the geographic location, environmental harshness, subsistence styles, and neighboring groups. For example, Glowacki & Molleman (2017) found that the application of social learning strategies is influenced by one's subsistence style. Simultaneously, the environment also shapes aspects of culture. For instance, cultural complexity is related to a population's relationship with the environment—changes in the environment are more pronounced in societies that rely on gathering food, as opposed to producing food (Fogarty & Creanza, 2017). Additional research is needed to understand how social learning strategies might fit into the bigger picture of cultural and environmental variables. Future research also needs to conglomerate these diverse findings and create a testable and falsifiable theory on these unconventional forms of material social learning, such as games, story-telling, and music, that have often been overlooked in previous research (Pellegrini et al., 2007).

Differences in study findings

As mentioned in the beginning of this section, there were some differences in the findings between chapter 3, chapter 6, and previous research on the relationship between games and the cultural levels of cooperation. However, there was also a common finding among these studies. I will discuss each of these findings in the sections below.

Social stratification

The results from chapter 3 and chapter 6 lack evidence for a relationship between social stratification and games. Namely, in both studies, the levels of social stratification across cultures did not correlate with the goal structures of games. Previous research suggests a relationship between social stratification and the distribution of games across cultures. For example, Boyette (2016b) found a negative relationship between the social stratification of cultures and the cooperativeness of games—egalitarian forager populations played fewer competitive games than hierarchical non-forager populations. And many other observational studies suggest the existence of such a relationship (e.g., Bonta, 1997; Ager, 1976). However, previous studies suggesting this relationship used descriptive and observational methodological approaches, and did not statistically test for the correlation between these variables. While these descriptive approaches are important for the scientific method, they need to be tested and validated using statistical methods—such as those presented in this dissertation.

One possible explanation for the discrepancy between the findings in this dissertation and previous research could be a result of my focus on the goal structure of the game. Some previous research suggests a relationship between social stratification and the *competitive experience* of players. For example, Ager (1975) suggests that during competitive interactions in Inuit society, such as games, humor is a crucial factor in mitigating aggression and competition. It therefore might be that social stratification has a direct relationship with other aspects of games, such as the competition and cooperation experienced by the players, but not the goal structure of the game. I elaborate on this idea in further detail in the section: Focusing on the goal structure, below.

In sum, I show a lack of a direct relationship between social stratification and the goal structure of games in two studies using two different methodological approaches. Future research needs to further investigate the relationship between social stratification and other aspects of games, using causal models that also make the predicted relationship explicit (McElreath, 2020).

Group-focused subsistence

In chapter 3, I investigated the relationship between group-focused subsistence and the distribution of games. Specifically, I investigated whether the land-based hunting and water-based hunting and fishing in groups correlated with the goal structure of games. These variables were used in chapter 3 as an additional proxy for cooperation. As discussed in chapter 3, I found a positive relationship between land-based hunting in groups and the distribution of the goal structure of games; however, water-based hunting and fishing did not correlate with games. Additionally, the effect of land-based hunting in groups was not reliably positive after including intra-group or inter-cultural conflict in the statistical models. This indicates weak support for a relationship between group-focused subsistence measures and games.

Previous research suggests differences in the cooperativeness of subsistence styles (Glowacki & Molleman, 2017; Talhelm et al., 2014). Specifically, Talhelm et al. (2014) investigated the interdependence of wheat versus rice farming regions and found that people from regions that predominantly grew rice were more interdependent than predominantly wheat-growing regions. This is likely due to the high levels of interdependence and cooperation between individuals needed to farm rice (Talhelm et al., 2014). Similarly, Glowacki & Molleman (2017) examined the use of social information in three sub-populations that varied in their subsistence styles (i.e, pastoralists, horticulturalists, and urban dwellers), and found that horiculturalists used social information less than the other two sub-populations. Similar to Talhelm et al. (2014), the authors argue that this is likely due to the varying degrees of interdependence experienced by the sub-populations, which directly translates to the availability and valuing of social information (Glowacki & Molleman, 2017).

As mentioned previously, I aimed to find real-world proxies for cooperation in both historical and modern-day cultures. Unlike Talhelm et al. (2014) and Glowacki & Molleman (2017), who used different subsistence styles as proxies for interdependence, I measured whether or not certain subsistence styles were conducted in groups as a proxy for interdependence and cooperation. It is therefore possible that the group-level binary measure was a poor or unreliable measure of real-world cooperation. Future research should investigate the relationship between games and subsistence styles (e.g., horitculture, pastoralism Glowacki & Molleman, 2017; Talhelm et al., 2014).

Conflict

In chapter 3, I found a positive relationship between the distribution of cooperatively structured games and inter-cultural conflict—more cooperative than competitive games are present in cultures with inter-cultural conflicts. I also found a positive relationship between the distribution of competitively structured games and intra-group conflict—more competitive than cooperative games are present in cultures with intra-group conflicts. However, in chapter 6, I was unable to replicate this relationship in three diverse modern-day cultures. In this study, I found no relationship between conflict levels and cooperative game preferences, which is partially due to a lack of variation in the conflict measure.

One possible explanation for the mixed findings in chapter 3 and chapter 6 regarding conflict is that I used a variety of methodological approaches to investigate this potential relationship in a broad-range of historical and modern-day groups. While it is important to use a variety of methods when investigating any phenomenon (Norenzayan & Heine, 2005), the methodological approaches may have differed in too many ways between the studies to show one clear pattern. By comparing the methodological approach between chapter 3 and chapter 6, one can note two substantial differences: the geographic location of the cultures and the time focus of the studies. These are explained separately in the sections below, but a combination of their effects is likely.

Geographic location In chapter 3, I focused on the ethnolinguistic groups in the broader Pacific region that corresponded to a language on the Austronesian language phylogeny. I focused on the broader Pacific region due to the cultural and linguistic diversity (R. D. Gray et al., 2009), and the availability of historical resources (e.g., Pulotu, ethnographic material, language phylogeny). In chapter 6, I examined three cultural groups in Namibia and Germany. As explained in chapter 4, I picked these three groups because of their differing social structures, levels of conflict, physical environments, and due to opportunistic sampling. Due to research limitations, I was unable to measure the cultural variables before picking these groups. Unfortunately, there was little variation in the cultural levels of cooperation as measured in chapter 4, which were used in chapter 6. I was therefore unable to directly test the relationship between the preference for games and cultural levels of cooperation.

By selecting cultures with different geographic locations, but that also vary in their cultural levels of cooperation, I aimed at testing whether the findings apply to other areas of the world. However, an intermediate step could have also been to look at historical games in another area of

the world or to focus on the modern-day games played by several of the ethnolinguistic groups in Part I. Due to limited resources, I was unable to investigate modern-day cultures within the Pacific region. Therefore, the differences between the findings in chapter 3 and chapter 6 may be due to the different geographic locations, or the relationship between the goal structure of games and cultural levels of cooperation might also be not be the same in all cultures or regions around the world.

Time focus The historic time focus of chapter 3 differed from the modern-day focus of chapter 6—the games used in the analyses of study one were of historical nature and part two of this dissertation focused on modern-day groups and games. In general, this is a methodological strength when studying any phenomenon; however, given the novelty of systematic, large-scaled studies on games, a smaller step in differences between the studies presented in this dissertation might have shown a more consistent pattern. For example, I could have investigated the historic games of another region of the world, using the same methods as in chapter 3. Subsequently, I could have investigated modern-day cultures in one of those areas of the world using the methods described in chapter 6. Future research should take a small-step approach to understanding the relationship between games and cultural levels of cooperation.

Additionally, it is possible that the mechanisms influencing the distribution of games in modern-day groups differ from those in the past. Due to technological advances, modern-day groups play both traditional and electronic games. Similar to games that are introduced into societies (Chepyator-Thomson, 1990), it could be that as the popularity of digital games increase, traditional games decrease in popularity. And with the dwindling popularity of traditional games and a shift toward electronic games, traditional games may no longer serve the same purpose that they have in the past, nor be influenced by the same forces that acted upon the distribution of games historically. This speculation has yet to be investigated. I did not systematically gather information on the electronic games played in the modern-day cultures examined in Part II of this dissertation. I did not observe individuals in the two cultures in Namibia playing electronic games; however, the absence of my observation of the behavior does not mean they were absent from the populations. In Germany, digital games are omnipresent and traditional games are still being played.

In sum, the difference in time foci of the two studies could also explain the difference in findings from chapter 3 and chapter 6.

7.3 Limitations & future directions

There are several limitations of the research presented in this dissertation, which provide avenues for future research. The limitations of the individual studies are discussed in each chapter. Thus, the limitations mentioned here pertain to general aspects of this dissertation and the general relationship between games and aspects of cultures.

Defining games

One influential piece of the research presented in this dissertation is the definition of games. I set out to create an etic definition of games that can be used in a wide variety of cultural contexts. Throughout my doctoral research I realized that this endeavor may not be possible, as there is not a universal definition of games. Several languages lack a separate word for "games", and even languages that do have a separate word for "games" disagree on the distinction between games, play, and work (Ember & Cunnar, 2015). As with concepts of human behavior more generally, the concept of rule-based games could also be defined emically, or according to the ethnolinguistic groups being examined. Given the comparative, historic, and modern-day foci of this dissertation, an etic definition of "games" was deemed appropriate, but future research might consider defining games emically, especially if there is only one or two foci cultures, or combining an etic and emic approach to defining games. Alternatively, researchers could use definitions of play and games from neighboring groups if one from the focus group is missing from the written record (e.g., using games from the !Kung when studying the Hai||om; Sbrzesny, 1976).

Proxies for cooperation

The cooperative characteristics that I focus on throughout this dissertation (i.e., social stratification, interdependence in subsistence, and conflict) were my attempts at identifying real-world proxies for cooperative behavior. Previous research has used economic games to measure cooperative behavior across a broad range of cultural groups (e.g., House et al., 2013; Apicella & Silk, 2019; Apicella et al., 2012). These economic games are flexible in their execution—they can be conducted with valued goods (e.g., money, stickers, beads; House et al., 2019) or edible resources (e.g., honey sticks; Apicella et al., 2012), with or without an audience (e.g., Engelmann et al., 2013), and can be modified for both children and adults across cultures (House et al., 2019).

However, economic games and interviews cannot be conducted in research with a historical focus. In historical contexts, such as in Part I of this dissertation, I had to search for measurable and quantifiable proxies of cooperation in everyday life that would be described in ethnographic materials. I searched for a few behaviors or group-level descriptors that most groups participate in—subsistence activities (e.g., fishing and hunting in the Pacific), the presence or absence of differences in status and wealth between individuals (i.e., social stratification), and conflict or warfare within and between groups. I derived my interviews from the coding schemes on conflict from Pulotu (Watts, Sheehan, et al., 2015) and the Standard Cross Cultural Sample (Murdock & White, 1969). However, I cannot speak for the validity, nor the long-term reliability of these measures of cultural levels of cooperation. I did not validate the interviews in chapter 4 that I used to measure these cultural proxies for cooperation. Future studies should develop methods to identify, evaluate, and quantify cooperation in everyday situations in historical and modern-day contexts.

Vertical vs. horizontal transmission

In chapter 3, I introduced the assumption of vertical transmission by using a language phylogeny to account for the relatedness of the ethnolinguistic groups. In other words, I assumed that games are passed down from generation to generation over evolutionary time. I included the language phylogeny in the analyses to account for Galton's problem, or the non-independence of subjects within a sample (Tylor, 1889). However, games can also be transmitted horizontally.

A consideration for future research, which was not the focus of this dissertation, is the horizontal transmission of games across cultures. Games can be introduced, copied, or borrowed from neighboring groups or other distant cultures (e.g., explorers, missionaries, researchers). Additionally, innovation may lead to new variations of existing games or to the creation of wholly new games, as is common with other types of play (Lew-Levy, Milks, et al., 2020; Riede et al., 2021). Research using phylogenetic comparative methods to investigate the ancestral origins of Indo-European folktales suggest that the distribution of folktales occurred vertically, not horizontally (Da Silva & Tehrani, 2016). But it remains untested whether horizontal or vertical transmission, or a combination of both, is the key mechanism in the distribution of games across cultures. Future research on games should investigate the horizontal transmission and innovation of games to identify common factors that influence the distribution, adoption, and creation of games. By understanding the different mechanisms of game transmission, we can better understand why

games are played across cultures.

Additional measures of games

Counts vs. duration of engagement

A limitation of chapter 2, chapter 3, and chapter 5 is that I focused the number of games (i.e., game counts) to assess the distribution of games across cultures. Assessing the number of games across cultures was crucial due to the historic nature of the game descriptions in Part I. However, cooperative games might be highly under-represented in historical texts due to the focus on competitive games by Western ethnographers. A majority of the ethnographic materials used to create the database in chapter 2 were written by Western authors foreign to the cultural group(s) they were describing. As with other forms of leisurely activities, ethnographies also tend not to report play and games (Scalise Sugiyama et al., 2021). These game descriptions, and thereby game counts, are highly dependent on the background and interests of the ethnographer(s) who described these games (Watts et al., 2021). This bias in ethnographic materials is well-known, and recent research recommends several avenues to combat these biases (Watts et al., 2021).

As an alternative measure, the frequency of engaging in each game (i.e., how often and the duration of play) might be a more precise measure of game preference and relevance across cultures. A previous study investigating the time allocated to various activities during childhood showed that children in two hunter-gatherer cultures spent 15-31% of their time engaging in play (Lew-Levy, Boyette, et al., 2019). Of this play time, the time specifically allocated to playing rule-based games was between 4-26%. This detailed time allocation data gives a more precise and rounded picture of childhood activities and the potential importance of the activities to children across cultures. Measuring the frequency with which each game was played was not possible for the data presented in Part I, due to the lack of detailed information in most of the historical game descriptions. I attempted to measure the frequency of game play in the games questionnaire presented in chapter 5, but the reliability of the frequencies reported are questionable[1], and therefore not presented in this dissertation. Future research on the distribution of games in modern-day cultures should investigate the frequency with which rule-based games are played (e.g., Boyette, 2016a; Lew-Levy, Boyette, et al., 2019), in addition to other aspects of games, such

[1]The reliability of the frequency of game play is questionable because when I informed the cultural groups in Namibia that I was interested in what kinds of games play play, several individuals actively showed me the games that they play. I therefore do not know whether my inquiries of game play influenced the frequency with which games were played, or whether the frequencies I observed were unbiased.

as the goal structure of games. By using multiple measures to assess game play, we can gain a more precise picture of the importance of games across cultures.

Focusing on the goal structure

The goal structure coding elaborated on in chapter 2 does not attend to other important cooperative aspects of games. Previous studies mentioning games in small-scale societies often note the reduced focus on competition during game play. For example, in describing Inuit games, Ager (1976) notes that despite the competitive structure of the game, players laugh and joke with one another. This lightheartedness and joking during competition might be one mechanism which diffuses the competition experienced by the players. In talking about hunter-gatherer play and games, P. Gray (2014) argues that even when competitive games are played, which he argues is rare, hunter-gatherers do so without dominating others (i.e., showing superiority). This is a common theme in other aspects of egalitarian human societies, such "insulting the meat" (Lee, 1984), that might also be present in the games played in egalitarian societies. Joking and humility might be mechanisms to diffuse the competition experienced during game play. Competitive games might also be prevalent in egalitarian societies as one type of interaction in which individuals can reinforce their values of egalitarianism, given that they are *just* play. The goal structure coding used in this dissertation was not designed to measure these subtle differences in behavior during game play. The enforcement of cultural norms surrounding competition, in addition to the goal structure of games, might a promising avenue for future research in understanding the function of games across human societies.

Additionally, there might be other ways in which playing games "cooperatively" differ across cultures. For example, Orlick (1978) suggests that a competitive game with two players might be played twice, thereby allowing both players the chance to win. Gathering this detailed degree of information about playing games will require future researchers to observe game play attentively and for an extended period of time, to catch these varying aspects of game play.

Type of game

J. M. Roberts et al. (1959) influential study was the first large-scaled attempt to understand the distribution of games across the world's cultures. They showed that the type of game, namely whether the game required physical skill, luck or chance, or strategic skills, varied across a wide-range of cultures. They also showed that this variation was not random, but rather varied with

attributes of cultural groups, such as geographic location, religious beliefs, and "social systems" (i.e., the presence and absence of social classes, and low or high political integration). While these findings are important and cited broadly, the methodological concerns mentioned in the introduction of this dissertation, should be taken into consideration. My inability to reliably apply the coding scheme, as well as the inaccessible raw dataset from J. M. Roberts et al. (1959), unfortunately prevented me from replicating and extending the findings presented in J. M. Roberts et al. (1959). My attempts to more closely define and reliably code the J. M. Roberts et al. (1959) categorization of games is discussed in the Appendix A. Future studies should validate, replicate, and expand the findings from J. M. Roberts et al. (1959) and create a categorization of game types that is open-access and replicable for subsequent research.

7.4 Conclusion

Previous research on the ontogeny and phylogeny of play has often excluded rule-based games, limiting our understanding of this uniquely human behavior. To engage in games, an understanding of and adherence to rules, complex social cognitive abilities, and of course, free time, is necessary. Games are not randomly distributed throughout the world's cultures, but vary with some measures of group-level cooperation. Once we know more about how games are distributed across the world's cultures, we can create a testable theory of games and other material culture, to understand whether they are tailored to the cultures that play them. Games may be one way for children and adults to learn and maintain cultural norms, but future research is needed to confirm these ideas. There is much work for future researchers examining games across cultures. We still do not know why only humans play games, but by figuring out why and how games are distributed across cultures, we are one step closer to understanding the role of this uniquely human invention.

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Appendix

Appendix A

Determination of the outcome of the game (DOG)

J. M. Roberts et al. (1959) coded games into three categories: 1) physical skill, 2) strategy, 3) chance. However, the categories are not clearly defined, which would allow other researchers to adopt their game typology. Thus, I attempted to define and expand on these categories and created the determination of the outcome (DOG). Additionally, the current coding scheme keeps the first and the last categories from J. M. Roberts et al. (1959), but splits up the strategy category into two new categories. I was interested in the kinds of cognitive skills players need: either cognitive-social skill, in which players have to consider social information (e.g.what other players are doing), or cognitive non-social skill, in which players need some kind of non-social, trainable or learned information or skill (see Table A.1). The coding scheme is also hierarchical (Figure A.1).

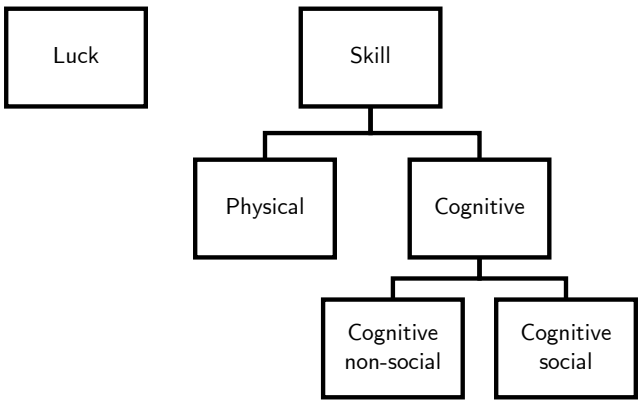
The determination of the outcome of the game describes which factors lead players to succeed in the game, but not necessarily win the game. In other words, if a player is talented in one of these domains, they could be successful in playing the game. If a game description provided enough information on the game, this coding was based on what the players attribute the outcome of the game to. If the information on the game did not suffice, then no code was assigned. Either a single code could be assigned, or a mixture of two codes could be chosen (e.g., physical skill and cognitive-social skill).

As noted in the main text, this coding scheme had low inter-rater reliability scores and was therefore not used in the current dissertation. However, I provide it for future researchers to use as a reference for future attempts to replicate J. M. Roberts et al. (1959)'s coding scheme. As mentioned in the main text, this could also be due to the lack of specificity regarding how much of the skill is required. Future research should attempt to define clearer boundaries for an objective coding scheme.

Table A.1: Determination of the outcome of the game (DOG) coding scheme.

Code	Description
Luck or Faith	Attributing the outcome to an external source or being (e.g., praying, chance)
Physical Skill	Bodily functions that can be learned or trained (e.g., agility, hand-eye-coordination, speed)
Cognitive-Social Skill	Cognitive skills that involve other players (e.g., good communication, Theory of Mind, planning, strategy)
Cognitive Non-Social Skill	Cognitive skills that do not involve any kind of social reasoning (e.g., knowledge, mathematics, logic, mental rotation, memory, cognitive control)

Figure A.1: A decision tree showing the hierarchy of the DOG coding.



Appendix B

Games and enculturation

B.1 Game Counts

As mentioned in the main text, we use several filters provided by the AustroGames database (S. M. Leisterer-Peoples, Hardecker, et al., 2021) to filter the games. These filters were applied using the `game_filter()` function from the AustroGames package (S. M. Leisterer-Peoples et al., 2021) in R. The sample size of games after each of these steps is provided in Table B.1. The final number of games of each goal structure type for each ethnolinguistic group is provided in Table B.2. We used the following filters:

1. the description must have been coded as a game
2. games must have been linked to an Austronesian Basic Vocabulary Database code (ABVD, Greenhill et al., 2008)
3. games must be described in enough detail to assign a goal structure code
4. games must not be of non-local origin
5. games must occur within cultural groups in the Austronesian language phylogeny (R. D. Gray et al., 2009)
6. the game descriptions must correspond to the same time frame as the covariate data from Pulotu, $\pm$50 years
7. games must occur in cultural groups with covariate data in Pulotu (Watts, Sheehan, et al., 2015)

The "Games dropped" column in Table B.1 indicates that most games were dropped by using the "coded goal structure" filter (275 games dropped), the "matching time frames with Pulotu $\pm$50 years" filter (258 games dropped), and the "linked to an ABVD" filter (143 games dropped). To our knowledge, the main difference between the games that were kept in the final dataset and those that were removed by using these filters lies in the quality of the game descriptions provided by the ethnographic materials. The game descriptions varied largely in their level of detail (S. M. Leisterer-Peoples, Hardecker, et al., 2021). The most common reasons that some games could not be assigned a goal structure code were: 1) a lack of information about the rules of the game, 2) a lack of information about the players of the game, and 3)a lack of information about the general set-up of the game. Game descriptions that could not be linked with an ABVD code either did not contain sufficient information to assign an ABVD code, or the ABVD code could not be mapped on to the Austronesian language phylogeny (R. D. Gray et al., 2009). Finally, game descriptions that were excluded from the final dataset by the filtering step: "matching time frames with Pulotu $\pm$50 years", were either described more than 50 years before or 50 years

Table B.1: The filters applied to the AustroGames database (S. M. Leisterer-Peoples, Hardecker, et al., 2021) with the sample sizes after each step. The "Games remaining" column refers to the sample size of games after each step. The "Games dropped" column indicates the number of games that were removed from the sample by applying a respective filter to the results of the previous step. The "Groups remaining" column refers to the sample size of ethnolinguistic groups after each step. The abbreviation "MCCT" refers to the maximum clade credibility tree, and the abbreviation "ABVD" refers to the Austronesian basic vocabulary database code.

Filter	**Games remaining**	**Games dropped**	**Groups remaining**
(None)	952	-	-
Coded as a game	907	45	80
Linked to an ABVD	764	143	79
Coded goal structure	489	275	67
Excluding non-local origin	466	23	66
ABVD on the MCCT	430	36	55
Matching time frames with Pulotu $\pm$ 50 yrs	172	258	27
Covariate data in Pulotu	168	4	25
Total	**168**	-	**25**

after the cultural attributes. As described in Leisterer-Peoples et al. (S. M. Leisterer-Peoples, Hardecker, et al., 2021, p.9), we believe that this filtering step is important to reduce the possibility that games from an early time point are not associated with cultural variables at a later time point (e.g., we would not want cultural variables from the 1700s to be linked with game data from the 1900s, especially if the cultural variables have since changed).

The ethnolinguistic groups that were excluded from the final sample did not systematically vary geographically from the ethnolinguistic groups that were included in the final sample (see Figure B.1). Games were not systematically dropped based on their cultural attributes (for more information on the games that were excluded during filtering, see the main text, Table B.1, and the R code on GitHub). There were some moderate differences between the cultural groups that were included versus excluded from the final sample (see Table B.3 to Table B.8). ABVD codes were used to match the game data with the cultural attributes provided by Pulotu. As such, we could only investigate the relationship between games and cultural covariates after filtering out games that could be assigned an ABVD code.

Figure B.1: The ethnolinguistic groups included in the final sample (i.e., the black dots), and in the original sample (i.e., the red dots; 3 are not visible due to missing coordinates). The "original" sample was only subset using the filters "coded as a game", "linked to an ABVD code", and "linked to a Pulotu code" (Table B.1). The R code for this plot is available in the GitHub repository. For further information on the filters, see (S. M. Leisterer-Peoples, Hardecker, et al., 2021).

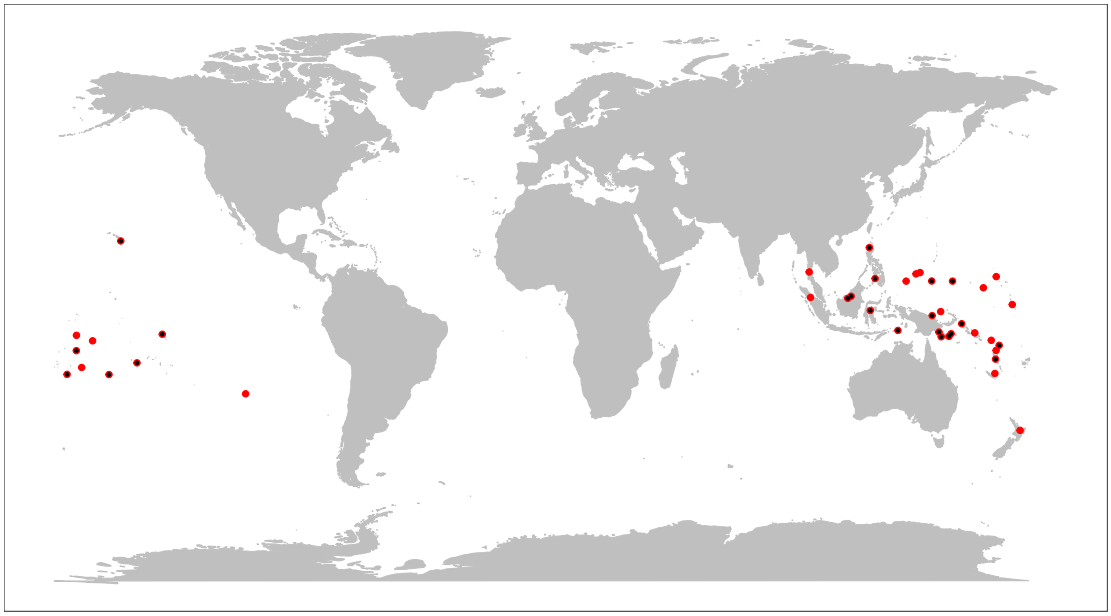


Figure B.2: The number of games for each ethnolinguistic group included in the final sample ("final") and the number of games before the filtering steps ("orig") (see Figure B.1 for more information). The dotted line marks 5 games. The colors represent the goal structures of the games. Please note that the y-axis differs for several plots.

Table B.2: The number of games of each goal structure type in the analyses (N = 168). For the analyses, the AustroGames data were grouped into three categories (solitary, competitive, cooperative).

Culture	Solitary	Competitive	Cooperative
Iban	1	1	0
Yamdena	0	1	0
Marquesan	0	2	0
Hawaiian	1	12	2
TahitianModern	0	1	0
Rarotongan	0	1	0
Tikopia	0	3	0
Rennellese	4	17	9
Samoan	2	7	11
Tongan	3	7	6
Marshallese	0	4	2
Chuukese	0	2	3
Woleai	0	4	1
Nahavaq	0	3	0
Teop	3	1	2
Wogeo	0	0	1
Bwaidoga	2	2	4
Kilivila	1	2	3
Motu	0	2	4
Mekeo	0	0	1
Baree	5	3	7
MerinaMalagasy	1	3	1
KayanUmaJuman	0	3	0
SubanunSindangan	0	0	1
ItnegBinongan	0	4	2

Table B.3: The number of cultural groups included in the final sample and excluded during filtering steps, and the levels of social stratification provided by Pulotu (Watts, Sheehan, et al., 2015). We note here that we may have lost more data from non-stratified groups than from stratified groups during filtering.

Social stratification	Excluded	Included
0	10	13
1	3	11
NA	5	1

Table B.4: The number of cultural groups included in the final sample and excluded during filtering steps, and the levels of land-based hunting in groups provided by Pulotu (Watts, Sheehan, et al., 2015). We note here that we may have lost more data during filtering from groups with low levels of land-based hunting in groups than from groups with this variable.

Land	Excluded	Included
0	13	18
1	2	7
NA	3	0

Table B.5: The number of cultural groups included in the final sample and excluded during filtering steps, and the levels of water-based hunting in groups provided by Pulotu (Watts, Sheehan, et al., 2015).

Water	Excluded	Included
0	9	9
1	6	16
NA	3	0

Table B.6: The number of cultural groups included in the final sample and excluded during filtering steps, and the levels of intra-group conflict provided by Pulotu (Watts, Sheehan, et al., 2015). We note here that we may have lost more data during filtering from groups with intra-group conflict than from groups without intra-group conflict.

Intra-group conflict	Excluded	Included
0	3	13
1	11	12
NA	4	0

Table B.7: The number of cultural groups included in the final sample and excluded during filtering steps, and the levels of intra-cultural conflict provided by Pulotu (Watts, Sheehan, et al., 2015).

Intra-cultural conflict	Excluded	Included
0	6	7
1	11	18
NA	1	0

Table B.8: The number of cultural groups included in the final sample and excluded during filtering steps, and the levels of inter-cultural conflict provided by Pulotu (Watts, Sheehan, et al., 2015). We note here that we may have lost more data during filtering from groups without inter-cultural conflict than from groups with inter-cultural conflict.

Inter-cultural conflict	Excluded	Included
0	14	12
1	3	13
NA	1	0

B.2 Statistical Methods

B.2.1 A basic model

The outcome of interest here is a count vector, Y, of the number of games of a given goal structure, s, observed in a given cultural group, c. Thus, let $Y_{[c]} \in \mathbb{N}^S$, where $S = 3$ is the number of categories of goal structures considered here. The total number of games, G, in cultural group c is then: $\sum_{s=1}^{S} Y_{[c][s]} = G_{[c]}$.

As such, we use a multinomial model for the outcomes:

$$Y_{[c]} \sim \text{Multinomial}(G_{[c]}, \text{Softmax}(\theta_{[c]})) \tag{B.1}$$

where:

$$\theta_{[c][s]} = \alpha_{[s]} + \beta_{[s]} Z_{[c]} + ... \tag{B.2}$$

$$\theta_{[c][S]} = 0 \tag{B.3}$$

Here, Equation B.3 sets one category as a base case, and Equation B.2 gives a linear model for the log odds of category s relative to the base case S. Each category s has its own regression equation, with a unique intercept, α, and slope, β. In the univariate models, we include only a single culture-level covariate, Z. In the multivariate models, we include two predictor variables and two slope parameters.

B.2.2 A phylogenetically controlled model

The previous model assumes that cultural groups are independent units. To control for the fact that our outcomes may be correlated due to shared phylogenetic history, we integrate correlated random effects into our model.

As before, we model outcomes as:

$$Y_{[c]} \sim \text{Multinomial}(G_{[c]}, \text{Softmax}(\theta_{[c]})) \tag{B.4}$$

but we now define:

$$\theta_{[c][s]} = \alpha_s + \beta_s Z_{[c]} + ... + \gamma_{[s][c]} \tag{B.5}$$

$$\theta_{[c][S]} = 0 \tag{B.6}$$

Assuming we have C cultural groups in our study, we use a vector of random effects, $\gamma_{[s]} \in \mathbb{R}^C$, for each category of game (except the base case). These random effects vectors are defined using a Gaussian process model:

$$\gamma_{[s]} \sim \text{Multivariate Normal Cholesky}((0, ..., 0)', \Sigma_{[s]}) \tag{B.7}$$

where:

$$\Sigma_{[s]} = \sigma_{[s]} L_{[s]} \tag{B.8}$$

and where $\sigma_{[s]}$ is a scale parameter and $L_{[s]}$ is a factor from the Cholesky decomposition of the correlation matrix $\rho_{[s]}$. To define $\rho_{[s]}$, we specify:

$$\rho_{[s][i,j]} = \phi_{[s]} \text{exp}(-\psi_{[s]} D^2_{[i,j]}) \tag{B.9}$$

Here, $\phi_{[s]}$ is a maximal correlation parameter, $\psi_{[s]}$ is a decay parameter and, $D_{[i,j]}$ is the unit normalized phylogenetic distance between cultural groups i and j.

B.2.3 Priors

We use weakly regularizing priors on the intercept and slope parameters:

$$\alpha_{[s]} \sim \text{Normal}(0, 5) \tag{B.10}$$

$$\beta_{[s]} \sim \text{Normal}(0, 5) \tag{B.11}$$

The priors for phylogenetic control parameters are:

$$\phi_{[s]} \sim \text{Beta}(10, 2) \tag{B.12}$$

$$\psi_{[s]} \sim \text{Exponential}(2.5) \tag{B.13}$$

$$\sigma_{[s]} \sim \text{Exponential}(2.5) \tag{B.14}$$

B.2.4 Robustness checks

In the analyses presented in the main text, we used the maximum-clade credibility tree (MCCT). We conducted robustness checks using ten randomly selected trees from the Austronesian lan-

guage phylogeny (R. D. Gray et al., 2009). As indicated in Figure B.3, the results do not differ from those in the main text using the MCCT.

Figure B.3: The change in log relative frequency of each goal structure type as a function of predictor variables with phylogenetic controls included in the model. A positive parameter value corresponds to an increase in the frequency of goal structure type, while a negative parameter value corresponds to the opposite effect. Posterior densities show the results of pooling the densities for the same parameter in each of the 10 models with different phylogenetic trees. Vertical bars show 90% credible intervals.

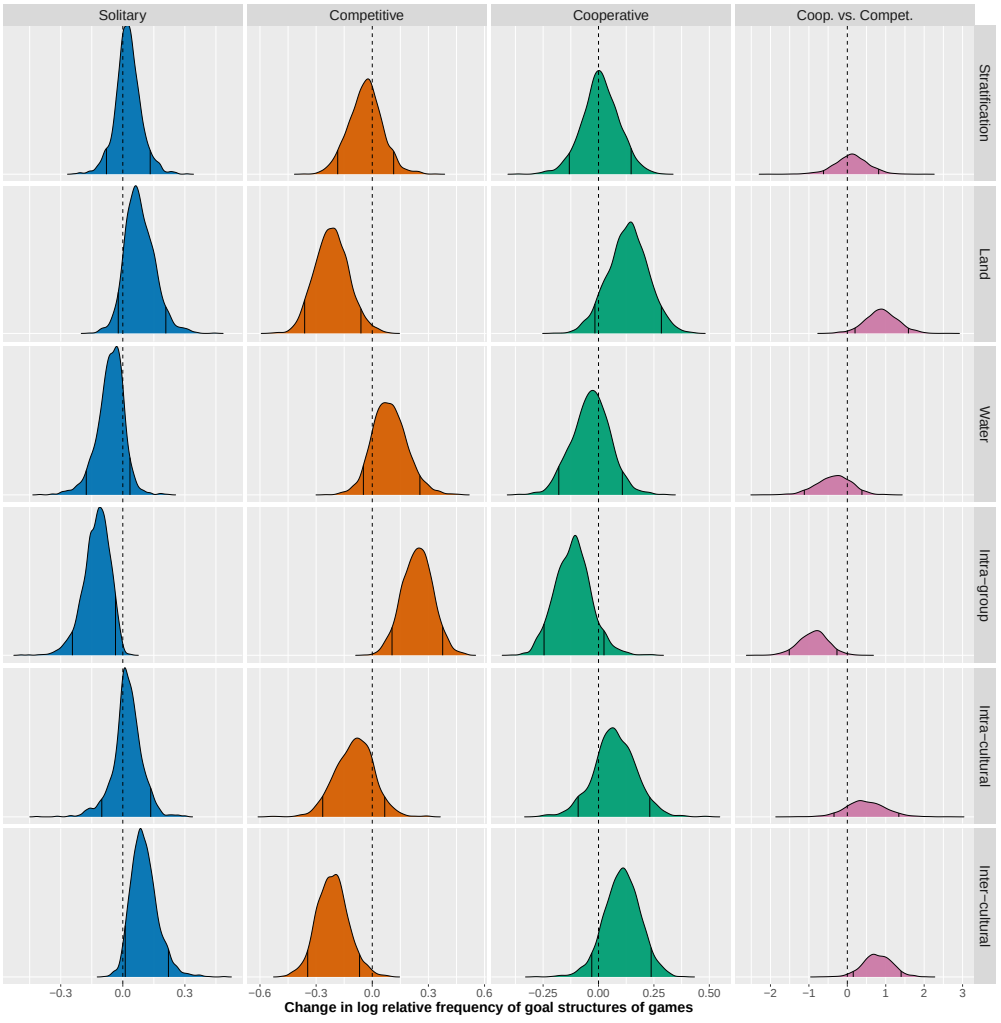
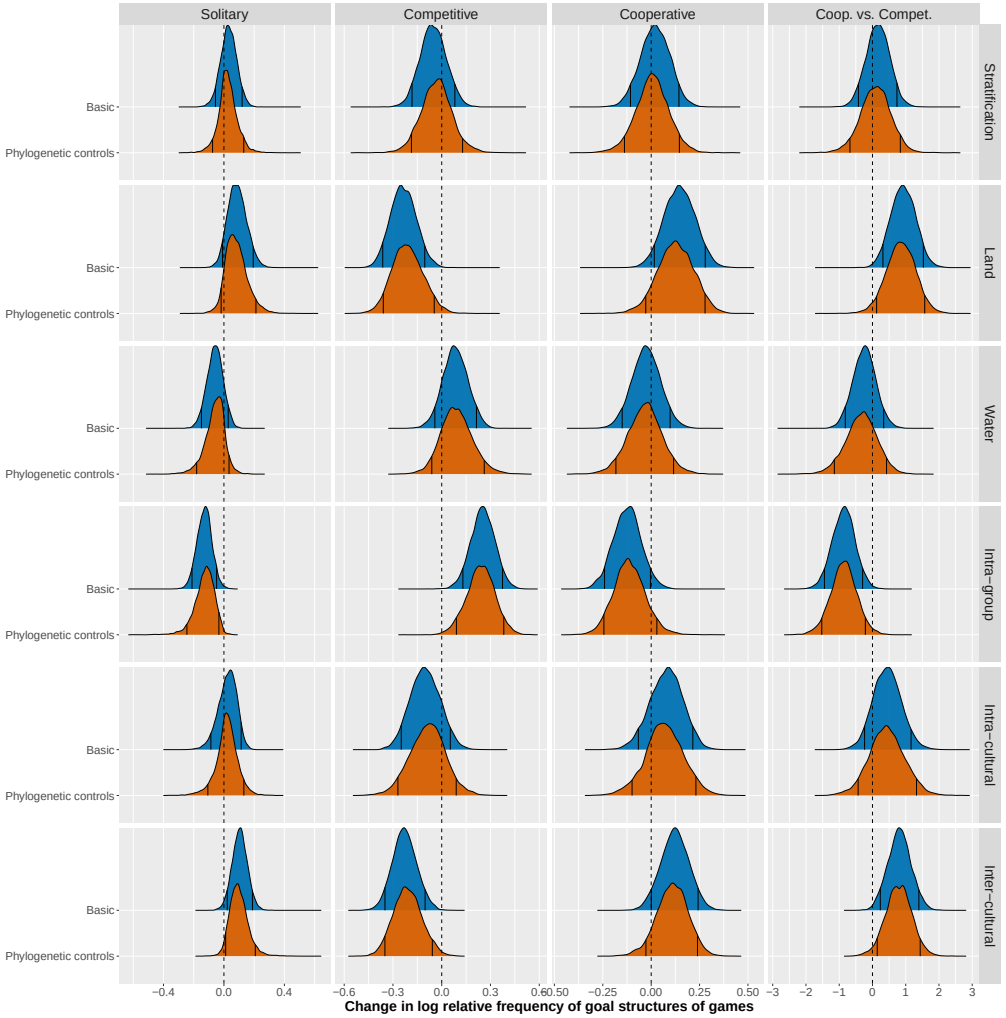


Figure B.4: The change in log relative frequency of each goal structure as a function of predictor variables, with (basic, orange) and without phylogenetic controls (blue) included in the model. A positive parameter value corresponds to an increase in the frequency of goal structure types, while a negative parameter value corresponds to the opposite effect. Vertical bars show 90% credible intervals.



Appendix C

Cultural interviews

ID Number: _____

Social Stratification Interview

Date: _____ Interview start time: _____

Location: _____ Interviewer: _____

GENERAL PARTICIPANT INFORMATION				
1	What is your name?	Name: (write on separate piece of paper)	ID Number:	demo
2	Sex	☐ male ☐ female		demo
3	How old are you?	Age (or date of birth):		demo
4	Have you always lived here or did you move here?	☐ from here ☐ moved here *If "moved here",* when and from where?		demo

☐ **Start the interview. Take notes on the next page.**

☐ **Write down the time the interview ended: _____**

☐ When you're finished with the interview, fill-out the interviewer rating below.

— Interviewer Rating —

	Interviewer rating	**Interview partner check**
Are there differences in people's status? Describe.	☐ Yes ☐ No ☐ Other:	☐ agrees ☐ disagrees with:
Are there differences in people's wealth? Describe.	☐ Yes ☐ No ☐ Other:	☐ agrees ☐ disagrees with:
Is a person's status/wealth inherited? Describe.	☐ Yes ☐ No ☐ Other:	☐ agrees ☐ disagrees with:
Can a person change their status or wealth? Describe.	☐ Yes ☐ No ☐ Other:	☐ agrees ☐ disagrees with:

☐ **Read the answers to the interview partner and ask them if they agree with what you understood.**

☐ End the interview with: "How did you find the interview?" and "Do you think this is a useful topic to ask about?"

☐ **Turn off the audio recorder.**
☐ **Fill-out the table on the next page.**

ID Number: _____

Was the respondent alone during the interview?	☐ yes ☐ no If "no", other people present:
How well do you think the respondent understood the questions?	☐ A lot ☐ A little ☐ Not at all
How uncomfortable do you think the respondent was during the interview?	☐ Very uncomfortable ☐ A little uncomfortable ☐ Comfortable

Other comments:

Notes from the interview

Questions you can ask about social stratification:

Does your culture have a class system?
Are there some people in your culture who have a higher or lower status than other people?
How does someone get a high status?
How does someone get a low status?
Can people change their status in your culture?
Are there some people in your culture who have a more or less money than other people?
Can people change their wealth in your culture?

Conflict Interview

Date: _____ Interview start time: _____
Location: _____ Interviewer: _____

GENERAL PARTICIPANT INFORMATION				
1	What is your name?	Name: (write on separate piece of paper)	ID Number:	demo
2	Sex	☐ male ☐ female		demo
3	How old are you?	Age (or date of birth):		demo
4	Have you always lived here or did you move here?	☐ from here ☐ moved here *If "moved here",* when and from where?		demo

☐ **Start the interview. Take notes on the next page.**

☐ **Write down the time the interview ended: _____**

☐ When you're finished with the interview, fill-out the interviewer rating pages.

☐ **Read the answers to the interview partner and ask them if they agree with what you understood.**

☐ End the interview with: "How did you find the interview?" and "Do you think this is a useful topic to ask about?"

☐ **Turn off the audio recorder and fill-out the table below.**

Was the respondent alone during the interview?	☐ yes ☐ no If "no", other people present:
How well do you think the respondent understood the questions?	☐ A lot ☐ A little ☐ Not at all
How uncomfortable do you think the respondent was during the interview?	☐ Very uncomfortable ☐ A little uncomfortable ☐ Comfortable

Other comments:

ID Number: _____

Notes from the interview

Conflict in (location) 	
Conflict between (location) **and …** *(other* (location) *)* 	
Conflict between (culture) **and …** *(other cultures)* 	

Appendix C

ID Number: _____

— Interviewer Rating —

____(culture)___**IN** ____(location)___

	Who is in conflict? *(1+)*	**How often?** *(only 1)*	**How bad?** *(only 1)*	**Interview partner check**
	☐ never			☐ agrees ☐ disagrees with:
	☐ family members (describe)	☐ every day ☐ once a season ☐ yearly ☐ more than 5 years ago ☐ never ☐ other:	☐ never violent (0%) ☐ rarely violent (<50%) ☐ often violent (>50%) ☐ always violent (100%)	☐ agrees ☐ disagrees with:
Conflict in ___(location)___  *(between individuals and within location)*	☐ neighbors (describe)	☐ every day ☐ once a season ☐ yearly ☐ more than 5 years ago ☐ never ☐ other:	☐ never violent (0%) ☐ rarely violent (<50%) ☐ often violent (>50%) ☐ always violent (100%)	☐ agrees ☐ disagrees with:
☐ unfamiliar with ___(location)___	☐ other side (describe)	☐ every day ☐ once a season ☐ yearly ☐ more than 5 years ago ☐ never ☐ other:	☐ never violent (0%) ☐ rarely violent (<50%) ☐ often violent (>50%) ☐ always violent (100%)	☐ agrees ☐ disagrees with:
	☐ other people: (describe)	☐ every day ☐ once a season ☐ yearly ☐ more than 5 years ago ☐ never ☐ other:	☐ never violent (0%) ☐ rarely violent (<50%) ☐ often violent (>50%) ☐ always violent (100%)	☐ agrees ☐ disagrees with:

ID Number: _____

	Who is in conflict? *(1+)*	**How often?** *(only 1)*	**How bad?** *(only 1)*	**Interview partner check**
	☐ never			☐ agrees ☐ disagrees with:
Conflict between ___(location)___**and …** (other ___(location)___)  *(between locations and within culture)*	☐ between two groups (social, political, etc.) in ___(location)___ (describe)	☐ less than 1 year ago ☐ 5 years ago ☐ more than 5 years ago ☐ rare or never ☐ other:	☐ never violent (0%) ☐ rarely violent (<50%) ☐ often violent (>50%) ☐ always violent (100%)	☐ agrees ☐ disagrees with:
	☐ other _(culture)_cities: (describe)	☐ less than 1 year ago ☐ 5 years ago ☐ more than 5 years ago ☐ rare or never ☐ other:	☐ never violent (0%) ☐ rarely violent (<50%) ☐ often violent (>50%) ☐ always violent (100%)	☐ agrees ☐ disagrees with:
Conflict between ___(culture)___**and …** (other cultures)  *(between cultures)*	☐ never			☐ agrees ☐ disagrees with:
	☐ ___(culture)___ (describe)	☐ less than 1 year ago ☐ 1 to 5 years ago ☐ more than 5 years ago ☐ rare or never ☐ other:	☐ never violent (0%) ☐ rarely violent (<50%) ☐ often violent (>50%) ☐ always violent (100%)	☐ agrees ☐ disagrees with:
	☐ ___(culture)___ (describe)	☐ less than 1 year ago ☐ 1 to 5 years ago ☐ more than 5 years ago ☐ rare or never ☐ other:	☐ never violent (0%) ☐ rarely violent (<50%) ☐ often violent (>50%) ☐ always violent (100%)	☐ agrees ☐ disagrees with:
	☐ other cultural group: (describe)	☐ less than 1 year ago ☐ 1 to 5 years ago ☐ more than 5 years ago ☐ rare or never ☐ other:	☐ never violent (0%) ☐ rarely violent (<50%) ☐ often violent (>50%) ☐ always violent (100%)	☐ agrees ☐ disagrees with:

Social stratification

In the following section, I present the results of the social stratification interview after it was reliability coded.

Question 1: Are there differences in people's status?
A majority of Germans report differences in status, while a majority of Hai||om report no differences in status. See Figure C.1.

Question 2: Are there differences in people's wealth?
All German participants report differences in wealth, while a majority of Hai||om report no differences in wealth. See Figure C.2.

Question 3: Is a person's status/wealth inherited?
A majority of Germans report that a person's status or wealth can be inherited. Hai||om do not report this. The answer from one Hai||om male was excluded due to low reliability. See Figure C.4.

Question 4: Can a person change their status or wealth?
All German participants report that a person can change their status or wealth. A majority of Hai||om also report being able to report their status or wealth. The answer from one Hai||om male was excluded due to low reliability. See Figure C.3.

Conflict

In the following section, I present the results of the conflict interview after it was reliability coded. Given the open structure of the interview, I summarize the data collected with the following three general categories:

- Who is involved in the conflict?
- How often does the conflict take place?
- How violent is the conflict?

Question 1: Are there conflicts between people of this community?
Nearly all participants in both communities report inter-personal conflicts. See Figure C.5.

Question 2: Are there conflicts between this community and other (Hai||om/German) communities?
Nearly all participants in both communities report intra-group conflicts. See Figure C.6.

Question 3: Are there conflicts between (this cultural group) and other cultural groups?
A majority of German participants report conflict or warfare with other cultural groups. Roughly half of the Hai||om report no conflicts or warfare with other cultural groups, while the other half do report them. See Figure C.7.

Question 4: How frequent are the conflicts?
A majority of German participants reported frequent inter-personal conflict, occasional intra-group conflict, and occasional inter-group conflict. A majority of Hai||om participants reported

common inter-personal conflict, common or frequent intra-group conflict, and no inter-group conflict. See Figure C.8 and Figure C.9.

Figure C.1: A majority of Germans report differences in status, while a majority of Hai||om report no differences in status.

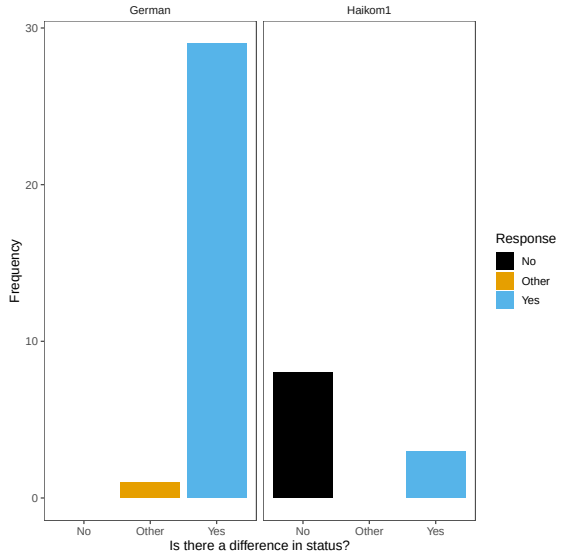


Figure C.2: All German participants report differences in wealth, while a majority of Hai||om report no differences in wealth.

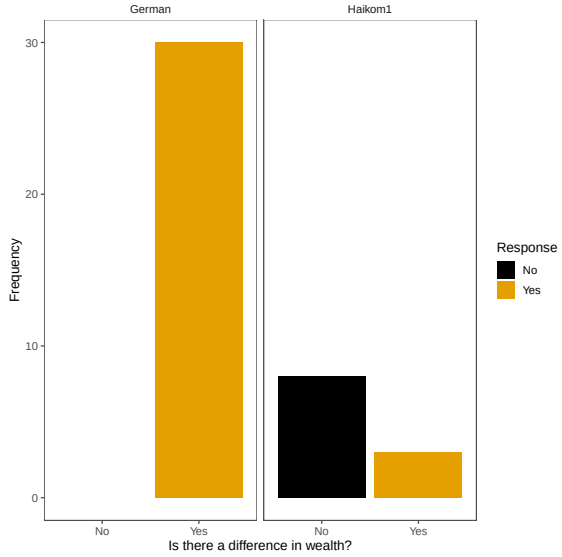


Figure C.3: All German participants report that a person can change their status or wealth. A majority of Hai||om also report being able to report their status or wealth.

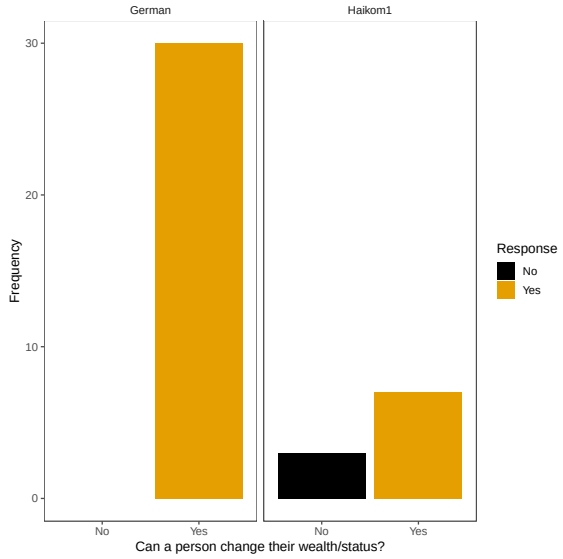


Figure C.4: A majority of Germans report that a person's status or wealth can be inherited. Hai||om do not report this.

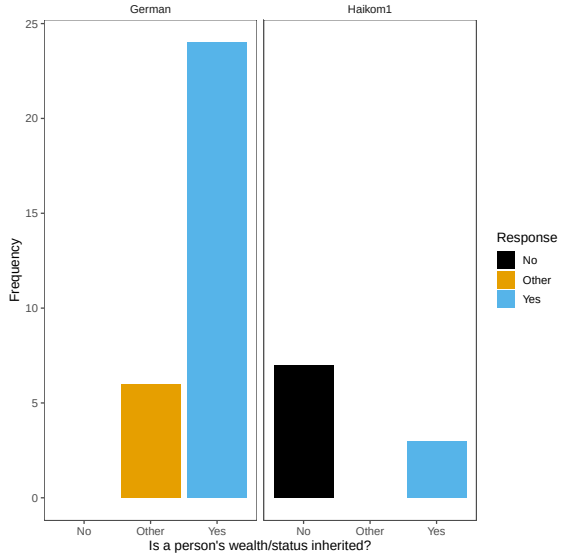


Figure C.5: A summary of the responses regarding inter-personal conflict. Nearly all participants in both communities report intra-personal conflicts.

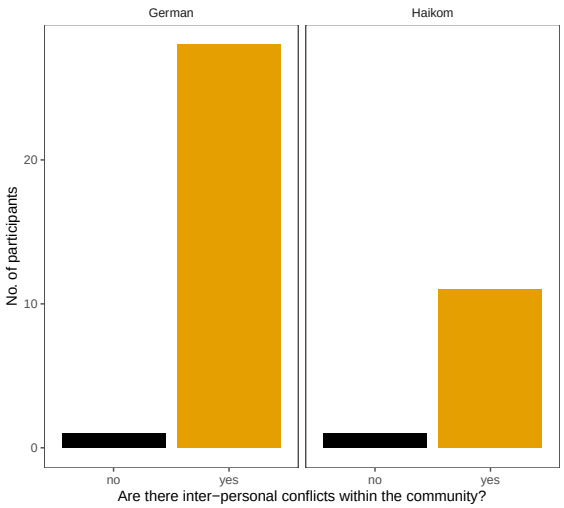


Figure C.6: A summary of the responses regarding intra-group conflict. Nearly all participants in both communities report intra-group conflicts.

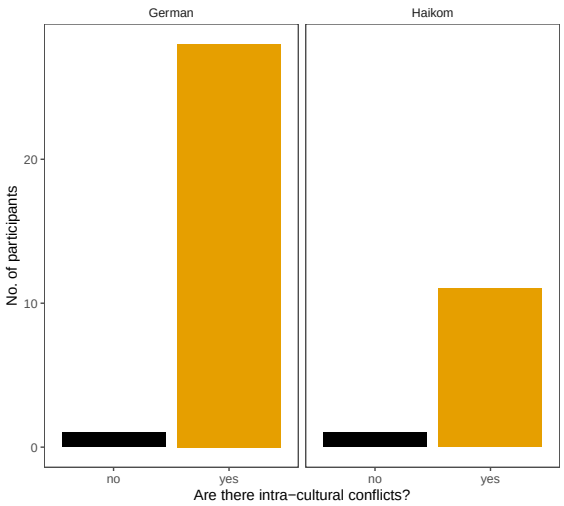


Figure C.7: A summary of the responses regarding inter-group conflict.

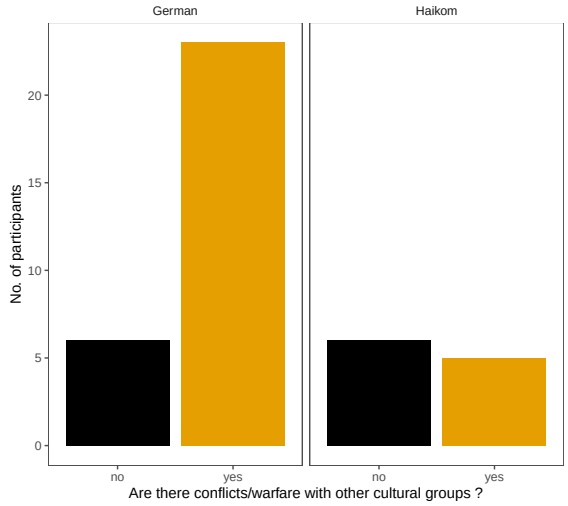


Figure C.8: A summary of the responses regarding the frequency of the three conflict types in German culture.

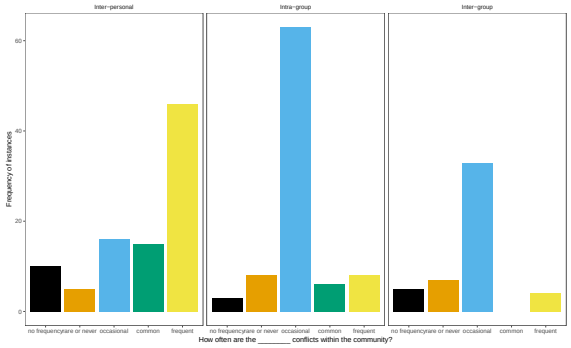
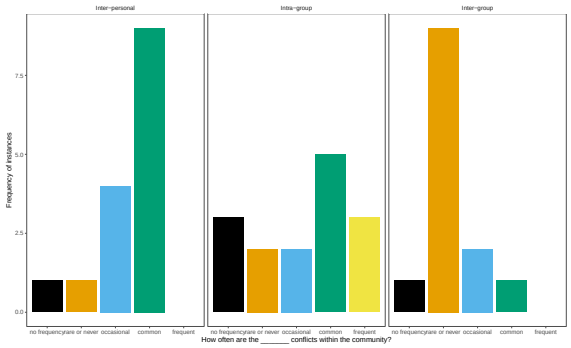


Figure C.9: A summary of the responses regarding the frequency of the three conflict types in Hai||om culture.



Appendix D

Game Interviews

Leipzig Research Center for Early Child Development

Cross-Cultural Games Questionnaire

Introduction to respondent:

My name is _____ . I am working with a research team from Germany. We are doing a survey in order to learn about the kinds of games that people in your village play. For example, I will ask you about how the game is played and what you need to play. We will also take pictures and videos of you playing the game. Your answers will help us understand the kinds of games played in your village. It is ok if you don't have an answer or if you don't want to answer any question. You can also stop this interview at any time and for any reason. If my questions are not clear, please just ask me to explain. If there are any questions you don't want to answer, please just say so.
Would you like to participate? I will need to record some videos and take some pictures. Is this ok? Thank you very much for agreeing to talk with me today.

Date: _____ (Date of written documentation: _____)
Time: _____ Location: _____
Interviewer: _____ Translator: _____

(For interviewer: Please take videos and photos of the game being played!)

GAME DETAILS			
1.	What is the name of the game?		Alternative names:
	Why is it called this?		
2.	Detailed description of the game: How is the game played?		
3.	How many people are needed to play the game?		☐ Unknown

Game name: _____ 1

4.	What kind of materials are used in the game (e.g. stones, board, figurines)?	
5.	Is there a winner of the game?	☐ No ☐ Yes. *If yes, how does one win the game?*
6.	What is the goal of the game? (When does the game end?)	
7.	What are the rules of the game? (What are players not allowed to do?)	
8.	Is this game sometimes played differently (i.e. with different rules or different objects)?	☐ No ☐ Yes. *If yes, how?*
9.	Was the game created by people who live in this village?	☐ Unknown ☐ Yes. *If yes, by whom?* ☐ No. *If no, by whom?*
10.	Has the game been played by people who live in this village since generations?	☐ Played since 3+ generations ☐ Played since 1-2 generations ☐ New game ☐ Unknown
11.	How old are the people that play this game? (Be as specific as possible)	☐ Adults (14-99+) ☐ Children (4-13) ☐ Babies (0-3) ☐ Other:
12.	Do adults and children play the game together?	☐ Yes, both adults and children ☐ No, just adults ☐ No, just children ☐ Other:
13.	Is the game played by males? Females? Do both play the game? Do they play the game together or separately?	☐ Played by just one sex ☐ Females ☐ Males ☐ Played by both sexes, separately ☐ Played by both sexes, together
14.	Is there a special time of the year or a special occasion when the game is played?	☐ Seasonally: ☐ Occasion: ☐ Other:
15.	On how many of the last 10 days did you play the game?	

16.	Do you play the game every day?	☐ Yes ☐ No				
17.	Do you play the game every week?	☐ Yes ☐ No				
18.	What time of the day is the game played?	☐ Any time ☐ Daytime ☐ Nighttime		☐ Unsure ☐ Other:		
19.	Where is the game played?	☐ Anywhere ☐ Schoolyard ☐ Other:		☐ Community house ☐ At home		
SOURCE						
20.	What is your name(s)?	Name:	Name:	Name:	Name:	Name:
21.	How old are you?	Age:	Age:	Age:	Age:	Age:
22.	Where are you from?					
23.	Confidant's sex	☐ Female ☐ Male	☐ Female ☐ Male	☐ Female ☐ Male	☐ Female ☐ Male	☐ Female ☐ Male
24.	When did you last play the game?					
25.	Where/From whom did you learn the game from?					
26.	*If adult:* Did the confidant play the game as a child?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
27.	Is there anything else I should know about the game?	Open answer:				

Record time interview ended: _____

Source(s) of information:	☐ Observation ☐ Participated in game ☐ Confidant familiar with game *(if no, skip questions 20-27)*
How well do you think the confidant(s) understood the questions?	☐ A lot ☐ A little ☐ Not at all
How comfortable do you think the confidant(s) were during the interview?	☐ Very uncomfortable ☐ A little uncomfortable ☐ Comfortable
Common name of the game in English/German: ☐ Unknown	
Please draw the game being played with all objects and people involved in playing. *(on the back page)*	

Game name: _____ 3

Appendix E

Cross-Cultural Variation in Game Preference

E.1 Overview of results

The results of all parts of this project are summarized in Table E.1.

Table E.1: An overview of the current results of the study. *These values are inferred from ethnographies and researcher evaluation, as data collection for the Ovambo was not possible due to COVID-19. "Cultural interview" refers to the cultural interviews described in chapter 4.

	KoKo Game: Children		**KoKo Game: Adults**		**Caretaker Interview**			**Cultural Interview**		
	Choice	Smiling	Choice	Smiling	"**I want** them to play the [XX] game."	"**They would like** to play the [XX] game."	"I play with my children."	Social stratification	Intra-group conflict	Inter-cultural conflict
Hai||om	Competitive	Competitive	No pref.	Competitive	Competitive	Competitive	50%	Egalitarian	Common	Never
Ovambo	No pref.	Cooperative	No pref.	Competitive	Cooperative	Competitive	88%	Highly soc. strat.*	Common*	Rare*
German	Cooperative	Competitive	No pref.	Competitive	No pref.	Competitive	100%	Highly soc. strat.	Frequent	Occasional

E.2 Quasi-experiment KoKo

E.2.1 Methods

The KoKo Game

The participants played a game called KoKo (25cm x 25cm x 7.5cm; see Figure E.1). KoKo used in this study varied slightly from the original (Toppe et al., 2019). KoKo used in this study was re-built from lightweight plywood in the shape of a square (25cm x 25cm x 7.5cm), to ensure durability and transportability and durability of the materials to several sites in Namibia and Germany. The game can be played cooperatively or competitively. Participants moved the game vertically and horizontally with four string loops attached to the corners of the game (42cm); two strings for each participant. The marbles (16mm) were green for the cooperative game and white for the competitive game. A removable level with two holes diagonal to one another was inserted into the game.

The competitive game had two holes of identical size with two different colors (∅ 22mm, blue and red hole). A transparent Plexiglas lid with a hole in the center (∅ 20mm) prevented the marbles from coming out of the game during play. Participants sat on the ground opposite of each other (.5 cm apart, see Figure E.2). A string was attached to the bottom of each game and was wrapped around a stick that the players were seated on. The stick was placed underneath cushions where the participants sat, thus preventing the game from being moved higher than 35cm from the ground. When the game was not in play, the game rested in-between the players on two blocks.

The cooperative game was identical to the competitive game with a few exceptions. The holes differed in size (green: ∅ 22mm, black: ∅ 50mm) and there was a slightly raised edge around the green hole (2mm high), thus making it slightly harder to get the marble into the green hole and easier to get it into the black hole. Because the black hole was much larger than the other holes, a piece of mesh was glued to the bottom of the level to prevent marbles from going back through the black hole if the game was turned upside down.

The points participants earned corresponded to the color of the participant's strings (foam balls ∅ 35mm balls; green, blue, or red). The participants' points were placed in vertical Plexiglas tubes (12cm long, ∅ 5cm; 2 tubes for the competitive game, 1 tube for the cooperative game). A full tube with 3 foam balls or more indicated that the player(s) won the game, but the game was played for 5 rounds.

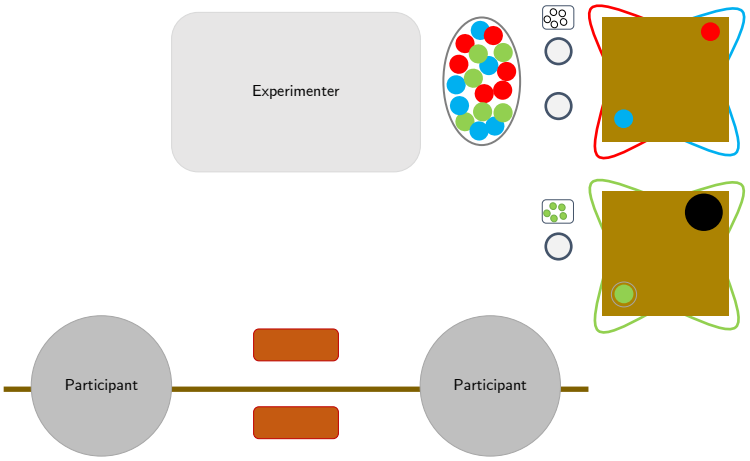
During the experiment, the competitive game was referred to as the "blue and red game". The participants had opposing goals in the competitive game: to get the white marble into their hole (colored either blue or red). If the marble fell into their hole during the competitive game, the respective colored ball was placed into a transparent tube, indicating that the player received a point. The participant who received 3 or more points won the game, while the player who received fewer than 3 points lost the game.

During the experiment, the cooperative game was referred to as the "green game". The par-

ticipants had one mutual goal during the cooperative game: to get the green marble into the green hole. If they did so, a green-colored ball was placed into a transparent tube, indicating that they received a point. If the dyad received 3 or more points, the dyad won the game. If fewer than 3 points were received, the dyad lost the game.

Figure E.1: A drawing of the KoKoPo set-up. The two participants are playing the competitive game and the experimenter is sitting near the participants.

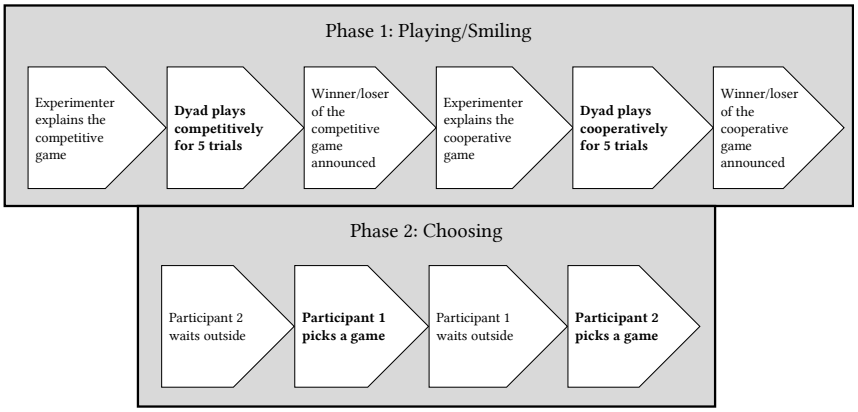
Figure E.2: The experimental set-up from a bird's eye perspective. The two games are visible on the right. The competitive game (blue and red) and the cooperative game (green and black) with their respective colored marbles (white and green) and tubes for the points. The colorful points are in a bag next to the experimenter. The two participants sit opposite each other (bottom of the figure). The participants sit on cushions that are placed on a long stick. Two bricks are used to mark the location of the game when it is in-between the participants.



Procedure

A schematic overview of the procedure can be seen in Figure E.3.

Figure E.3: A schematic overview of the procedure of the quasi-experimental game. For more details see subsubsection E.2.1. The order of the games during the playing phase were counterbalanced (i.e., cooperative and competitive game first) and the order of participants during the choosing phase were randomly selected.



Phase 1: Playing phase

1. Participants sat opposite of each other on a cushion.
2. The experimenter explained the first game to the dyad (first game counterbalanced).
3. A comprehension check ensured that the participants understood the game before they played the first round. Participants were each asked a series of questions regarding the game:
    - "Here is the marble. Which hole do you put it in? Point to the hole."
    - "Do you get a point when it goes into that hole?"
    - "Do you get a point when it goes into the (other) hole?"
    - "Do you win or lose if the tube is full?"
4. Participants played the first game for 5 rounds. When the marble went into one of the holes, the experimenter put the respective colored ball into the respective tube.
5. The experimenter announces the winner(s) and loser(s) of the game.
6. Steps 2-5 are repeated for the second game.

Phase 2: Choosing phase

1. One participant was asked to wait outside. The experimenter placed both games in-front of the participant (placement counterbalanced).
2. The experimenter told the participant they can play the game one more time and asked them whether they want to play the blue and red game or the green game again.

3. After the participant pointed to the game they wanted to play again, they were asked why they wanted to play that game.
4. Steps 1-3 were repeated for the other participant.
5. Both participants re-entered the room and played one of the games again.

Inter-rater reliability

The choosing data, was coded after testing by watching the video recording. The local experimenters and SMLP coded the Namibian data, and the local German experimenter coded the German data.

One main coder (AK) and two reliability coders (Namibian sample: AG, German sample: EM) coded whether or not the participant smiled during game play. AG and AK were blind to hypotheses. The coders were instructed to focus on the facial movements of the participants during play. Each of the 5 trials was divided into 5 second intervals for coders. Coders coded whether the participant smiled during those 5 seconds. For example, if a participant smiled for 1 of the 5 seconds, then that 5 second interval was coded with "Yes". "No" was coded if the participant did not smile within that interval. If the participant's face was not visible during an interval, "NOFACE" was coded and the interval was considered "NA" in the analyses. If the game was not being played or if it was unclear if a participant was smiling (e.g., because they were chewing gum or talking), the interval was coded as "NA". For cases in which coders disagreed, the main coder's code was used for the analyses.

A reliability for the smiling data with local coders (i.e., Ovambo and Hai||om) was attempted, but due to low inter-rater reliability from one coder, German coders were used.

The participants' reasons for choosing the game was coded by two coders (main: SMLP, reliability: NL). The reliability of the reasons coding was excellent (κ = .9).

Table E.2: The inter-rater reliability scores for the smiling data and reasons data. *N* refers to the number of intervals for the smiling data and to the number of participants for the reasons data.

Data	Sample	N	Portion of full sample	kappa
Smiling	Namibian	3867	25.6	0.647
	German	1513	22.5	0.643
Reasons	Overall	124	25.1	0.902

E.2.2 Statistical models

Choosing models (Forced-choice)

The outcome variable of interest, Y, is an individual's (i) choice of game. $Y = \{1, 0\}$ indicates choosing the cooperative (1) or competitive (0) game. I used a bernoulli logistic regression model with a logit link:

$$Y_i \sim \text{Bernoulli}(p_i)$$

where:

$$logit(p_i) = \beta_{0_{Dyad_i}} + \beta_{GOUT_{x_{GOUT_i}}} + \sum_{k \in FE} \beta_k X_k + \beta_{age*cult_i} X_{age_i}$$

$$FE = \{\text{sex, first, order, left}\}$$

I used weak, regularizing and default priors:

$$\beta_{0_{Dyad_i}} \sim \text{Normal}(\ 0,\ \sigma_j\ )$$

$$\beta_{GOUT_{x_{GOUT_i}}} \sim \text{Normal}(\ 0,\ 1.5\ )$$

$$\beta_k \sim \text{Normal}(\ 0,\ 1.5\ )$$

$$\beta_{age*cult} \sim \text{Normal}(\beta_{age},\ \sigma_j)$$

$$\beta_{age} \sim \text{Normal}(\ 0,\ 1.5\ )$$

$$\sigma_j \sim \text{Student\_t}(\ 3,\ 0,\ 2.5\ ),\ j = 1,\ 2$$

$$R \sim \text{LKJ\_corr\_cholesky}(\ 1\ )$$

Smiling models

The outcome variable of interest, S_i, is a binomially distributed outcome variable. Where N_{ij} indicates the number frames with smiles for any given trial (j) and individual (i) in proportion to the number of frames (i.e., the length) in that particular trial for that individual ($p_{i,j}$). I used a binomial logistic regression model with a logit link:

$$S_i \sim \text{Binomial}(N_{ij}, p_{ij})$$

where:

$$logit(p_i) = \beta_{0_{Dyad_i}} + \beta_{0_{ID_i}} + \sum_{k \in FE} \beta_k X_k + \beta_{age*cult_i} X_{age_i} + \beta_{game*cult_i} X_{game_i}$$

$$FE = \{\text{sex, first, order, game, trial outcome, trial}\}$$

I used weak, regularizing and default priors:

$$\beta_{0_{Dyad_i}} \sim \text{Normal}(\ \beta_0,\ \sigma_j\ )$$
$$\beta_{0_{ID_i}} \sim \text{Normal}(\ \beta_0,\ \sigma_j\ )$$
$$\beta_k \sim \text{Normal}(\ 0,\ 1.5\ )$$
$$\beta_{age*cult} \sim \text{Normal}(\beta_{age},\ \sigma_j)$$
$$\beta_{game*cult} \sim \text{Normal}(\beta_{game},\ \sigma_j)$$
$$\beta_{age} \sim \text{Normal}(\ 0,\ 1.5\ )$$
$$\beta_{game} \sim \text{Normal}(\ 0,\ 1.5\ )$$
$$\sigma_j \sim \text{Student\_t}(\ 3,\ 0,\ 2.5\ ),\ j = 1,\ 2,\ 3,\ 4$$
$$R \sim \text{LKJ\_corr\_cholesky}(\ 1\ )$$

E.2.3 Choosing and smiling models

The models are identical to those in the Choosing models section, with the addition of binary smiling preference as a fixed effect (0 = smiled more during competitive game, 1 = smiled more during the cooperative game).

E.3 Results

Table E.3: Raw means and standard deviations in children's smiling behavior. The raw scores are the proportions of smiling in comparison to the length of a trial. The mean and SD are provided for the cooperative and the competitive games.

Culture	Game	Mean	SD
Haikom	Cooperative	0.329	0.428
Haikom	Competitive	0.414	0.441
Ovambo	Cooperative	0.394	0.446
Ovambo	Competitive	0.389	0.429
German	Cooperative	0.399	0.426
German	Competitive	0.688	0.388

E.3.1 Hai||om choices

During data collection, we noticed that the children from the second Hai||om location were picking the cooperative game with a higher frequency than children from the first Hai||om location. To investigate this potential difference statistically, we collected more data from location 2 than the originally planned sample size (8 males and 8 females per age group). We checked for statistically notable differences in the choice of game between the two Hai||om locations.

Table E.4: Raw means and standard deviations in adult's smiling behavior. The raw scores are the proportions of smiling in comparison to the length of a trial. The mean and SD are provided for the cooperative and the competitive games.

Culture	Game	Mean	SD
Haikom	Cooperative	0.736	0.409
Haikom	Competitive	0.902	0.259
Ovambo	Cooperative	0.533	0.472
Ovambo	Competitive	0.787	0.374
German	Cooperative	0.63	0.463
German	Competitive	0.839	0.338

Model comparison showed that a model with an interaction between age and location (full model) and a model without this term location (ageloc) performed similarly to a model with no effect of location (model loc). Game choice did not differ for the two Hai||om locations.

Table E.5: Model comparisons for the Hai||om data. The full model (interaction between age and location), a model with no effect of location (model 1), and a model with a fixed effect of location (model 2).

Model	WAIC	SE	weight
seek_mod_child_haikom_full	183.4	14.24	0.351
seek_mod_child_haikom_ageloc	184.1	13.84	0.247
seek_mod_child_haikom_loc	183.13	14.31	0.402

E.3.2 Reasons for choosing

After participants played both games and chose the game they wanted to play again, they were asked why they chose that particular game. The results of this question are visible in Table E.6, Table E.7, Table E.8, and Table E.9. Only one code was given to each response and the reasons were coded in a hierarchical fashion. For example, if participants mentioned winning the game and the cooperativeness of the game, the cooperativeness of the game was coded. The hierarchy of coding was as follows: coop = comp >winning >tech >other >NA.

"Coop" and "comp" indicate that the participant mentioned the cooperative or competitive aspect of the game, including technical aspects of the game (e.g., how the game is set-up). "Win" indicates that the participant mentioned winning or losing the game. "Tech" indicates that the participant mentioned attributes of the game, other than the cooperative or competitive aspects of the game (e.g., the colors). "Other" indicates that the participant gave a reason, but it was very broad (e.g., "It's good", "I like it"). NA was coded when the participant did not give an answer (not shown in the tables).

The reasons given by children for why they picked the game varied across cultures. A majority of German children report picking the cooperative game because it is cooperative (85%), whereas a majority of Hai||om children report picking the cooperative game for "other" reasons

(58%), and Ovambo children report a variety of reasons (coop: 33%, other: 23%, tech: 31%). Children who picked the competitive game also report a variety of reasons for doing so. German children mostly chose the competitive game because it is competitive (44%), whereas Hai||om and Ovambo children provided"other" reasons (65% and 38%) or mentioned winning and losing (29% and 31%).

When adults were asked why they picked the game, 50% of German adults who picked the competitive game and 83% who picked the cooperative game referred to the goal structure of the game (i.e., the cooperative or competitive nature of the game). This pattern was not present in the two Namibian cultural groups—here, adults chose games for a handful of reasons (e.g., the goal structure of the game, the outcome of the game, or the color of the game). Studies on the psychological and cultural effects on adult gaming behavior are limited and the function of adult play behavior is still debated (P. Gray, 2014). Future studies are necessary to understand the mechanisms underlying adult game preference and how these relate to children's game preferences.

Table E.6: Child responses (N = 237) of why they picked the cooperative game.

	comp	coop	other	tech	win
German	2	86	5	7	1
Haikom	0	1	26	7	11
Ovambo	0	20	14	19	8

Table E.7: Child responses (N = 199) of why they picked the competitive game.

	comp	coop	other	tech	win
German	17	0	9	6	7
Haikom	0	0	46	6	21
Ovambo	9	1	20	6	16

Table E.8: Adult responses (N = 26) of why they picked the cooperative game.

	coop	other	tech	win
German	5	0	1	0
Haikom	2	2	1	3
Ovambo	2	2	6	0

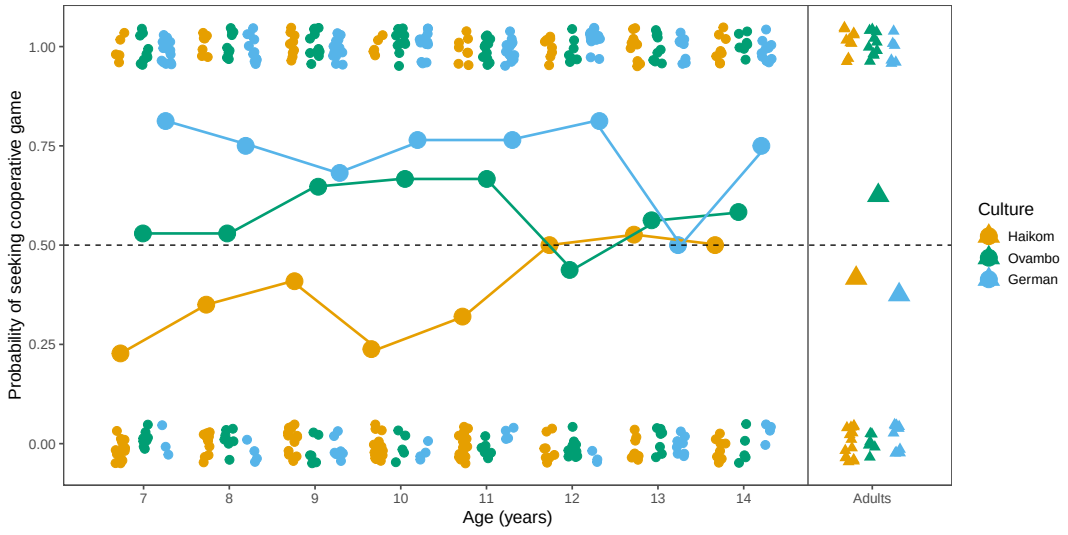
Table E.9: Adult responses (N = 30) of why they picked the competitive game.

	comp	other	tech	win
German	5	2	3	0
Haikom	0	9	2	3
Ovambo	0	4	0	2

E.3.3 Additional plots

See Figure E.4 for the raw choice data, Figure E.5 for the raw smiling data, and Figure E.6 for the posterior probability plots of the smiling data.

Figure E.4: The raw means of children's and adults' choices for games in the three cultural groups with age. Participants could either pick the cooperative game (1) or the competitive game (0). The small dots are jittered around 0 and 1 for visualization purposes and are plotted according to the age in days. The raw mean proportion of choices for adults in each cultural group, irrespective of age, are plotted on the right-hand side of the plot (i.e., the large triangles). *Note:* Children's age is grouped for the means shown in this plot (i.e., 7-year-olds, 8-year-olds, etc.), but was continuous in the model (i.e., in days).



E.3.4 Game Outcome

Choosing a game may not be directly indicative of game preference, but also a strategic decision on an individual level. Children did not simply pick the game that they won—children who lost the competitive game and won the cooperative game chose to play the cooperative game with a higher probability. The other combinations of winning and losing the cooperative and competitive games did not affect children's choice of game. Previous research on the effects of winning and losing during competitive and cooperative situations is mixed. Some previous research suggests that children who lose in competitive situations, but are a part of successful

Figure E.5: The raw means of children's smiling during games in the three cultural groups with age. Each dot is a participant and are plotted according to the age in days. The line represents the smoothest trend for each game ('*loess*' function in ggplot).

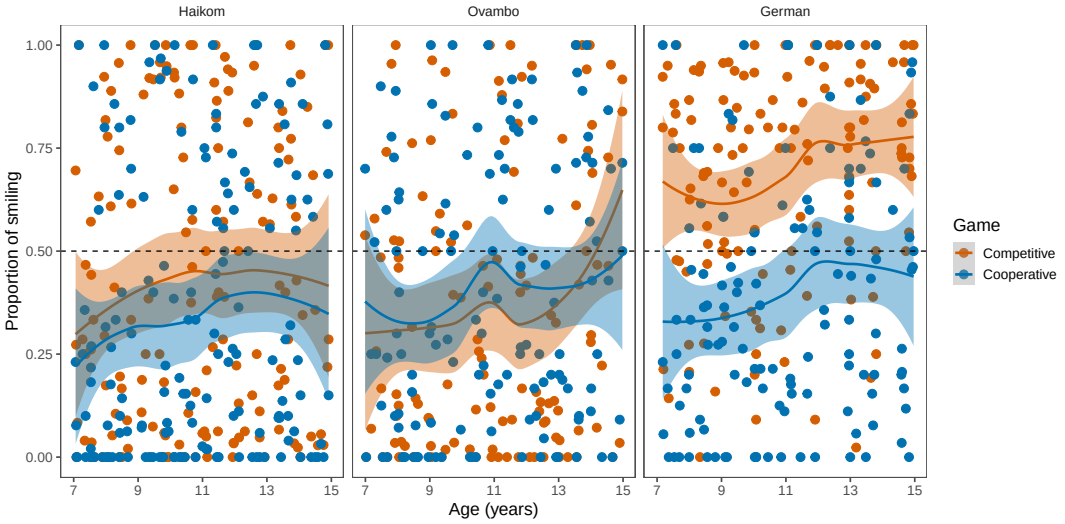
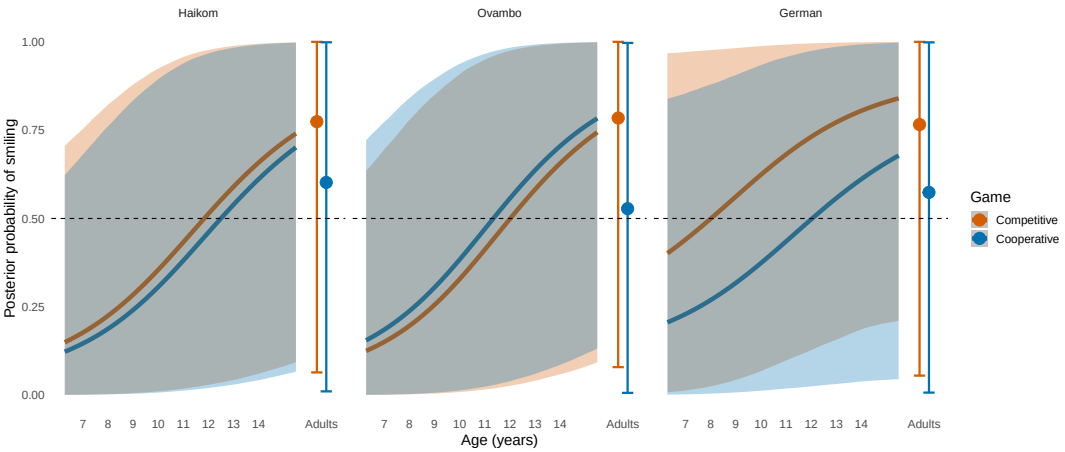


Figure E.6: The posterior probability and 90% credible intervals of children and adults smiling behavior.



cooperative group situation, had higher self-esteem following this cooperative situation (Ames, 1981). Children also reported their ability at the task to be higher, were more satisfied with their performance, and felt more deserving of reward following the successful cooperative situation than the unsuccessful competitive situation (Ames, 1981). Motivation and effort are also higher in cooperative goal structures in comparison to competitive situations (Peng & Hsieh, 2012). Other studies suggest that after losing a competitive game, players spend more of their free time engaging in the game than players who won the game (Vansteenkiste & Deci, 2003); although this study only focused on a competitive scenario, so it remains unclear how this may apply to cooperative games. However, as the focus of the current study was on group-level explanations in game preference, I refrain from interpreting this finding at the individual level in further detail. Future studies interested in children's game preferences at the cultural level should control for the outcome of the games or measure the effect of these outcomes on children's game preferences.

E.3.5 Game Length

The duration of game trials varied across dyads. The full smiling model fit the smiling behavior for shorter trials (5 - 25 intervals; each interval is up to 5 seconds) better than for longer trials (>25 intervals; see Figure E.7). To further investigate the effect of this skew in trial length on the model behavior, I ran a reduced model with game trials that were less than or equal to 12 intervals (i.e., $\leqslant$ 1 minute long trials).

To investigate whether the length of the game influence children's and adults' choices of games, I ran a full model with the length of both games (full), without the length of the cooperative game but with the competitive game (coop), without the length of the competitive game but with the cooperative game (comp), and without the length of either game (null). The length of the game did not influence the game that children (Table E.10), nor adults (Table E.11) chose to play again.

Figure E.7: The length of a trial (i.e., number of 5 second intervals) plotted against the full model residuals for children's smiling behavior.

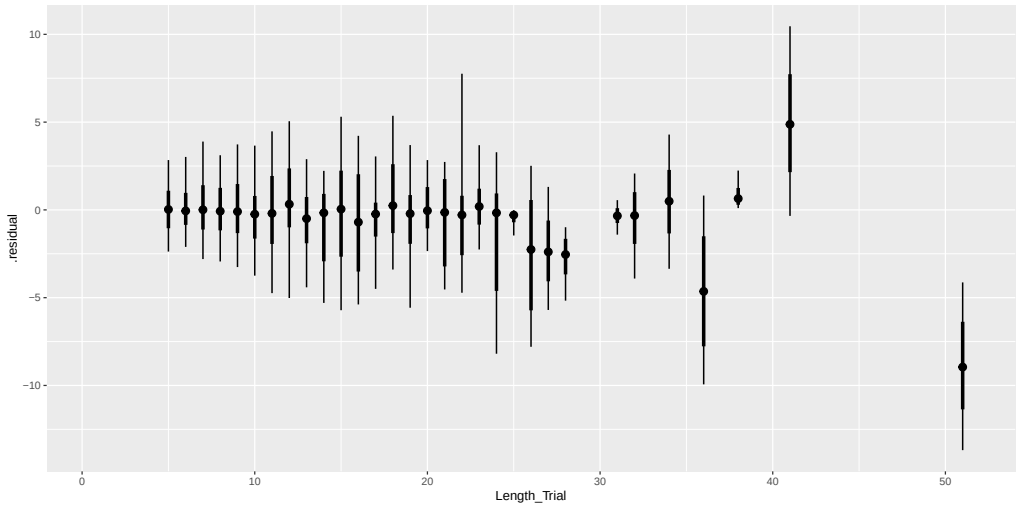


Table E.10: Model comparisons of children's choice behavior with the length of both games (full), without the length of the cooperative game (coop), without the length of the competitive game (comp), and without the length of either game (null).

Model	WAIC	SE	weight
seeklength_mod_child_full	514.93	19.26	0.193
seeklength_mod_child_null_coop	512.38	19.06	0.087
seeklength_mod_child_null_comp	518.47	18.41	0.688
seeklength_mod_child_null	516.52	18.26	0.033

Table E.11: Model comparisons of adults' choice behavior with the length of both games (full), without the length of the cooperative game (coop), without the length of the competitive game (comp), and without the length of either game (null).

Model	WAIC	SE	weight
seeklength_mod_adult_full	85.34	7.97	0.245
seeklength_mod_adult_null_coop	85.38	7.49	0.263
seeklength_mod_adult_null_comp	85.28	7.4	0.24
seeklength_mod_adult_null	85.2	6.87	0.253

Trial outcome and trial length

The length of the trials had a grave impact on children's smiling behavior during games, but not on the participants' choices of games (see Table E.10 and Table E.11). The longer the game proceeded, the less children smiled. The longest competitive game (251 seconds) was nearly twice as long as the longest cooperative game (124 seconds). I did not experimentally control for the duration of the game trials, but I did so statistically. I also tried to manipulate the difficulty of the cooperative game to match that of the competitive game by making the black hole in the cooperative game much larger than the green hole. Thereby increasing the probability with which the marble would roll into the black hole and preventing the players from easily getting a mutual point. However, the duration of the cooperative game was shorter on average than the competitive game, indicating that the manipulation of the difficulty of the cooperative game was unsuccessful.

Additionally, the effect of trial outcome in the current study should be interpreted with caution, given the positive skew of the length of the game trials. To investigate this effect further, I subsetted the dataset to include only the trials that were one minute long or shorter. Then, I compared two models using this reduced dataset: one with the trial outcome as a predictor and one without this predictor. The reduced model with trial outcome as a predictor performed better than the reduced model without trial outcome as a predictor (see Table E.12 for model comparison). This suggests that the outcome of the trial may have affected how much the children smiled during the games.

E.3.6 Model comparisons

The results of the model comparisons are presented in the tables Table E.13 to Table E.47.

Table E.12: Model comparisons of a reduced model (i.e., $\leqslant$ 1 minute long trials) with (full) and without trial outcome (trout; i.e., winning or losing the trial) for the children's smiling data. As the trials got longer, the residuals generally got larger (i.e., model predictions decreased in accuracy).

Model	WAIC	SE	weight
like_mod_child_full_red	7500.54	143.92	1
like_mod_child_trout_-red	8930.86	152.04	0

Full models for choice behavior included predictors for sex (contrast coded), age (in days, centered), the game played first (contrast coded), the order in which participants picked a game (contrast coded), game on the left (contrast coded), game outcome, random intercepts for dyad, and random intercepts for culture varying with age (in days, centered).

Full models for smiling behavior included predictors for sex (contrast coded), age (in days, centered), first (contrast coded), the game (contrast coded), trial outcome (contrast coded), trial number (centered), random intercepts for dyad and ID, and random intercepts for culture varying with age (in days, centered) and game (contrast coded).

Full models for choice and smiling behavior included the same predictors as for the full choice models mentioned above, with the addition of a binary smiling preference predictor (i.e., which game did participants smile more during).

Full models for Hai||om choice behavior included predictors for sex (contrast coded), age (in days, centered), the game played first (contrast coded), the order in which participants picked a game (contrast coded), game on the left (contrast coded), game outcome, random intercepts for dyad, and random intercepts for location varying with age (in days, centered).

Table E.13: Model comparisons of a model with (full) and without the effect of culture (cult) for the children's choice data.

Model	WAIC	SE	weight
seek_mod_child_full	525.51	18.16	1
seek_mod_child_cult	554.71	14.35	0

Table E.14: Model comparisons of a model with (full) and without the effect of age (age) for the children's choice data.

Model	WAIC	SE	weight
seek_mod_child_full	525.51	18.16	0.433
seek_mod_child_age	524.97	17.89	0.567

Table E.15: Model comparisons of a model with (full) and without varying intercepts of culture and varying slopes of age (agecult) for the children's choice data.

Model	WAIC	SE	weight
seek_mod_child_full	525.51	18.16	0.669
seek_mod_child_agecult	526.91	18.01	0.331

Table E.16: Model comparisons of a model with an effect of dyad (full) and a model without this term (dyad) for the children's choice data.

Model	WAIC	SE	weight
seek_mod_child_full	525.51	18.16	0.302
seek_mod_child_dyad	523.84	18.18	0.698

Table E.17: Model comparisons of a model with an effect of game outcome (full) and a model without this term (GOUT) for the children's choice data.

Model	WAIC	SE	weight
seek_mod_child_full	525.51	18.16	0.991
seek_mod_child_GOUT	534.82	15.91	0.009

Table E.18: Model comparisons of a model with an effect of the game played first (full) and a model without this term (first) for the children's choice data (i.e., the game played first for any given dyad).

Model	WAIC	SE	weight
seek_mod_child_full	525.51	18.16	1
seek_mod_child_first	546.12	16.01	0

Table E.19: Model comparisons of a model with an effect of sex (full) and a model without this term (sex) for the children's choice data.

Model	WAIC	SE	weight
seek_mod_child_full	525.51	18.16	0.335
seek_mod_child_sex	524.14	18.04	0.665

Table E.20: Model comparisons of a model with choice order (full) and a model without this term (order) for the children's choice data.

Model	WAIC	SE	weight
seek_mod_child_full	525.51	18.16	0.28
seek_mod_child_order	523.62	18.03	0.72

Table E.21: Model comparisons of a model with the game on the left during the choice phase (full) and a model without this term (left) for the children's choice data.

Model	WAIC	SE	weight
seek_mod_child_full	525.51	18.16	0.26
seek_mod_child_left	523.42	18.06	0.74

Table E.22: Model comparisons of children's smiling with (full) and without random intercepts of culture (cult).

Model	WAIC	SE	weight
like_mod_child_full	8458.68	165.12	1
like_mod_child_cult	8840.06	177.85	0

Table E.23: Model comparisons of children's smiling with (full) and without game as a predictor (game).

Model	WAIC	SE	weight
like_mod_child_full	8458.68	165.12	1
like_mod_child_game	8997.05	174.11	0

Table E.24: Model comparisons of children's smiling with (full) and without random slopes of game across cultures (game2).

Model	WAIC	SE	weight
like_mod_child_full	8458.68	165.12	1
like_mod_child_game2	8996.69	174.07	0

Table E.25: Model comparisons of children's smiling with (full) and without age as a predictor (age2.

Model	WAIC	SE	weight
like_mod_child_full	8458.68	165.12	0.653
like_mod_child_age	8459.94	165.12	0.347

Table E.26: Model comparisons of children's smiling with (full) and without random slopes of age across cultures (age2).

Model	WAIC	SE	weight
like_mod_child_full	8458.68	165.12	1
like_mod_child_age2	8838.19	177.62	0

Table E.27: Model comparisons of children's smiling with (full) and without trial outcome as a predictor (trout).

Model	WAIC	SE	weight
like_mod_child_full	8458.68	165.12	1
like_mod_child_trout	9952.08	176.55	0

Table E.28: Model comparisons of children's smiling with (full) and without trial number as a predictor (trial).

Model	WAIC	SE	weight
like_mod_child_full	8458.68	165.12	1
like_mod_child_trial	9268.37	186.43	0

Table E.29: Model comparisons of children's smiling with (full) and without the game played first (first).

Model	WAIC	SE	weight
like_mod_child_full	8458.68	165.12	0.69
like_mod_child_first	8460.28	165.2	0.31

Table E.30: Model comparisons of children's smiling with (full) and without sex as a predictor (sex).

Model	WAIC	SE	weight
like_mod_child_full	8458.68	165.12	0.622
like_mod_child_sex	8459.68	165.14	0.378

Table E.31: Model comparisons of children's choice behavior with (full) and without (null) children's smiling as a (binary) predictor.

Model	WAIC	SE	weight
seeklike_mod_child_full	518.63	18.37	0.262
seeklike_mod_child_null	516.56	18.29	0.738

Table E.32: Model comparisons of a model with (full) and without an effect of culture (cult) for the adults' choice data.

Model	WAIC	SE	weight
seek_mod_adult_full	86.64	6.7	0.463
seek_mod_adult_cult	86.34	5.66	0.537

Table E.33: Model comparisons of a model with (full) and without an effect of age (age) for the adults' choice data.

Model	WAIC	SE	weight
seek_mod_adult_full	86.64	6.7	0.482
seek_mod_adult_age	86.49	5.99	0.518

Table E.34: Model comparisons of a model with (full) and without varying intercepts of culture and varying slopes of age (agecult) for the adults' choice data.

Model	WAIC	SE	weight
seek_mod_adult_full	86.64	6.7	0.508
seek_mod_adult_agecult	86.71	6.27	0.492

Table E.35: Model comparisons of a model with (full) and without a fixed effect of game outcome (GOUT) for the adults' choice data.

Model	WAIC	SE	weight
seek_mod_adult_full	86.64	6.7	0.262
seek_mod_adult_GOUT	84.57	6.14	0.738

Table E.36: Model comparisons of a model with (full) and a model without the "order" predictor (order; i.e., the order in which individuals picked games for any given dyad) for the adults' choice data.

Model	WAIC	SE	weight
seek_mod_adult_full	86.64	6.7	0.257
seek_mod_adult_order	84.52	6.37	0.743

Table E.37: Model comparisons of a model with (full) and without the "first" predictor (first; i.e., the game played first for any given dyad) for the adults' choice data.

Model	WAIC	SE	weight
seek_mod_adult_full	86.64	6.7	0.421
seek_mod_adult_first	86.01	6.34	0.579

Table E.38: Model comparisons of a model with and without a fixed effect of "sex" (sex) for the adults' choice data.

Model	WAIC	SE	weight
seek_mod_adult_full	86.64	6.7	0.491
seek_mod_adult_sex	86.56	6.32	0.509

Table E.39: Model comparisons of a model with and without an effect of the game on the left during choosing (left) for the adults' choice data.

Model	WAIC	SE	weight
seek_mod_adult_full	86.64	6.7	0.426
seek_mod_adult_left	86.05	6.3	0.574

Table E.40: Model comparisons of adults' smiling with (full) and without random intercepts of culture (cult).

Model	WAIC	SE	weight
like_mod_adult_full	805.57	62.39	0.77
like_mod_adult_cult	807.99	62.52	0.23

Table E.41: Model comparisons of adults' smiling with (full) and without game (game).

Model	WAIC	SE	weight
like_mod_adult_full	805.57	62.39	1
like_mod_adult_game	940.75	63.75	0

Table E.42: Model comparisons of adults' smiling with (full) and without random slopes of game across cultures (game2).

Model	WAIC	SE	weight
like_mod_adult_full	805.57	62.39	1
like_mod_adult_game2	941.89	63.76	0

Table E.43: Model comparisons of adults' smiling with (full) and without sex as a predictor (sex).

Model	WAIC	SE	weight
like_mod_adult_full	805.57	62.39	0.739
like_mod_adult_sex	807.65	62.41	0.261

Table E.44: Model comparisons of adults' smiling with (full) and without the game played first as a predictor (first).

Model	WAIC	SE	weight
like_mod_adult_full	805.57	62.39	0.753
like_mod_adult_first	807.8	62.34	0.247

Table E.45: Model comparisons of adults' smiling with (full) and without trial outcome as a predictor (trout).

Model	WAIC	SE	weight
like_mod_adult_full	805.57	62.39	1
like_mod_adult_trout	1000.42	68.56	0

Table E.46: Model comparisons of adults' smiling with (full) and without trial number as a predictor (trial).

Model	WAIC	SE	weight
like_mod_adult_full	805.57	62.39	0.86
like_mod_adult_trial	809.2	62.56	0.14

Table E.47: Model comparisons of adults' choice behavior with (full) and without adults' smiling as a (binary) predictor (null).

Model	WAIC	SE	weight
seeklike_mod_adult_full	86.63	7.36	0.299
seeklike_mod_adult_null	84.93	6.91	0.701

E.4 Caretaker interview

The same adults who participated in the experimental game (KoKo)also participated in the games questionnaire. Responses to the questions are plotted in Figure E.8, Figure E.9, and Figure E.10. See Figure E.11 for details on the interview.

Figure E.8: Caretakers' responses to whether or not they play with their child(ren).

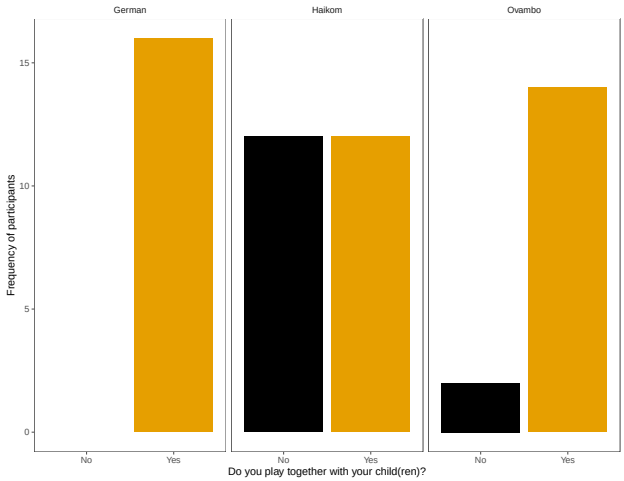


Figure E.9: Caretakers' responses to which games they want their child(ren) to play.

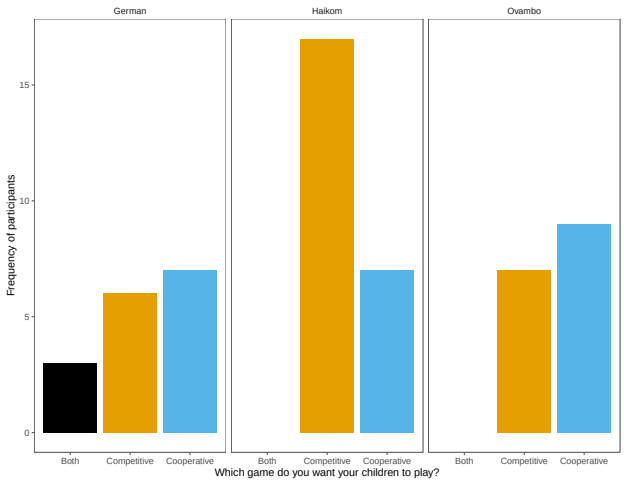


Figure E.10: Caretakers' responses to which games they think their child(ren) are likely to play.

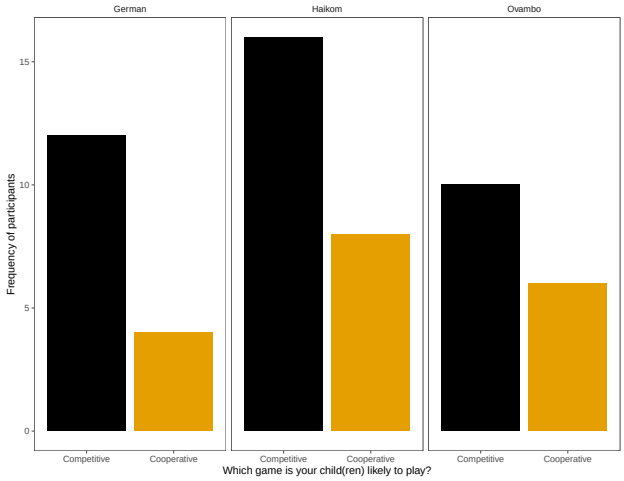


Figure E.11: The caretaker interview conducted with caretakers post-experiment.

Games Q

Date: _____ **Experimenter(s)**: _____

Culture: Hai||om Owambo German **Location**: _____

Dyad Nr.: _____ **Sex**: M F Mix

I will ask you a few questions about what you think about the games your children play. I would like you to answer what you think and believe, and not what you think I want to hear. I would like to learn about the games your culture plays and your personal beliefs.

	Name of adult:	**Age**:	**Sex**: ☐ M ☐ F	**Shirt color**:
1	How many children live in your house?			
2	**What are your children's …names?**	**…ages?**	**…sex?**	
			☐ Male ☐ Female	
			☐ Male ☐ Female	
			☐ Male ☐ Female	
			☐ Male ☐ Female	
			☐ Male ☐ Female	
			☐ Male ☐ Female	
			☐ Male ☐ Female	
			☐ Male ☐ Female	
			☐ Male ☐ Female	
			☐ Male ☐ Female	
3	Do you play with your children?	☐ Yes (if yes → Q4) ☐ No (if no → Q5)		
4	How often did you play with your children in the last 10 days?	☐ Daily ☐ Not at all ☐ Other:		
5	Do you tell your children which games they can play?	☐ Yes ☐ No		
6	Which game would your children *most likely* play? Please point to which game your children would most likely play.	☐ Green ☐ Red/Blue Why?		
7	Which game do you *want* your children to play? Please point to which game you want your children to play.	☐ Green ☐ Red/Blue Why?		
8	What would you say to your children, if they played this game? [point to the game that wasn't picked in previous question]	Open answer:		

General Comments:

1

Summary

Several species of animals play—it is a safe way for them to practice behaviors and skills they need for their daily lives. Humans also spend much of their young lives playing, acquiring culture-specific skills. Remarkably, humans are the only animals that participate in rule-based games. Rule-based games are a specific form of play that involves goal-directed actions governed by predefined rules and are played by both children and adults. Previous research examining the phylogenetic and ontogenetic functions of play has often excluded games from its studies (e.g., Pellegrini et al., 2007; P. Smith, 2005). As such, the potential function that games might have in human society has not been adequately examined. One possible function of games is the transmission of culturally specific knowledge to group members. Subsequently, the distribution of games might be related with cultural norms. However, before we can postulate the ultimate mechanism of games, it is first important to understand how games are played and distributed across cultures. In what follows, I refer only to rule-based games.

The distribution of games is not random (Chick, 2015), but varies with factors such as war and religious practices (J. M. Roberts et al., 1959), the geographic location of cultures (Mogel, 2008), and child-rearing practices (J. M. Roberts & Sutton-Smith, 1962). Previous observational studies also suggest that cultures that emphasize cooperation and egalitarianism prefer games that are cooperative rather than competitive (Ager, 1976; Eifermann, 1970; Boyette, 2016a). Thus, games could be a mechanism to ensure the transmission and maintenance of cooperation. However, studies that have examined the relationship between the cooperativeness of cultures and cooperative aspects of games have focused on one or two cultures and have been based primarily on observations, thereby limiting the generalizability of this potential relationship.

In this dissertation, I investigate the relationship between the cooperative nature of games and the cooperativeness of cultural groups. Using a breadth of methodological approaches, I aim to find out how different types of games are distributed across cultures. Following the general introduction, there are two main parts of this dissertation. In Part I (chapters 2-3), I take a historical approach and examine the relationship between games and cultural aspects in 25 ethnolinguistic groups located in the Pacific region and belonging to the Austronesian language phylogeny. In Part II (chapters 4-6), I focus on the relationship between games and cultural aspects in three modern-day cultural groups that vary in their cultural levels of cooperation.

Part I: Historical games and cooperation in Austronesia

In chapter 2, I sort through ethnographic records, historical documents, and other sources to find descriptions of games played by ethnolinguistic groups in the Austronesian language

phylogeny. I conglomerate these brief game descriptions to create an open-access, relational database containing 907 historical games—the Austronesian Game Taxonomy. Furthermore, I present the definition of games used in this dissertation, which includes both cooperative and non-cooperative activities. I also develop a coding scheme for assessing the degree of structural cooperativeness in games—the "goal structure" of games—and apply it to the historical games in the Austronesian Game Taxonomy. This goal structure coding scheme assesses the cooperative, competitive, and solitary organization of players in any given game. Furthermore, I find that the distribution of games with differing goal structures varies within the Austronesian language phylogeny.

In chapter 3, I examine whether the distribution of historical games from the Austronesian Game Taxonomy is related to the cultural levels of cooperation in 25 Austronesian ethnolinguistic groups. For this, I draw on six factors for group-level cooperation: interdependence in subsistence (i.e., land-based hunting in groups and water-based hunting and fishing in groups), social stratification, and conflict (i.e., intra-group conflict, inter-group conflict, and intercultural conflict). I find that cooperative games are more frequent than competitive games in cultures with inter-cultural conflict and land-based hunting in groups, and less frequent in cultures with intra-group conflict. The goal structure of games is not associated with social stratification nor water-based hunting and fishing in groups. These findings suggest that games are related to some socio-ecological settings of cultural groups and may play a functional role in the transmission of group-specific norms in childhood.

Part II: Games and cooperation in modern cultural groups

In chapter 4, I describe three cultural groups: the Hai||om and the Ovambo in Namibia and the Germans in Leipzig, Germany. I develop and conduct three semi-structured interviews that assess basic information about the groups, their levels of social stratification, as well as intra-group conflict and inter-cultural conflict. The Hai||om identify as an egalitarian group in which intra-group conflicts are common and inter-cultural conflicts do not occur. The Germans in Leipzig report being a highly socially stratified group in which intra-group conflict is frequent and inter-cultural conflict is occasional. Due to the outbreak of the COVID-19 pandemic, I was unable to conduct the interviews with the Ovambo; therefore, I draw on information from other sources for this cultural group. The Ovambo are described as a highly socially stratified group in which intra-group conflict is common and inter-cultural conflict is rare (Brown, 2013; Malan, 1995).

In chapter 5, I develop a cross-cultural game interview and use it to capture various details of games in the three cultural groups. I elaborately describe 16 Hai||om games and seven Ovambo games. I observe mostly games with a competitive structure, but I also observe solitary and cooperative games. Several of the games I describe are also played in other cultural groups

around the world.

In chapter 6, I use a quasi-experimental approach to examine the relationship between game preference and cultural levels of cooperation among Hai||om and Ovambo in Namibia, and Germans in Leipzig. Seven to 14-year-old children (n = 438) and adults (n = 56) play a game called 'KoKo' that can be played cooperatively or competitively by two players. While participants play the games, I measure how often they smile to determine which variant (cooperative or competitive) they enjoy playing more. After playing each variation of the game five times with a partner, the children indicate which variation they would like to play again. I find cross-cultural variation in children's game preferences, but none in adults. Hai||om children prefer the competitive game, German children choose the competitive game, but smile more often during the cooperative game, and Ovambo children choose both variants with similar frequency, but smile more often when playing cooperatively. Adult caregivers from all three cultures prefer the competitive game. Children's game preferences do not vary systematically with cultural levels of conflict nor social stratification. In addition to the quasi-experiment, I interviewed adults about their attitudes toward children's play and games. Adults from cultures where children's action autonomy is high (Hai||om) report playing with their children less often than adults from cultures where children have low action autonomy (Germans). In the discussion, I elaborate on possible explanations for the quasi-experimental findings and suggest improvements for future research.

Taken together, this dissertation contributes the following to previous cross-cultural research of games. First, I develop an open-access database of historical games, a cross-cultural interview of games, and detailed descriptions of Hai||om and Ovambo games. Second, I examine the relationship between the goal structure of games and several proxies for cultural levels of cooperation. The studies show mixed support for a relationship between the cooperativeness of games and the level of conflict. However, neither study provides evidence for a relationship between the goal structure of games and social stratification.

In the general discussion (chapter 7), I discuss several possible explanations for my study findings. I also elaborate on other aspects of games and cultures that might explain the distribution of games across cultures. Further research is needed to fully understand how games are distributed across different cultures and ultimately, why only humans play games. I conclude by discussing possible future avenues and methodological improvements for the cross-cultural study of games.

Zusammenfassung

Mehrere Tierarten spielen — es ist eine sichere Möglichkeit für sie, um Verhaltensweisen und Fähigkeiten zu üben, die sie für ihr tägliches Leben benötigen. Auch Menschen verbringen einen Großteil ihres jungen Lebens mit Spielen und erwerben dabei kulturspezifische Fähigkeiten. Bemerkenswert ist, dass der Mensch das einzige Tier ist, das sich an regelbasierten Spielen beteiligt. Regelbasierte Spiele (Englisch:'Games') sind eine bestimmte Form des Spielens (Englisch: 'Play'), bei der es sich um zielgerichtete Handlungen handelt, die durch vordefinierte Regeln gesteuert werden und sowohl von Kindern als auch von Erwachsenen gespielt werden. Bisherige Forschung, die die phylogenetischen und ontogenetischen Funktionen des Spielens untersuchte, hat Regelspiele oft aus ihren Studien ausgeschlossen (e.g., Pellegrini et al., 2007; P. Smith, 2005). Daher ist die potenzielle Funktion, die Regelspiele in der menschlichen Gesellschaft haben könnten, noch nicht ausreichend erforscht. Eine mögliche Funktion von Spielen ist die Weitergabe von kulturspezifischem Wissen an Gruppenmitglieder. In der Folge würde die Verbreitung von Spielen und kulturellen Normen einen Zusammenhang zeigen. Bevor wir jedoch den ultimativen Mechanismus von Regelspielen untersuchen können, ist es zunächst wichtig zu verstehen, wie Regelspiele in verschiedenen Kulturen gespielt und weitergetragen werden. Im Folgenden beziehe ich mich nur auf regelbasierte Spiele.

Die weltweite Verbreitung von Regelspielen ist nicht zufällig (Chick, 2015), sondern hängt von Faktoren wie Krieg und religiösen Praktiken (J. M. Roberts et al., 1959), der geografischen Lage der Kulturen (Mogel, 2008) und den Erziehungspraktiken (J. M. Roberts & Sutton-Smith, 1962) ab. Frühere Beobachtungsstudien deuten auch darauf hin, dass Kulturen, die Kooperation und Egalitarismus betonen, Regelspiele präferieren, die kooperativ und nicht kompetitiv sind (Ager, 1976; Eifermann, 1970; Boyette, 2016a). Regelspiele könnten also ein Mechanismus sein, der die Übertragung und Aufrechterhaltung von Kooperation sicherstellt. Studien, die die Beziehung zwischen der Kooperationsbereitschaft von Kulturen und kooperativen Aspekten von Spielen untersucht haben, konzentrieren sich jedoch auf eine oder zwei Kulturen und basieren hauptsächlich auf Beobachtungen, was deren Generalisierbarkeit eingeschränkt.

In der vorliegenden Dissertation untersuche ich die Beziehung zwischen dem kooperativen Charakter von Regelspielen und der Kooperationsbereitschaft von kulturellen Gruppen. Dabei möchte ich herausfinden, wie verschiedene Arten von Regelspielen kulturell verteilt sind. Zur Beantwortung dieser Frage verwende ich ein breites Spektrum an methodischen Ansätzen. Nach

einer allgemeinen Einleitung folgen zwei Hauptteile. Im ersten Hauptteil (Kapitel 2 bis Kapitel 3) untersuche ich diese Beziehung zwischen Regelspielen und kulturellen Aspekten aus einer historischen Perspektive in 25 ethnolinguistischen Gruppen, die im pazifischen Raum angesiedelt sind und zur austronesischen Sprachphylogenie gehören. Im zweiten Hauptteil (Kapitel 4 bis Kapitel 6) konzentriere ich mich auf die Beziehung zwischen Regelspielen und kulturellen Aspekten in drei modernen kulturellen Gruppen, die sich in ihrem kulturellen Kooperationsgrad unterscheiden.

Teil I: Historische Regelspiele und Kooperation in Austronesien

In Kapitel 2 sichte ich ethnographische Aufzeichnungen, historische Dokumente und andere Quellen, um Beschreibungen von Spielen zu finden, die von ethnolinguistischen Gruppen in der austronesischen Sprachphylogenie gespielt wurden. Durch eine Zusammenfassung dieser kurzen Spielbeschreibungen erstelle ich eine frei zugängliche, relationale Datenbank mit 907 historischen Spielen: die Austronesian Game Taxonomy. Weiterhin stelle ich die in dieser Dissertation angewandte Definition von Spielen vor, die sowohl kooperative als auch nicht-kooperative Aktivitäten einschließt. Außerdem entwickle ich ein Kodierungsschema zur Bewertung des Grades der strukturellen Kooperativität in Spielen - die "Goal Structure" (Deutsch: Zielstruktur) von Spielen - und wende es auf die historischen Spiele in der Austronesian Game Taxonomy an. Dieses Goal Structure-Kodierungsschema bewertet die kooperative, kompetitive und solitäre Organisation der Spieler/-innen in einem Spiel. Weiterhin finde ich heraus, dass die Verteilung von Spielen mit unterschiedlichen Goal Structures innerhalb der austronesischen Sprachphylogenie variiert.

In Kapitel 3 untersuche ich, wie die Verteilung historischer Spiele aus der Austronesian Game Taxonomy mit dem kulturellen Kooperationsniveau der 25 austronesisch ethnolinguistischen Gruppen zusammenhängt. Dafür ziehe ich sechs Faktoren für Kooperation auf der Gruppenebene heran: Interdependenz in der Subsistenz (d.h. landbasierte Jagd in Gruppen sowie wasserbasierte Jagd und Fischerei in Gruppen), soziale Stratifizierung und Konflikt (d.h. gruppeninterner Konflikt, gruppenübergreifender und interkultureller Konflikt). Ich stelle fest, dass kooperative Spiele in Kulturen mit interkulturellen Konflikten und landbasiertem Jagen in Gruppen häufiger vorkommen als kompetitive Spiele, und weniger häufig in Kulturen mit gruppeninternen Konflikten. Die Goal Structure von Spielen steht nicht im Zusammenhang mit sozialer Stratifizierung oder der wasserbasierten Jagd und Fischerei in Gruppen. Diese Ergebnisse deuten darauf hin, dass Spiele mit bestimmten sozio-ökologischen Gegebenheiten kultureller Gruppen

zusammenhängen und möglicherweise eine funktionelle Rolle bei der Weitergabe gruppenspezifischer Normen in der Kindheit spielen.

Teil II: Regelspiele und Kooperation in modernen kulturellen Gruppen

In Kapitel 4 beschreibe ich drei kulturelle Gruppen: die Hai||om und die Ovambo in Namibia sowie die Deutschen in Leipzig, Deutschland. Dafür entwickle ich drei halbstrukturierte Interviews und führe diese durch. Die Interviews erfassen grundlegende Informationen über die Kulturen, den Grad der sozialen Schichtung sowie Konflikte innerhalb einer Gruppe und interkulturelle Konflikte. Es zeigt sich, dass sich die Hai||om als eine egalitäre Gruppe identifizieren, in der gruppeninterne Konflikte üblich sind und interkulturelle Konflikte nicht auftreten. Die Deutschen in Leipzig geben an, eine stark sozial geschichtete Gruppe zu sein, in der es häufig zu Konflikten innerhalb der Gruppe und gelegentlich zu interkulturellen Konflikten kommt. Aufgrund des Ausbruchs der COVID-19-Pandemie war es mir nicht möglich, die Interviews mit den Ovambo zu führen; daher ziehe ich für diese kulturelle Gruppe Informationen aus anderen Quellen heran. Hier werden die Ovambo als eine stark sozial geschichtete Gruppe beschrieben, bei der es häufig zu Konflikten innerhalb der Gruppe und selten zu interkulturellen Konflikten kommt (Brown, 2013; Malan, 1995).

In Kapitel 5 entwickle ich ein kulturübergreifendes Interview und erfasse mit diesem verschiedene Details von Spielen in den drei kulturellen Gruppen. Ich beschreibe ausführlich 16 Hai||om-Spiele und 7 Ovambo-Spiele. Es finden sich vor allem Spiele mit einer kompetitiven Struktur, aber auch solitäre und kooperative Spiele. Mehrere der von mir beschriebenen Spiele werden auch in anderen kulturellen Gruppen auf der ganzen Welt gespielt.

In Kapitel 6 untersuche ich mit einem quasi-experimentellen Ansatz die Beziehung zwischen der Spielpräferenz und dem kulturellen Kooperationsniveau der Hai||om und Ovambo in Namibia sowie der Deutschen in Leipzig. Sieben- bis 14-jährige Kinder (n = 438) und Erwachsene (n = 56) spielen ein Spiel namens ‘KoKo’, das von zwei Spielern kooperativ oder kompetitiv gespielt werden kann. Während die Teilnehmer/-innen die Spiele durchführen, messe ich, wie häufig sie lächeln, um festzustellen, welche Variante (kooperativ oder kompetitiv) ihnen mehr Spaß bereitet zu spielen. Nachdem sie jede Spielvariante fünfmal mit einem Partner/einer Partnerin gespielt haben, geben die Kinder an, welche Variante sie noch einmal spielen möchten. Ich finde kulturübergreifende Unterschiede bei den Spielvorlieben der Kinder, aber nicht bei den Erwachsenen. Hai||om-Kinder bevorzugen das Wettbewerbsspiel. Auch deutsche Kinder wählen das kompetitive Spiel, lächeln aber häfiger, wenn sie kooperativ spielen. Ovambo-Kinder wählen beide

Varianten ähnlich häufig, lächeln aber häfiger beim kooperativen Spiel. Erwachsene Betreuer aus allen drei Kulturen bevorzugen das kompetitive Spiel. Die Spielpräferenzen der Kinder variieren nicht systematisch mit den kulturellen Konfliktniveaus oder der sozialen Stratifizierung. Zusätzlich zu dem Quasi-Experiment habe ich Erwachsene zu ihrer Einstellung gegenüber dem Spielverhalten ihrer Kinder im Allgemein befragt. Erwachsene aus Kulturkreisen, in denen die Handlungsautonomie der Kinder hoch ist (Hai||om), geben an, seltener mit ihren Kindern zu spielen als Erwachsene aus Kulturkreisen, in denen Kinder eine geringe Handlungsautonomie haben (Deutsche). In der Diskussion gehe ich auf mögliche Erklärungen für die quasi-experimentellen Ergebnisse ein und schlage Möglichkeiten und Verbesserungen für zukünftige Studien vor.

Insgesamt trägt diese Dissertation Folgendes zur bisherigen kulturübergreifenden Forschung von Spielen bei: Erstens entwickle ich eine frei zugängliche Datenbank zu historischen Spielen, ein kulturübergreifendes Interview zu Spielen sowie detaillierte Beschreibungen von Hai||om- und Ovambo-Spielen und stelle diese Entwicklungen zur Verfügung. Zweitens untersuche ich die Beziehung zwischen der Goal Structure von Spielen und verschiedenen Faktoren des kulturellen Kooperationsniveaus. Die Studien zeigen widersprüchliche Ergebnisse für die Beziehung zwischen der Kooperativität von Spielen und dem Konfliktniveau. Jedoch liefern beide Studien keine Belege für eine Beziehung zwischen der Goal Structure von Spielen und der sozialen Schichtung.

In einer allgemeinen Diskussion (Kapitel 7) erörtere ich mehrere mögliche Erklärungen für meine Studienergebnisse. Außerdem gehe ich auf weitere Aspekte von Regelspielen und Kulturen ein, die die Verteilung von Regelspielen in verschiedenen Kulturen erklären könnten. Weitere Studien sind notwendig, um vollständig zu verstehen, wie Regelspiele über verschiedene Kulturen hinweg verbreitet sind und warum letztlich nur Menschen Regelspiele spielen. Für diese zukünftige kulturübergreifende Untersuchung von Regelspielen diskutiere ich abschließend mögliche Wege und methodische Verbesserungen.

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Love life.

Declaration of Academic Integrity

Hiermit versichere ich, Sarah Marie Leisterer-Peoples, geboren am 30.09.1990 in Honolulu, Hawaii, das Folgende:

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

Bei Auswahl und Auswertung des Materials sowie der Herstellung der Manuskripte für die einzelnen Studien erhielt ich Unterstützung von Prof. Dr. Daniel Haun (*Max-Planck-Institut für evolutionäre Anthropologie*, Germany), Prof. Dr. Susanne Hardecker (*SRH Hochschule für Gesundheit, Germany*), Dr. Joseph Watts (*University of Otago, New Zealand*), Dr. Simon J. Greenhill (*Australian National University, Australia*), und Dr. Cody T. Ross (*Max Planck Institute for Evolutionary Anthropology, Germany*).

Ich versichere, dass außer den oben genannten Personen keine weiteren an der geistigen Herstellung der Arbeit beteiligt waren. Dritte Personen haben von mir weder unmittelbar noch mittelbar geldwerte Leistungen für Arbeiten enthalten, die im Zusammenhang mit dem Inhalt der vorgelegten Dissertation stehen.

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

Am 21. März 2022 in Leipzig,

Sarah M. Leisterer-Peoples

Author Contributions

Nachweis über Anteile der Co-Authoren, Sarah M. Leisterer-Peoples
An Examination of the Cooperativeness of Games in the Context of Culture

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Nachweis über Anteile der Co-Authoren

Titel:	The Austronesian Game Taxonomy: A cross-cultural dataset of historical games
Journal:	Humanities and Social Sciences Communications
Autoren:	Sarah M. Leisterer-Peoples, Susanne Hardecker, Joseph Watts, Simon J. Greenhill, Cody T. Ross, Daniel B.M. Haun

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Sarah M. Leisterer-Peoples:	- Study conceptualization - Data collection - Data coding - Data preparation - Initial manuscript - Manuscript revision - Project management
Susanne Hardecker:	- Study conceptualization - Supervision - Manuscript revision
Joseph Watts:	- Data preparation - Manuscript revision
Simon J. Greenhill:	- Data preparation - Manuscript revision
Cody T. Ross:	- Manuscript revision
Daniel B.M. Haun:	- Study conceptualization - Supervision - Manuscript revision - Project funding

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Nachweis über Anteile der Co-Authoren

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Scientific Contributions

Publications Corresponding to this Dissertation

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Leisterer-Peoples, S.M., Hardecker, S., Watts, J., Greenhill, S.J., Forkel, R., Ross, C.T., & Haun, D.B.M. (2021). The Austronesian Game Taxonomy: A cross-cultural dataset of historical games (Version 1.2.1) [Data set]. *Zenodo*. http://doi.org/10.5281/zenodo.4675217.

Leisterer-Peoples, S.M., Ross, C.T., Greenhill, S.J., Hardecker, S., & Haun, D.B.M. (2021). Games and enculturation: A cross-cultural analysis of cooperative goal structures in Austronesian games. *PLoS One*. https://doi.org/10.1371/journal.pone.0259746.

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Peoples, S.M., Hardecker, S., Watts, J., Greenhill, S., Colleran, H., & Haun, D.B.M. (2017). *The Transmission of Cultural Values via Games.* Cultural Evolution Society Conference, Jena, Germany.

Peoples, S., Thiele, M., Hepach, R., & Tomasello, M. (2017). *Do young children compare their deservingness with others in a social context?* Poster presented at the Gemeinsame Tagung der Fachgruppen Entwicklungspsychologie und Pädagogische Psychologie, Münster, Germany.

Peoples, S.M., Hardecker, S., Watts, J., Greenhill, S., Colleran, H., & Haun, D.B.M. (2017). *The Transmission of Cultural Values via Games.* Poster presented at the Gemeinsame Tagung der Fachgruppen Entwicklungspsychologie und Pädagogische Psychologie, Münster, Germany.

Peoples, S., Thiele, M., Hepach, R., & Tomasello, M. (2017). *Do young children compare their deservingness with others in a social context?* Poster presented at the Eye Tracking Workshop, Leipzig, Germany.