MULTIPLE SOCIAL CATEGORIZATION AND TOLERANCE

Dissertation
der Mathematisch-Naturwissenschaftlichen Fakultät
der Eberhard Karls Universität Tübingen
zur Erlangung des Grades eines
Doktors der Naturwissenschaften
(Dr. rer. nat.)

vorgelegt von
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Tübingen
2013

Tag der mündlichen Qualifikation:	25.10.2013
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To My Parents, Nina and Viktor Nuss

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ABSTRACT

The present research which is based on models of multiple social categorization tested and discussed the impact of multiple categorized ingroup representation on intergroup bias. For this purpose a new experimental paradigm was developed by building different artificial multiple categorized micro-societies. The first two experiments (*N* = 45 and *N* = 71) showed that different forms of ingroups' representations, which were operationalized through different compositions of group memberships, did not impact tolerance towards an outgroup. In general, the ingroup was evaluated as being more likable and warmer than the outgroup. Further experiments tested a set of influencing factors, which could have interacted with ingroups' representation. The third experiment (*N* = 78) controlled possible interference between ingroups' and outgroups' representations by simultaneously manipulating both, ingroup and outgroup compositions. Experiment 4 (*N* = 81) and Experiment 5 (*N* = 154) varied the salience of distinction between ingroup and outgroup in different ways. Experiment 4 tested the role of a shared dimension of categorization. Experiment 5 investigated the impact of ingroups' representation on intergroup bias with respect to the presence of a superordinate category and with respect to the kind of intergroup representation – separated vs. mixed. The last aspect – mixed representation of ingroup and outgroup – became essential for the disappearance of intergroup bias, irrespective of the other conditions. Taken together, the present research demonstrates that intergroup bias in a minimal group situation is not affected by different representations of multiple categorized ingroups, not even considering other possible interacting factors, such as, outgroup variability, sharing of a dimension and presence of a superodinate category. However, intergroup bias completely disappears, if, in an additional step of simulation, ingroup and outgroup are presented mixed together, irrespective of the other factors. We discussed the absence of predicted effects of multiple categorized ingroup representation, the disappearance of intergroup bias following a mixed ingroup-outgroup representation and risks of separate habitation of different social groups. With respect to methodical implication, the presented method of virtual micro-societies proved useful in inducing temporary identifications with artificial social categories and in demonstrating intergroup phenomena.

Keywords: intergroup relations, intergroup bias, social categorization, multiple social categorization, and social identity complexity

ZUSAMMENFASSUNG

Die vorliegende auf den Modellen der multiplen sozialen Kategorisierung basierende Forschung überprüfte und diskutierte den Einfluss der multipel kategorisierten Eigengruppen-Repräsentation auf den Intergruppen-Bias. Zu diesem Zweck wurde ein neues experimentelles Paradigma entwickelt, indem unterschiedliche, künstliche, multipel kategorisierte Mikrogesellschaften gebildet wurden. Die ersten beiden Experimente (N = 45 und N = 71) zeigten, dass unterschiedliche Formen der Eigengruppen-Repräsentationen, die durch unterschiedliche Kompositionen der Gruppenmitgliedschaft operationalisiert wurden, keinen Einfluss auf die Toleranz gegenüber der Fremdgruppe hatten. Insgesamt wurde die Eigengruppe im Vergleich zur Fremdgruppe als sympathischer und wärmer eingeschätzt. Weitere Experimente überprüften eine Reihe von Einflussfaktoren, die mit der Eigengruppen-Repräsentation interagiert haben könnten. Das dritte Experiment (N = 78) kontrollierte eine mögliche Interferenz zwischen Eigen- und Fremdgruppen-Repräsentationen, indem die Zusammenstellung beider Gruppen gleichzeitig manipuliert wurde. Experiment 4 (N = 81) und Experiment 5 (N = 154) variierten die Salienz der Eigen- und Fremdgruppen-Distinktheit auf unterschiedliche Art und Weise. Experiment 4 überprüfte die Rolle einer gemeinsamen Kategorisierungsdimension. Experiment 5 erforschte die Wirkung der Eigengruppen-Repräsentationen auf den Intergruppen-Bias unter Berücksichtigung der Präsenz einer übergeordneten Kategorie und in Bezug auf die Art der Intergroup-Repräsentation – getrennt vs. vermischt. Der letzte Aspekt – vermischte Repräsentation der Eigen- und der Fremdgruppe – erwies sich als entscheidend für das Verschwinden des Intergruppen-Bias, unabhängig von den anderen Bedingungen. Zusammengefasst demonstriert die vorliegende Forschung, dass der Intergruppen-Bias in einer Minimal-Gruppen-Situation nicht durch unterschiedliche Repräsentationen der multipel kategorisierten Eigengruppen beeinflusst wurde, auch nicht, wenn andere möglicherweise interagierenden Faktoren wie Fremdgruppen-Variabilität, Vorhandensein einer gemeinsamen Dimension und Präsenz einer übergeordneten Kategorie, berücksichtigt wurden. Der Intergruppen-Bias verschwand jedoch komplett, wenn Eigen- und Fremdgruppe in einem zusätzlichen Simulationsschritt vermischt dargestellt wurden, unabhängig von den anderen Faktoren. Wir diskutierten die Abwesenheit der erwarteten Effekte von multipel kategorisierter Eigengruppen-Repräsentation, das Verschwinden vom Intergruppen-Bias nur in einer vermischten Repräsentation von Eigen- und Fremdgruppe sowie Risiken separaten Wohnens von unterschiedlichen sozialen Gruppen. In Bezug auf den methodischen Beitrag scheint die Methode der virtuellen Mikro-

Gesellschaften geeignet zu sein, um temporäre Identifikationen mit künstlichen Kategorien zu induzieren und Intergruppen-Phänomene zu demonstrieren.

Schlagwörter: Intergruppenbeziehungen, Intergroup-Bias, soziale Kategorisierung, multiple soziale Kategorisierung und Komplexität der sozialen Identität

1 THEORETICAL PERSPECTIVES

> On the next day at the Fizzli-Puzzlis it went all haywire. Some found the yellow more beautiful than the red and wanted to play only with him. Others however found the red more beautiful than the yellow. Still others didn't want to know anything about red or yellow Fizzli-Puzzlis and played only with their blue friends. (Rau, 1988, p. 20)[1]

Ongoing economic and cultural globalization, accompanied by mobility, media ubiquity and worldwide networking, requires competencies for intercultural tolerance, conflict resolution, as well as maintaining and managing one's identity. The development of intracultural, intercultural, and transcultural competencies as well as knowledge of socio-psychological phenomena like multiple social categorization and tolerant intergroup behavior are extremely important.

Since Tajfel, Billig, Bundy, and Flament (1971) have shown with their minimal group paradigm the "fatal" role, categorization plays for intergroup bias, namely that mere division into groups may be sufficient for ingroup favoritism and outgroup disregard, intergroup research adopting a socio-cognitivistic approach has looked mainly for mechanisms that can influence categorization and avoid or solve some of the negative consequences associated with it. Already the names of many theories and models of prejudice reduction in the four most recent decades, like self-categorization (Turner, Hogg, Oakes, Reichert, & Wetherell, 1987), de-categorization (Brewer & Miller, 1984; Wilder, 1978), re-categorization (Gaertner, Davidio, Anastasio, Bachman, & Rust, 1993), sub-categorization (Hewstone & Brown, 1986), cross-categorization (Deschamps & Doise, 1978), dual categorization (Gaertner & Dovidio, 2000; Gaertner, Davidio, Anastasio, Bachman, & Rust, 1993; Hornsey & Hogg, 2000), and multiple categorization (Crisp & Hewstone, 2006; Roccas & Brewer, 2002), reveal that mainly the link between social categorization and intergroup behavior is the question and that thereby change of categorical structures is aimed at (Gaertner, Dovidio, Bunker, Houlette, Johnson, & McGlynn, 2000; Park & Judd, 2005).

1.1 Minimal Group Paradigm

The minimal group paradigm was developed in order to understand the psychological basis of intergroup discrimination, by suggesting that competition is not the necessary condition for the occurrence of discrimination (Tajfel, 1970; 1978; Tajfel et al., 1971). The

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[1] Translated from German by the author

intention was to create base-line conditions in which ingroup favouritism and outgroup discrimination can be expected to occur. For this reason, the following experimental criteria had to be fulfilled: absence of face-to-face interaction, anonymity of group membership, absence of a link between the criteria for intergroup categorization and the nature of responses, absence of personal profit, availability of different strategies of responding, and significance of responding.

In the first part of the experiments, an intergroup categorization was induced by assigning the participants (14-15-year-old pupils) to groups presumably based on irrelevant attributes like judgement style (overestimation vs. underestimation) or preference for a painter (Klee vs. Kandinsky). In fact, classification was effected by chance. In the second part of the experiments, the effects of categorization were tested on intergroup behaviour. The participants distributed rewards among individuals (denoted by code numbers) who belonged to one of the two groups by using matrices with numbers in a special order.

The results demonstrated that the participants distributed the rewards not in order to maximize the joint profit, but to maximize the profit for the own group and to maximize the difference between the ingroup and the outgroup in favour of the ingroup, even if that meant a lower joint profit.

The experiments by Tajfel et al. (1971) have been criticised because they are not ecologically valid, contain demand characteristics and could be alternatively interpreted (e.g., Brown, 1988; Park & Judd, 2005). However, the question, if the simple act of categorization is sufficient to create discrimination, has motivated a whole slew of research for some decades and has been discussed until now.

1.2 Social Identity Theory

Minimal group effects were explained by Tajfel and Turner (1979) with the concept of social identity. At first this concept was a theory about the behavior between groups, which tries to explain discrimination between groups in the absence of conflicts of interest. The central psychological hypothesis is cognitive-motivational: individuals try to differentiate their own group positively from other groups in order to achieve a positive social identity.

Tajfel (1978; 1982) defines the social identity as a part of the self-concept of an individual, which is derived from his/her knowledge about his/her membership in social groups and from the value and emotional relevance of this membership. The general assumptions of the theory are (Tajfel & Turner, 1979, p. 40): (1) individuals aspire to maintain and enhance their self-evaluation, they aspire a positive self-concept; (2) social groups or categories and membership within them are related with positive or negative evaluations, therefore social identity can be positive or negative, depending on the evaluation of the groups, which contribute to the social identity of the individual; (3) the evaluation of the own group is determined by social comparisons with specific other groups, positive comparisons between ingroup and outgroup lead to high prestige, negative comparisons result in low prestige.

The theory tries to explain the psychological process of the formation of group behavior by means of four big social psychological concepts – social categorization, social identity, social comparison, and social distinctiveness (Tajfel, 1982). Social categorization gives the person orientation in the social reality and information about the own position within the group. Social identity is determined by the membership of a particular social category. The characteristics of this social identity the individual learns through social comparisons between ingroup and outgroup. Social identity is satisfactory, when a positive distinctiveness is formed. In this case the individual tries to maintain his/her social identity. If there is a negative distinctiveness and accordingly a dissatisfactory social identity, individuals either try to leave their group and join another group with a positive distinctiveness, or they aspire to raise their existing group.

1.3 Self-Categorization Theory

A generalization of the social identity theory is the self-categorization theory (Turner et al., 1987), which is a theory about the group, which does not aim to explain so much the group behavior itself, but analyzes the question, when and how individuals act as a group. The essential hypothesis is the social-cognitive elaboration of the perception of oneself and others.

The theory assumes that individuals derive part of their self concept from their membership in a specific social category. They regard themselves as being equal or interchangeable with other members of their own social category, but not with members of other social categories. There is a hierarchical relation between the different social categories. Every social category is included in another category, as long as it is not on top of the hierarchy. Turner et al. (1987) differentiate between three different levels of abstraction. On top there is the superordinate level of the self as human being, on which there are the common features shared with other human beings. In the middle there is the level of ingroup-outgroup-categorization. Here the features of the own social category are compared with the features of other social categories. On the lowest level there is the individual by itself. Personal features are compared with features of other members of the same social category. Thus, an individual derives his/her self-concept from his/her personal features (subordinate level), from his/her membership in different social categories (intermediate level) as well as from the fact that it is a human being (superordinate level).

This hierarchical relation between the different categories plays an important role for intergroup comparison. Thereby, the assumption is essential that the own social category tends to be evaluated positive, whereas this evaluation is based on the comparison with other social categories. The evaluation of ingroup and outgroup depends on the superordinate category that is on the social category in which ingroup as well as outgroup are included. Social identity theory and self-categorization theory as a set of various related assumptions and hypotheses about the functioning of the social self made many other subtheories possible.

1.4 Decategorization, Recategorization and Subcategorization

From the perspective of decategorization the personal layer of self-categorization hierarchy is very important (cf. personalization model by Brewer & Miller, 1984; Wilder, 1978). Ingroup bias decreases (ingroup will be devalued rather than outgroup enhanced) and prejudices are refuted, by changing the uniform perception of outgroup members from interchangeable members to individuals. The availability and usefulness of ingroup-outgroup categorization is undermined. In this model the following point is seen to be problematic: the generalization from the interaction with an outgroup member to the whole outgroup (Hewstone & Brown, 1986), for example, through absent salience of intergroup context or through the possibility of subtyping in the sense that individuals of the outgroup are seen as an “exception to the rule” (Rothbart & John, 1985; Webber & Crocker, 1983). Hence, in order to reduce the salience of category boundaries and increase the perceived outgroup variability through personalization, frequent contact with several group members over the long run is necessary (Brewer 2003; Brewer & Miller, 1988). Such a personalized cross-group contact (e.g., receiving self-relevant and more intimate information) can then result in the breakdown of the perception of the outgroup as a homogenous unit.

Contrary to decategorization, recategorization in the sense of “complete recategorization” (Gaertner et al. 2000, p. 104) does not aim at the dilution or loosening of categorization, in order to reduce prejudice, but aims at a new categorization on the next higher level (Allport, 1954; Doise, 1978; cf. common ingroup identity model by Gaertner, Davidio, Anastasio, Bachman & Rust, 1993). Outgroup bias – outgroup will be enhanced rather than ingroup devalued – is supposed to disappear through inclusion of the outgroup into the shared superodinate ingroup. Positive attitudes and behaviors that are associated with the ingroup are now also extended to the new ingroup members (who were formerly outgroup members).

The previous models – decategorization and recategorization – require a change or abandonment of social categories, which cannot always be fulfilled. Therefore, the subcategorization approach (cf. model of mutual differentiation by Hewstone & Brown, 1986) proposes to maintain different identities and assign to the groups complementary roles when solving cooperative tasks (Brown & Wade, 1987; Deschamps & Brown, 1983). The transfer of any benefit to the outgroup as a whole will be more likely in such intergroup interaction than in an interpersonal contact.

In summary, de-, re-, and subcategorization models provide separately situation specific but not long-term solutions to the reduction of intergroup bias (Brewer, 2003). In this respect also the interplay between de-, re-, and subcategorization processes regarding the optimal and complementary effectiveness in intergroup contacts is discussed. Pettigrew (1998), for example, proposes *temporal consecution* of personalization, mutual differentiation and recategorization. And also Gaertner et al. (2000) in a reanalysis of the famous Robbers Cave study (Sherif, Harvey, White, Hood, & Sherif, 1961) conclude an improvement of intergroup relations through *reciprocity* of the mentioned processes.

1.5 Dual Categorization and Ingroup Projection Model

The more advanced models of recategorization (vs. "complete recategorization", Gaertner & Davidio, 2007, p. 104), the dual identity models, deal with *overlap* or *integration* of re- and subcategorization processes (Gaertner & Dovidio, 2000; Gaertner, Davidio, Anastasio, Bachman, & Rust, 1993; Hornsey & Hogg, 2000). Simultaneous salience of intergroup and superodinate categorization levels should enable easier generalization to the outgroup through existing salience of intergroup relation in comparison to the complete recategorization model.

Another dual identity approach is the ingroup projection model proposed by Mummendey and Wenzel (1999) that is strongly based on the theory of self-categorization by Turner et al. (1987). According to this model outgroups can also be evaluated negatively if ingroup and outgroup are included in a superodinate social category, and characteristics of the ingroup are perceived to be typical for the superodinate category. In this case, there is no agreement regarding the correspondence with the prototype of the common superodinate category, because the prototype is construed enthnocentristically by each group. Mummendey and Wenzel (1999) hypothesized: „ […] an outgroup's difference will be evaluated negatively if both ingroup and outgroup are sufficiently included in a more abstract social category and if the ingroup's attributes are perceived as prototypical for the inclusive category" (p. 164).

Accordingly, *tolerance* – in the sense of feeling friendliness towards all kinds of people not only enduring but accepting them – increases, either when there is no inclusive category or when the prototype of the superodinate category is broadly or not precisely defined so that many characteristics are acceptable and correspond with the norm. Mummendey and Wenzel (1999) propose that

> […] tolerance may be conceptualized as the perceived categorical disparity of ingroup and outgroup, so that there is no inclusion of the groups and thus no prescriptions exist according to which the outgroup's difference would be regarded as norm violation. Tolerance may also be conceptualized as a complex and vague representation of the inclusive category, in the sense of an "undefined" prototype that qualifies many different attributes and positions as normative and acceptable. (p. 167)

The empirical findings support Mummendey and Wenzel's assumptions (e.g., Waldzus, & Mummendey, 2004; Waldzus, Mummendey, & Wenzel, 2005; Waldzus, Mummendey, Wenzel, & Weber, 2003; Weber, 2002; Wenzel, Mummendey, Weber, Waldzus, 2002). But until now empirical research about this model focused on the ingroup projection rather than on the definition of the prototype or on the complexity of superodinate self-categories (see Waldzus, 2010, for a review; see Wenzel, Mummendey & Waldzus, 2007, for a meta-analysis). Moreover this model is limited by considering only hierarchical representations.

1.6 Multiple Categorization and Cross-Categorization

Even if the most researchers on social categorization, social identity, and intergroup relations agree on the existence of multiple social memberships or identities (Gergen, 1971), they concentrate their attention primarily on the memberships based on a single dichotomous categorization that Deschamps and Doise (1978, 144) call "simple categorization".

Complexity, *multiplicity* and s*imultaneity* of social categorization are becoming increasingly important in the theoretical debate on social categorization. When social objects are gathered in groups on several different dimensions, we deal with processes of multiple social categorization. Research on multiple categorization focuses both on simultaneous categorization in terms of more varied identity domains and multiple categorization within a single identity domain (Crisp, 2010; Crisp & Hewstone, 2006; Deaux, 1993).

The model of cross-categorization was one of the first models, which deals with simultaneous salience of two dichotomous ingroup categories. Cross-categorization means categorization of people in two dichotomous dimensions simultaneously so that some individuals are on one dimension a member of the ingroup category and on the other dimension a member of the outgroup. These simultaneous accentuations of perceived differences and perceived similarities within as well as between categories neutralize each other and therefore reduce intergroup bias (Deschamps & Doise, 1978). Research suggests that cross-categorization reduces intergroup bias in comparison to a single ingroup-outgroup categorization (Diehl, 1989, 1990; for review see Migdal, Hewstone, & Mullen, 1998; Urban & Miller, 1998; Vanbeselaere, 1991). However, this model is also limited by regarding categorization only in two dichotomous dimensions and provides no solution for the intergroup bias in the contact situation in which the outgroup members are outgroup members on both categorization dimensions (Brown & Turner, 1979).

1.7 Social Identity Complexity

The idea of different complexity of subjective representation of ingroups becomes essential in a further construct of multiple social categorization, the model of *Social Identity Complexity* by Roccas und Brewer (2002). This theory is remarkable in that it deals with subjective, not necessarily hierarchical representations (cf. McGarty, 2006), and not only with two but several salient ingroup categories simultaneously. And it proposes a link between these different representations of ingroup memberships and tolerance toward outgroups.

Social identity complexity is defined as a result of information processing about one’s own ingroups. It reflects the perceived overlap between memberships of multiple ingroups. When this overlap is perceived as strong or even complete, the members of different ingroups will be seen as the same, identity structure is deemed to be exclusive and *simple*. When multiple ingroups subjectively do not overlap or only partly, different identities are both differentiated and integrated. The members of these social categories will be seen as different, social identity structure becomes in this case more inclusive and *complex*.

Corresponding with patterns of response to multiple categorized others (Urban & Miller, 1998) and in analogy to different modes of resolving inconsistency between two incompatible attitudes (Abelson, 1959; Kelman & Baron, 1968; Tetlock, 1983), the authors specify four modes of ingroups’ representation along a continuum of complexity and inclusiveness from least to most complex: *intersection*, *dominance*, *compartmentalization*, and *merger*. In the intersection-mode, ingroup is defined as the conjunction of several contributing social categories. Those who do not share the contributing identities are outgroup members. In the dominance-mode, ingroup is defined through shared membership in the primary or dominant category, according to Roccas and Brewer (2002):

> When one social identity takes precedence over all others, the individual should classify other people in terms of their membership in that one category. Those who share the dominant category membership are treated as ingroup members; those who are not in the category are outgroupers. (p. 90)

The compartmentalization-mode particularly relating to membership composition is a contrary version of intersection. Ingroupers are those who belong to one of the contributing categories. The final multiple ingroup representation, merger, is the most inclusive ingroup membership composition, which is the sum of belonging to contributing social categories and to their intersection.

The social identity complexity model implies further that different complex and thereby different inclusive ingroups' representations influence perception of others. Complex ingroups' representation should reduce intergroup bias because of awareness of cross-categorization (awareness of more than one social categorization and recognition that the multiple ingroups do not converge) and hence of reducing of the effects of inter-category accentuation (Deschamps & Doise, 1978). Furthermore, with complex ingroups' representation motivational bases for intergroup bias are reduced, that is, the evaluative significance of intergroup comparisons for the self (Vanbeselaere, 1991) and importance of any ones social identity for satisfying a need for belonging (Brewer, 1991). In addition, Roccas and Brewer (2002) suggest that the effect of social identity complexity can be extended to tolerance for outgroups in general: "Making salient that an outgroup member on one category dimension is an ingroup member on another decreases bias by comparison with instances in which the latter information is not available (Gaertner, Davidio, Anastasio, Bachman, & Rust, 1993)" (p. 102).

The first empirical findings indicate that tolerance towards outgroup members (also with no shared membership) was higher for persons who had higher complexity (Brewer & Pears, 2005; Roccas & Brewer, 2002). Roccas and Brewer (2002) reported results from a sample of American college students that tolerance toward outgroup was higher for persons who had lower scores on the overlap measure and from a sample of Israeli students that social identity complexity was positively related to readiness to engage in social contact with outgroup members. Brewer and Pears (2005) showed with results from a telephone interview survey of non college student adults (assumedly with a wider range of social group identities and with a more stable ingroups' representation) a further positive relation between social identity complexity and tolerance for outgroups in general. Individuals with high complexity, that is, which see their ingroups as distinct and low overlapping, had greater acceptance of multicultural diversity and positive attitudes towards affirmative action as well as lower affective distance from outgroups, than those with low complexity, which see their ingroups as highly overlapping. Further empirical findings support the assumptions of the social identity complexity model (Miller, Brewer, & Arbuckle, 2009; Schmid, Hewstone, Tausch, Cairns, & Hughes, 2009).

However, the above-mentioned studies were all of a correlative nature. The impact of different multiple representations of ingroups on tolerance for outgroup remains to be tested experimentally. Moreover it was important to distinguish the model from closely related theories, such as cross-categorization model and ingroup projection model. This was done in the present research.

2 PRESENT RESEARCH

The aim of the first two experiments was to investigate whether different representations of ingroups according to the social identity complexity model (Roccas & Brewer, 2002) affected perceived ingroup homogeneity and intergroup bias. Particularly, the question was addressed whether representations with lower membership overlap lead to lower perceived ingroup homogeneity and to reduction of intergroup bias. The perception of ingroup homogeneity in these experiments differed, as predicted, depending on the representation of ingroups. However, the tolerance measures for ingroups and outgroups were not impacted by the ingroups' representations. The ingroup was evaluated as more likable and warmer than the outgroup in general.

Looking at the overall pattern of the perceived homogeneity of ingroup and outgroup simultaneously gave rise to the assumption that the expected effects of ingroups' representations on tolerance might have been suppressed by interference between intragroup homogeneity and intergroup homogeneity. The third experiment controlled for this possible interference between ingroup and outgroup representations by simultaneously manipulating both, ingroup and outgroup compositions. However, also in this experiment in the simple as well as in the complex ingroups' representations conditions an intergroup bias resulted, irrespective of outgroups' representations. This bias was moderated only through ingroup identification, such that ingroup favoritism was more likely to appear in conjunction with a strong ingroup identification.

In the initial experimental paradigm salience of ingroup-outgroup distinction might have been too strong and may have precluded generalization of social complexity of the ingroup to the outgroup. The new alternative paradigm for testing this idea – the introduction of outgroup avatars with a shared dimension – was carried out in Experiment 4. Extended overlapping categorization (Roccas and Brewer, 2002) was compared here with overlapping categorization (Deschamps and Doise, 1978). But again, the intergroup bias was not impacted by experimental manipulations in Experiment 4. There was an ingroup favoritism irrespective of ingroup and outgroup representations covarying with ingroup identification, such that ingroup favoritism appears only with a strong ingroup identification – yielding similar results to previous research.

The next lower ingroup-outgroup distinction – mixed representation of ingroup and outgroup and introduction of a superodinate category – was planned for Experiment 5. The last factor is related to the ingroup projection model that pools together tolerance and a complex and vague representation of an inclusive category (Mummendey & Wenzel, 1999). An interaction between representation of ingroups, kind of intergroup representation, and presence of superodinate category did not appear. But there was a clear effect of kind of intergroup representation; such that intergroup bias disappeared, if ingroup and outgroup are mixed presented, irrespective of other experimental factors. The absence of predicted effects of multiple categorized ingroup representation on intergroup bias and the disappearance of intergroup bias following a mixed ingroup-outgroup representation will be discussed.

Moreover, a further aim of this research was to test virtual reality (VR) as an appropriate method for studying intergroup phenomena. Existing online fantasy worlds, so called massively multiplayer online role-playing games, for instance, EverQuest, Ultima Online or Second Life, have already been explored by scientists for quite some time. For example, Castronova (2001, 2005, 2007), studied virtual economies in EverQuest with the online world Norrath as an "economy under a bell-jar" (Iwersen, 2005, p. 13) and found that in artificial worlds real socio-economic processes are occurring. Further, Yee, Bailenson, Urbanek, Chang, and Merget (2007) investigated non-verbal communication of *avatars* (graphical representatives of the real persons) in Second Life and concluded that in virtual surroundings, human interactions are driven by the social norms of the real world. Also Frey, Hartig, Ketzel, Zinkernagel, and Moosbrugger (2007) pointed out that the interaction of pairs in a virtual setting, like distance between avatars and frequency of eye contact, is similar to behaviors in face-to-face interactions. However, we can not only monitor or analyze artificial social worlds, we can also develop new ones and manipulate them experimentally in order to validate social-psychological theories or develop such theories further. The computer allows an ideal experimental control and the consideration of many variables and their complex interrelations (Kaiser, Hansruedi & Keller, Beat, 1991, for computer-based theory construction). Thus, in this project virtual different multiple categorized micro-societies were built in order to test experimentally the effects of multiple categorization on intergroup relations. A specific program SIC was developed, and the experimental design was adjusted to each experiment (Baun & Ermel, 2007a, 2007b, 2008, 2009a, 2009b; Baun, Ermel, & Dubiski, 2009).

2.1 Experiment 1

In accordance to the model of social identity complexity by Roccas und Brewer (2002) in the first experiment the influence of different subjective ingroups' representations or different perceived compositions of simultaneously salient memberships on tolerance to the outgroup and on perceived ingroup homogeneity was analyzed. With an example of four modes, positioned on a continuum from simple to complex, the social identity complexity model predicts that little overlapping memberships in two social categories in comparison to highly overlapping memberships are perceived to be less homogeneous and therefore result in more tolerance for other outgroup members.

2.1.1 Method

2.1.1.1 Participants and Design

Forty-five undergraduates at a German university (38 women and 7 men; *M* age = 23.82; *SD* = 4.14; 93% psychology students) were randomly allocated to one of the four experimental conditions of social identity complexity: intersection, dominance, compartmentalization, and merger. The experiment lasted approximately 30 minutes and participants were rewarded course credits for their study.

2.1.1.2 Procedure and Program

The experiment was conducted on a standard computer (Pentium 4; CPU 3.0 GHz; RAM 768 MB; graphic board: NVIDIA GeForce 7300 LE PCI X) with a LCD monitor (17-inch; 60 Hz; 1280 x 1024 Pixel), with standard mouse and standard keyboard. The mouse was placed at the right of the keyboard and in case of left-handedness it was placed on the left. The distance to the display was approximately 55 cm.

Participants were tested individually. Upon arrival at the laboratory, participants were greeted, seated at the work desk and asked to follow the instructions. The program (SIC 2.1; Baun & Ermel, 2007b) runs automatically, whereupon in simulation dialogs and by judgment scales it waits for the affirmation of a target subject. The judgments and interaction results are saved. At the end of the study participants were asked to write down any comments regarding the experiment. Participants were then thanked and fully debriefed.

The program SIC was developed in the language C++ using 3D-openGL-computer graphics. Visual C++ with MFC-library (Microsoft Foundation Classes) was used as developmental environment. In order for the program to run, a windows PC (especially Windows XP) with a graphic board that is capable to express OpenGL is required. SIC is a simple form of virtual reality. It consists of a three-dimensional, interactive, and computer-based environment that represents a minimal intergroup situation where the members of the involved groups are equal in status, anonymous, and experience no conflicts. SIC also includes a questionnaire to measure the dependent variables.

Besides control and interactivity VR features another important media quality for the present research – immersion or first-person experience (Bente, Krämer, & Peterson, 2002; Heers, 2005; Qvortrup, 2001). Moreover, a virtual environment can represent abstractly and metaphorically, e.g., data transfer between computers as sending of packages (Schwan & Buder, 2002) or in our case culture symbolized by color.

The VR of the SIC-program consists of three islands in the sea (each with a surface of approx. 30000 m²/30 ha) and is populated by 600 star-shaped avatars. Each avatar is 1 m in height, has a smiling face and is unable to move. The simulation scenario within the described VR begins with the following introduction to a fantasy world:

> Hallo and thank you that you participate in our research! This research is about social perception of figures or groups of figures in computer games. Please imagine the following story: the [name of the first subculture], which had a highly developed [first color] culture, and the [name of the second subculture], which had a highly developed [second color] culture, have discovered an island, populated it and mixed among each other. You are a descendant of this cultures, thus you are a [hyphenated name of combined culture]. Next you see an actual picture of your island. Please look at this very attentively and follow the further instructions.

In the next scene a personal bicolored (bi-cultural) avatar is assigned to each participant who was instructed to give his/her avatar a name. Thereby immersion into the virtual world should be enabled and simultaneous membership within the two categories or biculturality should be made salient. In the following the ingroup is represented and elaborated. For this purpose the participants are supposed to build a look-out by clicking on the ingroup-avatars. Due to this look-out it is possible to see that the own island is only part of a group of islands and that a neighboring island is populated by different avatars. Thereby, the outgroup is made salient. Finally another look-out is built by both groups (ingroup-outgroup elaboration). In order to achieve good visibility of avatars and islands several changes of perspective are used. The most important simulation steps are represented as VR-fragments in Figure 1. A detailed formulation of simulation dialogs is arranged in Appendix A.

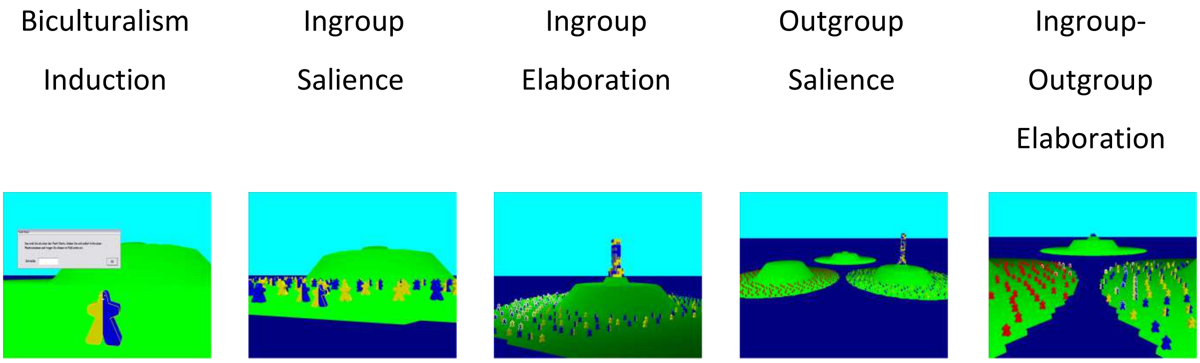

Figure 1. Overview of important simulation steps of ingroup and intergroup contact situation.

2.1.1.3 Manipulation

Social identity complexity was operationalized through the different compositions of group memberships (Brewer & Pierce, 2005; Roccas & Brewer, 2002). According to Roccas and Brewer (2002):

> High perceived overlap in group memberships implies that the different ingroups are actually conceived as a single convergent social identity. In this case, the subject boundaries of both ingroups are defined in such a way that they contain only those who share the other identity as well. On the other hand, when overlapping membership between various ingroups is perceived to be relatively small, the boundaries of each ingroup are defined in such a way that they include members who do not share the other identities. In this case, the combined group identities are larger and more inclusive than any of the ingroups alone. In sum, the more a person perceives the groups to which he or she belongs as sharing the same members, the less complex is his or her social identity. (p. 95)

In analogy to the four alternative structures of multiple ingroup representations by Roccas and Brewer (2002) from simple (shared overlapped memberships) to complex (lower shared and lower overlapped memberships), one of the four virtual compositions of two ingroup memberships (blue and yellow culture) was introduced in the second step of VR: intersection with only bicolored blue-yellow members (all ≈ Blue ∩ Yellow), dominance with blue and bicolored blue-yellow members (all ≈ Blue U Blue/Yellow), compartmentalization with blue and yellow members (all ≈ Blue or Yellow) and merger with blue, yellow and bicolored blue-yellow members (all ≈ Blue U Yellow)[1]. Therefore all ingroups were bicultural however they differed in the degree of overlapping or inclusiveness (see Figure 2).

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[1] This manipulation of ingroups compositions was satisfactorily pretested with 41 participants in reference to ingroup inclusivity, ingroup heterogeneity, ingroup identification and immersion with the program SIC 1.0 (Baun & Ermel, 2007).

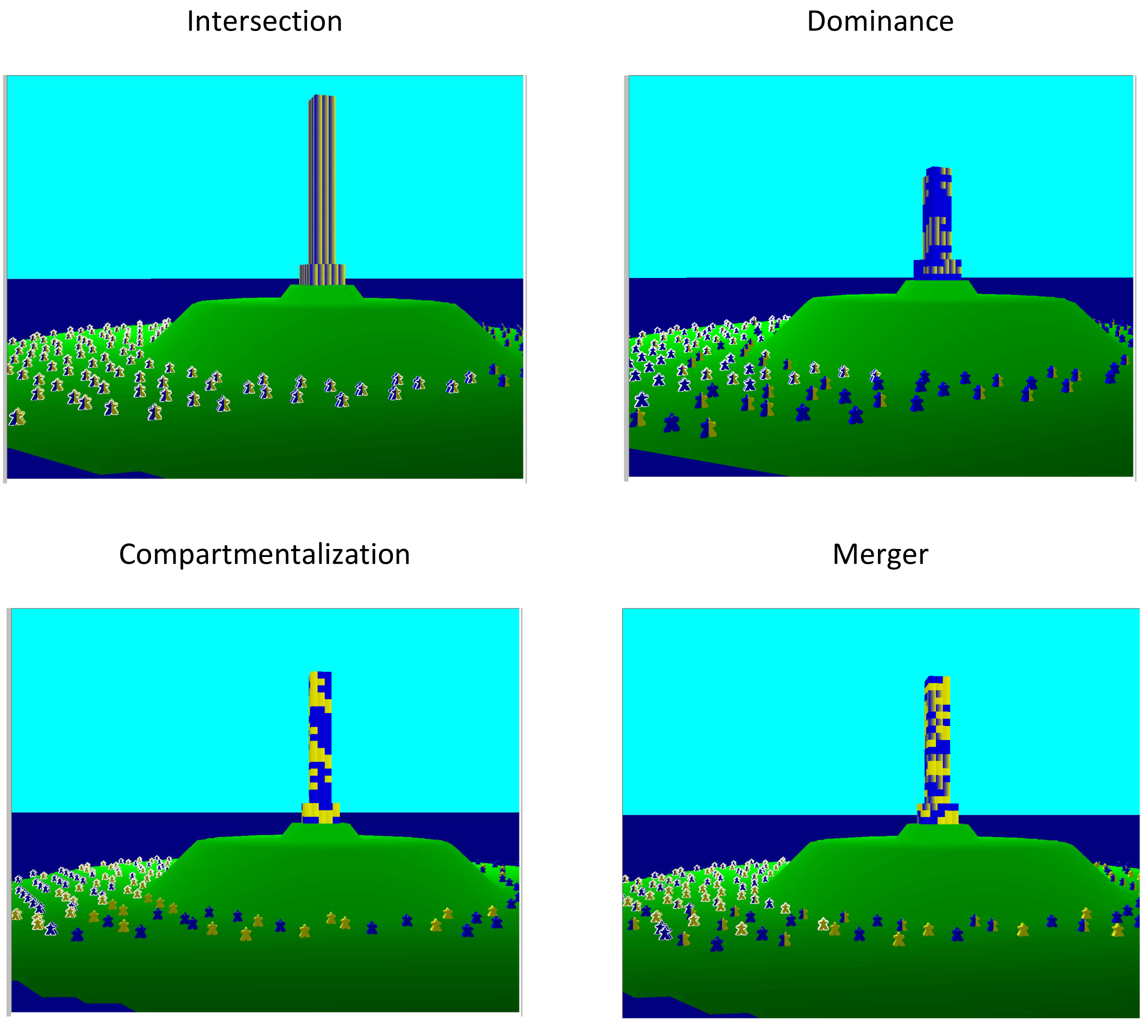

Figure 2. Manipulation of four bicultural ingroups' representations from simple (intersection and dominance) to complex (compartmentalization and merger).

2.1.1.4 Dependent Measures

The following measurement sequence was used in Experiment 1: manipulation check, ingroup and outgroup tolerance, ingroup and outgroup feeling thermometer, ingroup homogeneity, outgroup acceptance, simulation acceptance, immersion, and personal data.

Ingroup homogeneity was assessed with four items (adapted from Rothgerber, 1997; Simon, Pantaleo, & Mummendey, 1995; e.g., "We, the [ingroup name], are among each other similar"), which possessed adequate internal reliability ($\alpha = .71$).

Possible covariant variables were simulation acceptance (two items, e.g., "It was interesting to me, to build a look-out with other [ingroup-name]", $\alpha = .78$), immersion according to Heers (2005) with five items (e.g., "I had been struck to be in the world of the [ingroup-name] and [outgroup-name]", $\alpha = .84$), and personal data (age, sex, and occupation).

Liking ratings for ingroup and outgroup (cf. Schmitt & Branscombe, 2001) as well as the feeling thermometer for ingroup and outgroup (adapted from Brewer & Piers, 2005), which was arranged between 0 (*very cold*) and 100 (*very warm*), were used to asses tolerance. Four ingroup-liking items (e.g., “I find us [ingroup name] likeable”) and four parallel outgroup-liking items (e.g., “I don’t like the [outgroup name]”) showed a good reliability, with $\alpha = .85$ and $\alpha = .88$ accordingly.

All scales, except for the feeling thermometer and personal data, were Likert scales between 1 (*strongly disagree*) and 7 (*strongly agree*). For these scales, scores were computed by averaging across items, with higher scores reflecting more extreme responding in the direction of the construct assessed. All measures used are summarized in Appendix B.

2.1.1.5 Statistical Hypotheses

The homogeneity hypothesis was tested as a main effect of ingroups’ representation on ingroup homogeneity so that the highest ingroup homogeneity value is expected to result in the condition intersection, followed by the conditions dominance, compartmentalization, and merger. The tolerance hypothesis was tested as a main effect of group being qualified by an intersection between ingroups’ representation and within factor *group* (ingroup vs. outgroup) so that intergroup bias will be strongest in the intersection condition, second in dominance, third in compartmentalization, and weakest in merger. In sum, in the simple conditions the positive distinctiveness is expected to be higher than in the complex. Statistical significance in this experiment as well as in all following experiments were determined using $\alpha = .05$.

2.1.2 Results

2.1.2.1 Immersion and Acceptance of Virtual Reality

Immersion and acceptance of simulation were controlled as possible moderating variables. Ingroups’ representation did not influence participants’ immersion, $F < 0.09$, $p > .97$, nor participants’ acceptance of the simulation, $F < 0.16$, $p > .92$. The reported values for immersion and simulation acceptance were very high ($M_{\text{immersion}} = 4.44$, $SD = 1.29$; $M_{\text{simulation}} = 5.65$, $SD = 0.95$) and differed significantly from the midpoint of the respective scale: immersion, $t(44) = 2.27$, $p = .03$, and simulation acceptance, $t(44) = 11.67$, $p < .001$. The participants in all experimental conditions accepted the simulation similarly and were comparably immersed in the VR.

2.1.2.2 Manipulation Checks

Perceived ingroup homogeneity. Perceived ingroup homogeneity was used for the manipulation check in Experiment 1. It was predicted that the ingroup with simple representations will be perceived to be more homogenous than one with complex representations, that is, the highest ingroup homogeneity value was expected to result in the condition intersection, followed by the conditions dominance, compartmentalization and merger.

A single factor Analysis of Variance ANOVA (representation of ingroups: intersection, dominance, compartmentalization, merger) revealed the expected main effect of ingroups' representation on ingroup homogeneity, $F(3, 41) = 6.01$, $p = .002$, $\eta^2 = .31$. As illustrated in Figure 3 participants perceived the ingroup in the simple conditions to be more homogeneous than in the complex conditions.

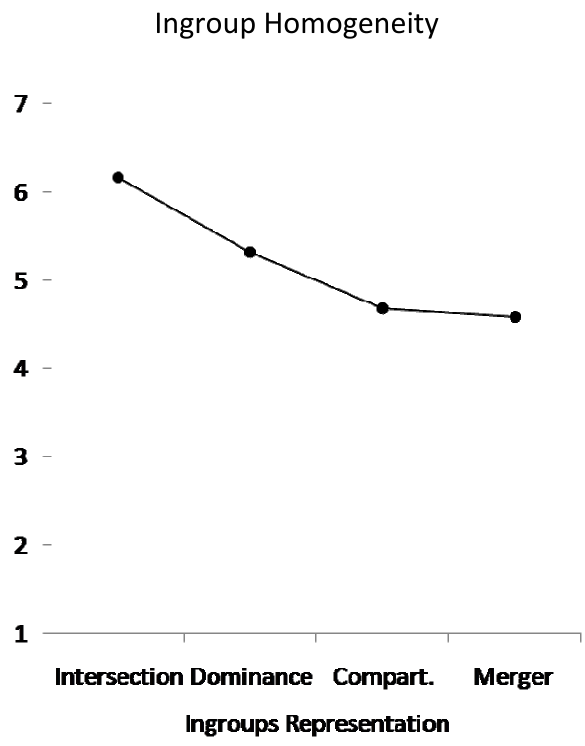

Figure 3. Perceived ingroup homogeneity as a function of ingroups' representation in Experiment 1.

Contrast analyses indicate that the ingroup was perceived as being more homogeneous in the intersection-condition ($M = 6.16$, $SD = 1.12$) compared to the dominance-condition ($M = 5.32$, $SD = 0.99$, $p < .05$), the compartmentalization-condition ($M = 4.68$, $SD = 0.74$, $p < .001$) and the merger-condition ($M = 4.58$, $SD = 1.07$, $p < .001$). Although not statistically significant, perceived ingroup homogeneity in the last three conditions differed among each other in the assumed direction.

2.1.2.3 Tolerance

For liking and feeling thermometer judgments of ingroup and outgroup a stronger intergroup bias was predicted in the simple than in the complex conditions. A 4 (ingroups' representation: intersection, dominance, compartmentalization, and merger) by 2 (group: ingroup vs. outgroup) General Linear Model (GLM) with ingroups' representation as between-subjects factor and group as within-subjects factor on the liking measure revealed a main effect of group, $F(1, 38) = 21.01$, $p < .001$, $\eta^2 = .36$. Participants judged the ingroup more likeable ($M = 5.78$, $SD = 0.85$) than the outgroup ($M = 4.79$, $SD = 1.21$) in general. This main effect was not qualified by the predicted interaction between ingroups' representation and group, $F < 1.06$; $p > .38$ (see the left panel in Figure 4).

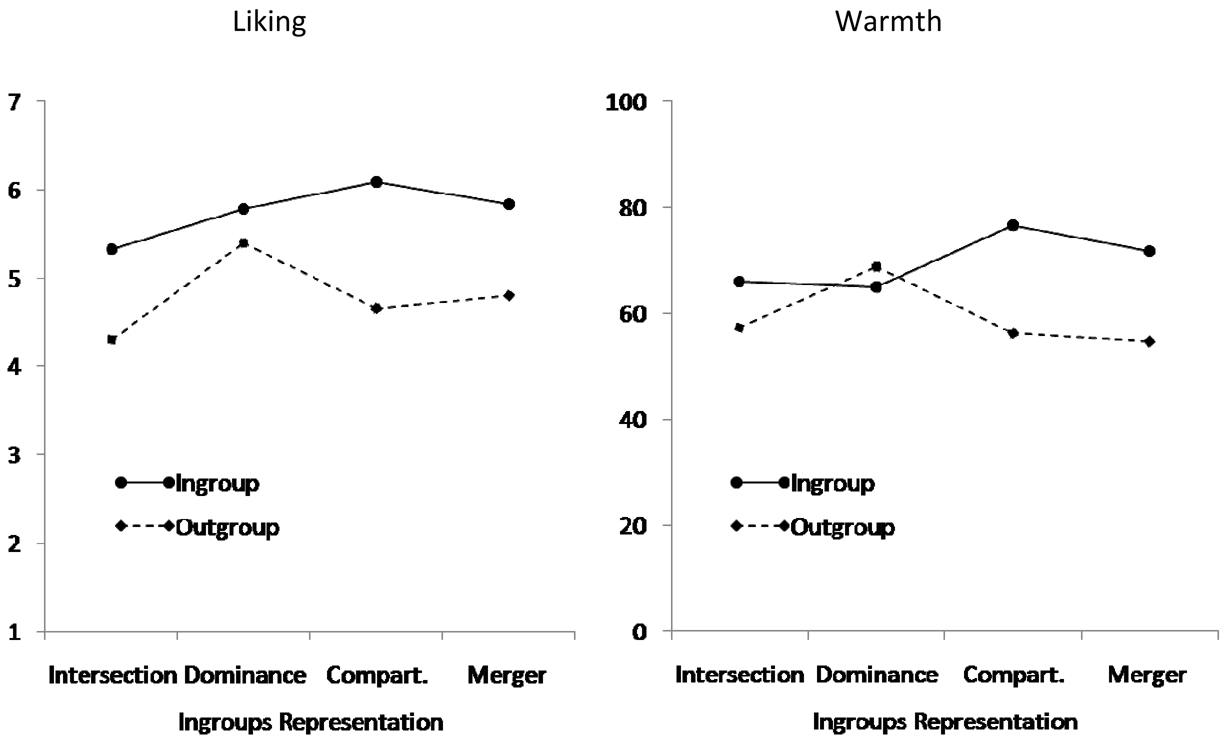

Figure 4. Liking and feeling thermometer judgments of ingroup and outgroup as a function of ingroups' representation in Experiment 1.

The following simple analyses revealed that liking rating differences for ingroup and outgroup among participants were not significant in the intersection, $F(1, 9) = 2.80$, $p = .13$, $\eta^2 = .24$, and dominance, $F(1, 9) = 1.40$, $p = .27$, $\eta^2 = .14$, but significant in the compartmentalization, $F(1, 10) = 14.77$, $p = .003$, $\eta^2 = .60$, and merger, $F(1, 10) = 9.18$, $p < .01$, $\eta^2 = .48$, conditions. All means and standard deviations are shown in Table 1.

Table 1

Liking Ratings for Ingroup and Outgroup as a Function of Ingroups' Representation in Experiment 1

		Liking	
		Ingroup	Outgroup
Ingroups' representation	*n*	*M* (*SD*)	*M* (*SD*)
Intersection	10	5.33[a] (1.21)	4.30[a,b] (1.34)
Dominance	10	5.78[a] (0.56)	5.40[a,b] (0.94)
Compartmentalization	11	6.09[a] (0.58)	4.66[b] (1.51)
Merger	11	5.84[a] (0.86)	4.80[b] (0.84)

Note. Means in rows and in columns with different superscripts differ significantly at $p < .05$

A similar results pattern was found on the second depended measure – feeling thermometer. A GLM revealed a main effect for group, $F(1, 40) = 9.77$, $p = .003$, $\eta^2 = .20$, such that the ingroup was judged as warmer ($M = 69.82$, $SD = 17.00$) than the outgroup ($M = 59.23$, $SD = 18.28$) in general. Furthermore a marginal interaction between ingroups' representation and group contrary to our hypotheses was found, $F(1, 40) = 2.55$, $p = .07$, $\eta^2 = .16$. Intergroup bias tended to be smaller in the simple than in the complex conditions (see the right panel in Figure 4). Separate analyses confirm this trend so that feeling thermometer rating differences for ingroup and outgroup among participants in the dominance conditions were not significant, *F*s < .86, *p*s > .38, they were significant in the compartmentalization, $F(1, 10) = 8.25$, $p = .02$, $\eta^2 = .45$, and merger conditions, $F(1, 10) = 11.52$, $p = .007$, $\eta^2 = .54$. All means and standard deviations are shown in Table 2.

Table 2

Feeling Thermometer Ratings for Ingroup and Outgroup as a Function of Ingroups' Representation in Experiment 1

		Warmth	
		Ingroup	Outgroup
Ingroups' representation	*n*	*M* (*SD*)	*M* (*SD*)
Intersection	11	66.00[a] (18.23)	57.36[a,b] (21.06)
Dominance	11	64.91[a] (18.06)	68.73[a,b] (19.67)
Compartmentalization	11	76.64[a] (11.54)	56.18[b] (16.42)
Merger	11	71.73[a] (18.81)	54.64[b] (14.15)

Note. Means in rows and in columns with different superscripts differ significantly at $p < .05$

2.1.3 Summary

The results of this study show a good immersion of the participants into the virtual context and a high acceptance of the simulation. Furthermore, the perception of ingroup homogeneity differed, as predicted, depending on the representations of ingroups. Participants perceived fellow ingroup members as less similar in the complex than in the simple conditions. This effect was most notable in comparisons between intersection and other modes. However, the tolerance measures for ingroups and outgroups (liking rating and feeling thermometer) were not impacted by the ingroups' representations. The ingroup was evaluated as more likable and warmer than the outgroup in general. Moreover, a trend contrary to the hypothesis arose such that distinctness was higher in the complex than in the simple condition. Since the experimental sample was relatively small these trends were assumed to occur by chance.

2.2 Experiment 2

The second experiment intended to verify the findings of Experiment 1. In addition, it controlled for the role of the personal avatar. The social identity complexity model does not differentiate exactly between categorization in terms of more different identity domains and multiple categorization within a single identity domain. However the present experimental paradigm covers the necessity to differentiate between these two perspectives and allows doing this simultaneously. The present research controls the role of constantly represented personal avatar.

2.2.1 Method

2.2.1.1 Participants and Design

Seventy one[1] participants (54 women and 17 men; *M* age = 24.31, *SD* = 6.56; 79% psychology students; 31% with migration background) were randomly allocated to one of the eight experimental conditions of a 4 (representation of ingroups: intersection, dominance, compartmentalization, and merger) by 2 (personal avatar: present vs. not present) between-subject design. The experiment lasted approximately 30 minutes and participants were rewarded with course credits for their study or alternatively participated in a lottery for a cinema voucher.

2.2.1.2 Procedure and Manipulations

Procedure, hardware, and manipulation of social identity complexity were the same as in the previous experiment. The program (SIC 2.2; Baun & Ermel, 2008a) was adjusted to the current experimental design. The second control factor – presence of the personal avatar – was manipulated by presenting the personal avatar after the introductory instruction only to half of the participants (cf. Appendix A).

2.2.1.3 Dependent Measures

The same dependent variables were used as in Experiment 1: ingroup (α = .73) and outgroup tolerance (α = .82), ingroup and outgroup feeling thermometer, ingroup homogeneity (α = .82), outgroup acceptance (α = .79), simulation acceptance (α = .86) and immersion (α = .84). A new dependent variable was outgroup homogeneity with α = .82.

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[1] Overall 72 participants were recruited, however the data of one person were excluded from the analysis because of too many (over 50 percent) missing data.

Additionally, the overlap complexity measure between 0 (*memberships do not overlap*) and 10 (*memberships overlap completely*) with one item ("Sometimes members of one group also belong to other groups. I'd like you to rate how much the membership of the different groups overlaps on a scale from 0 to 10 [...]"; adapted from Brewer & Piers, 2005) and the percentage estimation of ingroup memberships configuration with three items (for the first subculture: "Please estimate, how many percent unicolored [color 1 and ingroup name] live on our island"; for the second subculture: "Please estimate, how many percent unicolored [color 2 and ingroup name] live on our island"; and for the combined subculture: "Please estimate, how many percent bicolored [bicolor and ingroup-name] live on our island") were imposed, both as further manipulation check variables.

Also several additional covariates were imposed: ingroup identification (adapted from Luhtanen & Crocker, 1992; Reid, 2004) with five items (e.g., "I am one of the [ingroup name]", $\alpha = .75$), perceived intergroup variability (adapted from Rothgerber, 1997; Simon et al., 1995) with four items (e.g., "The [outgroup name] and we, the [ingroup name], are different", $\alpha = .72$), social desirability (adopted from Musch, Brockhaus, & Bröder, 2002; Stöber, 1999) with 3 items (e.g., "I always stay friendly and obliging to other people even when I am stressed", $\alpha = .49$) and ideological perspectives (Park & Judd, 2005) with four items (e.g., "If we want to help create a harmonious society, we must recognize that each cultural group has the right to maintain its own unique traditions"). The items of ideological perspectives were calculated to a multiculturalism index, which was arranged between -6 (low multiculturalism) and 6 (high multiculturalism). Among the personal data migration background was asked.

For the manipulation check of personal avatar presence five different statements for choice such as "I have imagined to be a [color and ingroup name] figure" or "I haven't imagined myself as a specific figure" were used. All measures used are summarized in Appendix B.

2.2.1.4 Statistical Hypotheses

The statistical hypotheses about homogeneity and tolerance were analogous to Experiment 1 by controlling the presence of the personal avatar. The homogeneity hypothesis was tested as a main effect of ingroups' representation on ingroup homogeneity so that the highest ingroup homogeneity value is expected to result in the condition intersection, followed by the conditions dominance, compartmentalization, and merger. The tolerance hypothesis was tested as a main effect of group being qualified by an interaction between ingroups' representation and group so that intergroup bias will be strongest in the intersection condition, second in dominance, third in compartmentalization, and weakest in merger. An additional identification hypothesis was that the two artificially induced ingroups generate sufficient identification, significantly over the midpoint of the scale, at least temporarily.

2.2.2 Results

2.2.2.1 Identification and Immersion

Ingroups' representation and avatar presence did not influence participant's ingroup identification (*F*s < 0.88, *p*s > .46) and immersion (*F*s < 1.67, *p*s > .18). Both ingroup identification and immersion were relatively high ($M_{\text{identification}}$ = 5.28, *SD* = 1.16; M_{imersion} = 4.64, *SD* = 1.86) and differed significantly from the midpoint of the scale, identification: t (69) = 9.27, $p < .001$ and immersion $t(69) = 2.89$, $p = .005$. On average the simulation was accepted with $M = 5.83$ ($SD = 1.21$) significantly over the midpoint of the scale, $t(69) = 12.62$, $p < .001$.

2.2.2.2 Manipulation Checks

Representation of ingroups. All ingroups differed in the degree of overlapping or inclusiveness operationalized through the different configurations of ingroup memberships: intersection with only combined subculture members, dominance with first subculture and combined subculture members, compartmentalization with first and second subculture members and merger with first, second and combined subculture members. Perceived estimations of ingroup membership configuration were used for the manipulation check of ingroups' representation.

A 4 (ingroups' representation: intersection, dominance, compartmentalization, und merger) by 2 (personal avatar: present vs. not present) multivariate GLM on the percentage estimations of ingroup memberships revealed the expected significant main effect of ingroups' representation ($F(9, 189) = 20.09$, $p < .001$, $\eta^2 = .49$) and a marginal effect of avatar presence ($p = .10$). In the same analysis this last marginal effect could be explained as a main effect of avatar presence on estimation of the first subculture ($F(1, 63) = 5.91$, $p = .02$, $\eta^2 = .09$), this subgroup was underestimated by participants with a personal avatar ($M = 29.67$, $SD = 19.45$ vs. $M = 38.63$, $SD = 21.45$), and a marginal main effect on the estimation of the combined subculture ($p = .08$), this bicolored subgroup was overestimated by participants with a personal avatar ($M = 52.78$ $SD = 19.45$ vs. $M = 48.69$, $SD = 21.45$). There are no other effects in this analysis.

Elaborated tests of within-subjects effects for every condition revealed the expected significant main effect on estimations of subgroups in the intersection ($F(1.00, 18.03) = 74.66$, $p < .001$, $\eta^2 = .80$), in the dominance ($F(1.34, 21.39) = 73.40$, $p < .001$, $\eta^2 = .82$) and in the compartmentalization conditions ($F(1.34, 21.39) = 73.40$, $p < .001$, $\eta^2 = .82$), in the merger condition this effect was marginally significant ($p = .09$). Bicolored avatars in the merger condition were by trend overestimated. Altogether, participants estimated ingroup memberships' configuration very close to the experimentally induced one. Estimated values in comparison with actual proportions are illustrated in Table 3.

Table 3

Estimated and Actual (in Brackets) Configuration of Ingroup Memberships in Percent as Function of Ingroups' Representation in Experiment 2

		Ingroup memberships		
		First subculture	Second subculture	Combined subculture
Ingroups' representation	*n*	*M*	*M*	*M*
Intersection	19	10.54^{a} (0)	10.98^{a} (0)	87.37^{b} (100)
Dominance	17	49.81^{a} (50)	1.56^{b} (0)	49.18^{a} (50)
Compartmentalization	17	43.80^{a} (50)	49.57^{a} (50)	12.93^{b} (0)
Merger	18	$35.11^{a,b}$ (33)	29.78^{a} (33)	40.61^{b} (33)

Note. Means in rows with different superscripts differ significantly at $p < .05$

Ingroup homogeneity and overlap complexity measure. Perceived ingroup homogeneity and overlap complexity measure were used to test a more indirect impact of social identity complexity manipulation. It was predicted that the ingroup with simple representations will be perceived to be more homogeneous and more overlapping than the ingroup with complex representations. A 4 (representation of ingroups: intersection, dominance, compartmentalization, and merger) by 2 (personal avatar: present vs. not present) ANOVA revealed an expected main effect of ingroups' representation on ingroup homogeneity, $F(3, 62) = 2.77$, $p < .05$, $\eta^2 = .11$, such that participants in the simplest condition perceived the ingroup more homogeneous ($M_{\text{intersection}} = 4.98$, $SD = 1.57$) than in the more complex conditions: $M_{\text{dominance}} = 3.69$, $SD = 1.51$; $M_{\text{compart.}} = 3.76$, $SD = 1.34$, and

M_{merger} = 3.89, *SD* = 1.75 (cf. lower line on the left panel of Figure 5). There are no other effects in this analysis.

These results were corroborated using the overlap complexity measure. A main effect of ingroups' representation on overlap was found, $F(3, 62) = 8.29$, $p < .001$, $\eta^2 = .28$, such that participants in the simplest condition ($M_{intersection} = 8.56$, $SD = 2.46$) perceived the ingroup to be more overlapping (less complex) than in the more complex conditions ($M_{dominance} = 5.94$, $SD = 2.28$; $M_{compart.} = 4.53$, $SD = 2.96$; and $M_{merger} = 5.44$, $SD = 2.46$). Thereby, simple contrasts were significant with *p*s < .02. Figure 5 demonstrates these results in the right panel. There are no other effects in this analysis.

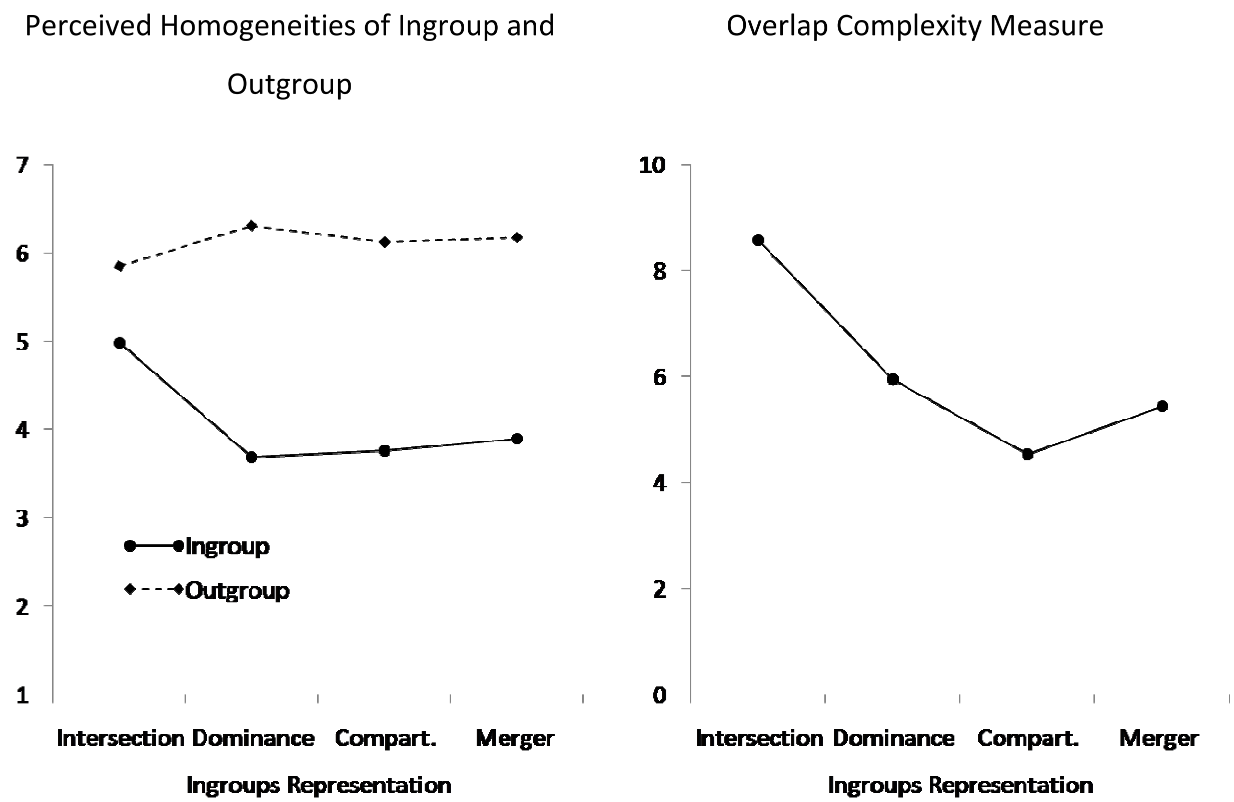

Figure 5. Perceived ingroup and outgroup homogeneities and overlap complexity measure as a function of ingroups' representation in Experiment 2.

Outgroup representation. Besides the perception of ingroup homogeneity, the perception of the outgroup was also assessed. A 4 (ingroups' representation: intersection, dominance, compartmentalization, and merger) by 2 (personal avatar: present vs. not present) by 2 (group: ingroup vs. outgroup) GLM with ingroups' representation and personal avatar presence as between-subjects factors and group as a within-subjects factor on the perceived homogeneity revealed a main effect of group ($F(1, 62) = 80.13$, $p < .001$, $\eta^2 = .56$). Perceived ingroup homogeneity was lower (*M* = 4.09; *SD* = 1.61) than perceived outgroup homogeneity (*M* = 6.04; *SD* = 1.23). Moreover, there was a 2-way interaction between group and ingroups' representation, $F(3, 62) = 4.31$, $p < .01$, $\eta^2 = .17$. The results reflected the actual representations of both groups, the unicolored outgroup was perceived to be more homogeneous than the ingroup except for the simplest condition.

Perception of personal avatar. In the with-avatar condition 67% of the participants were conforming to the manipulation and had imagined to be a blue-yellow figure, 1% had imagined being a yellow unicolored figure, and 31% hadn't imagined being a specific figure. In the without-avatar condition 49% of the participants had imagined being a bicolored figure, 6% had imagined being a blue figure, 9% being a yellow figure, and 37% hadn't imagined being a specific figure. However, nearly half of the participants without personal avatar presentation had imagined to be a bicolored avatar.

2.2.2.3 Tolerance

As in Experiment 1 for tolerance judgments, liking and warmth, a stronger intergroup bias in the simple than in the complex condition was predicted by controlling the presence of a personal avatar. For the first tolerance measure, a 4 (ingroups' representation: intersection, dominance, compartmentalization, and merger) by 2 (personal avatar: present vs. not present) by 2 (group: ingroup vs. outgroup) GLM with ingroups' representation and avatar as between-subjects factors and group as within-subjects factor on the liking revealed a main effect of group, $F(1, 62) = 11.88$, $p < .001$, $\eta^2 = .16$. Participants judged the ingroup more likeable (*M* = 5.75, *SD* = 1.00) than the outgroup (*M* = 5.26, *SD* = 1.20) in the simple as well as in the complex conditions. This main effect was not qualified by the predicted interaction between ingroups' representation and group ($F < 0.09$, $p > .97$). There are no other effects in this analysis.[1] Means and standard deviations of liking ratings for ingroup and outgroup as a function of ingroups' representation and avatar presence are shown in Table 4.

[1] The additional outgroup measures – acceptance and multiculturalism index– were not affected through the experimental manipulation in further ANOVA analyses either (*M* = 5.15, *SD* = 1.33, *F*s < 0.99, *p*s > .40; *M* = 3.04, *SD* = 1.65, *F*s < 0.88, *p*s > .35).

Table 4

Liking Ratings for Ingroup and Outgroup as a Function of Ingroups' Representation and Avatar Presence in Experiment 2

			Liking	
Ingroups' representation	Avatar presence		Ingroup	Outgroup
		n	*M* (*SD*)	*M* (*SD*)
Intersection	Present	9	6.33 (0.47)	5.47 (0.73)
	Not present	9	5.72 (1.20)	5.47 (1.27)
	Total	18	6.03[a] (0.93)	5.47[b] (1.00)
Dominance	Present	8	5.16 (1.03)	4.48 (1.65)
	Not present	9	5.36 (1.15)	5.11 (1.30)
	Total	17	5.26[a] (1.07)	4.82[a,b] (1.46)
Compart-mentalization	Present	9	5.94 (0.97)	5.83 (1.05)
	Not present	8	5.50 (1.27)	4.84 (1.01)
	Total	17	5.74[a] (1.11)	5.37[a,b] (1.12)
Merger	Present	9	6.00 (0.85)	5.31 (1.42)
	Not present	9	5.89 (0.78)	5.47 (0.92)
	Total	18	5.94[a] (0.79)	5.39[b] (1.17)

Note. Means in rows and in columns with different superscripts differ significantly at $p < .05$

Furthermore, rerunning the aforementioned 4 by 2 by 2 GLM as an Analysis of Covariance (ANCOVA) revealed a main effect of group, $F(1, 61) = 10.67$, $p = .002$, $\eta^2 = .15$, and revealed a main effect of the covariant ingroup identification, $F(1, 61) = 9.16$, $p = .004$, $\eta^2 = .13$. These main effects were qualified by an interaction between group and identification, $F\ (1, 61) = 17.19$, $p < 001$, $\eta^2 = .22$, such that ingroup favoritism appears only with a strong ingroup identification. These results were specified through a post-hoc blocking analysis by median splitting the sample into two groups with strong and weak ingroup identification (see upper and lower left panel in Figure 6).

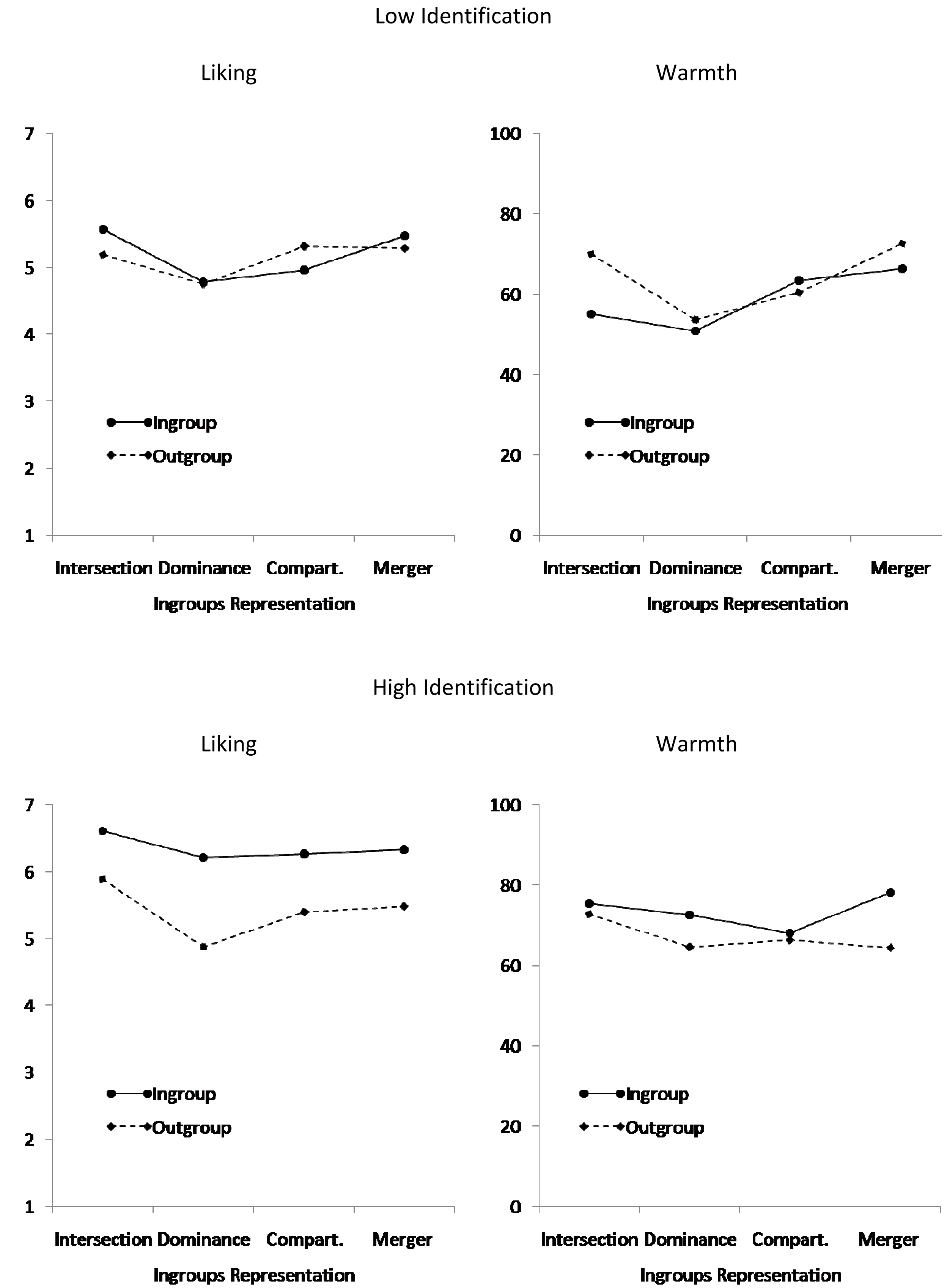

Figure 6. Liking and feeling thermometer judgments of ingroup and outgroup as a function of ingroups' representation and post blocked ingroup identification in Experiment 2.

A similar results pattern was found on the second main dependent measure – feeling thermometer. A 4 (ingroups' representation: intersection, dominance, compartmentalization, and merger) by 2 (personal avatar: present vs. not present) by 2 (group: ingroup vs. outgroup) GLM with ingroups' representation and personal avatar presence as between-subjects factors and group as within-subjects factor on the thermometer measure didn't reveal any effect (Fs < 1.46, ps >.23). All means and standard deviations of feeling thermometer ratings for ingroup and outgroup as a function of ingroups' representation and avatar presence are shown in Table 5.

Table 5

Feeling Thermometer Ratings for Ingroup and Outgroup as a Function of Ingroups' Representation and Avatar Presence in Experiment 2

			Warmth	
Ingroups'	Avatar		Ingroup	Outgroup
representation	presence	*n*	*M* (*SD*)	*M* (*SD*)
Intersection	Present	9	72.80 (15.33)	75.10 (12.96)
	Not present	9	57.22 (29.21)	67.11 (26.58)
	Total	18	65.42 (23.67)	71.32 (20.36)
Dominance	Present	8	54.88 (19.09)	48.63 (24.51)
	Not present	9	61.89 (24.79)	65.56 (21.86)
	Total	17	58.59 (21.90)	57.59 (24.03)
Compart-mentalization	Present	9	69.67 (27.26)	66.78 (23.68)
	Not present	8	62.13 (15.32)	60.63 (18.21)
	Total	17	66.12 (22.12)	63.88 (20.87)
Merger	Present	9	72.11 (22.37)	69.67 (21.28)
	Not present	9	73.78 (23.77)	66.44 (23.50)
	Total	18	72.94 (22.41)	68.06 (21.81)

Rerunning the aforementioned 4 by 2 by 2 mixed model as an ANCOVA on the thermometer measure revealed a main effect of group, $F(1, 61) = 9.46$, $p = .003$, $\eta^2 = .13$, and a main effect of identification, $F(1, 61) = 6.25$, $p = .02$, $\eta^2 = .14$. These main effects were qualified by an interaction between group and identification, $F(1, 61) = 10.16$, $p = .002$,

$\eta^2 = .14$, such that ingroup favoritism appears only with a strong ingroup identification. These results were also illustrated through a post-hoc blocking analysis (see the right panel in Figure 6).

2.2.3 Summary

The participants perceived the four ingroups' representations – intersection, dominance, compartmentalization, and merger – to be differently composed, overlapping, and homogeneous depending on the manipulation of the ingroups' representation. Again, the results showed a good immersion into the virtual context and a satisfactorily high identification with the artificial ingroups, both significantly over the midpoint of the respective scale. These results are in line with previous research on virtual communities (e.g., Utz, 2002). The method of virtual reality proved to be applicable, in order to build temporary membership in artificial social categories.

Presence of a personal avatar did not have an impact on the perceived ingroup homogeneity and tolerance towards outgroups. The personal bicolored avatar was maintained in the following studies for a better experimental continuity and comparability. However, presence of a personal avatar had a marginal effect on the percentage estimation of ingroups' configuration: compared to participants without a personal avatar, those that had one overestimated the bicolored subgroup (the group with the same color as the personal avatar) and underestimated one of the unicolored subcultures. Probably, this was the result of an impact of projection from oneself to the ingroup. These results confirm the necessity to differentiate between two perspectives simultaneously: categorization in terms of more different identity domains concerning the group and multiple categorization within a single identity domain concerning the individual.

An impact of representation of ingroups on tolerance was not found. In simple as well as in complex conditions there was an ingroup bias especially for participants who highly identified with their ingroup. Looking at the overall pattern of the perceived homogeneity for ingroup and outgroup simultaneously, gives rise to the assumption that so far the effects of ingroups' representation might have been suppressed by interference of the kind of representation of ingroup and outgroup. Therefore, it was important to control this possibility by varying the representation of the outgroup (simple vs. complex). This was done in the next experiment.

2.3 Experiment 3

Thus, in the previous two experiments manipulating ingroup homogeneity while keeping outgroup homogeneity constant could be confounded with the different intergroup variability or meta-contrast ratio[1] (Turner et al., 1987). The third experiment controlled for this possible interference between ingroup and outgroup representations by simultaneously manipulating both, ingroup and outgroup. Thereby contact situations were created where ingroup and outgroup were at the same time either both simple, or both complex, or the ingroup was simple and the outgroup complex or vice versa.

2.3.1 Method

2.3.1.1 Participants and Design

Seventy eight[2] undergraduates (62 women, 16 men; *M* age = 24.00, *SD* = 6.96; 96% psychology students; 15% with migration background) at a German university were randomly allocated to one of the 6 experimental conditions of the 2 (representation of ingroups: intersection = simple vs. merger = complex) by 3 (representation of outgroups: unicolor simple vs. bicolor simple vs. complex) between-participants design. A new color combination (red-yellow vs. blue-green) was counterbalanced in all bicolored simple and complex conditions, thus there were ten conditions overall (see Appendix C for an overview). The experiment lasted approximately 30 minutes and participants were rewarded course credits for their study.

2.3.1.2 Procedure and Manipulations

Procedure and hardware were the same as in the previous experiments. The program (SIC 2.3; Baun & Ermel, 2008b) was adjusted to the current experiment. Since the results of the manipulation checks of the previous experiments showed little differences between the three conditions: dominance, compartmentalization, and merger, the factor of representation of ingroups was reduced to the two levels, which contrasted best in the previous experiments, – intersection and merger. In the following they will be labeled as *simple* or *complex*, accordingly.

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[1] The meta-contrast ratio is defined by Turner et al. (1987) as the ratio of mean inter-category difference to mean intra-category difference.

[2] Overall 79 participants were recruited, however the data of one person were excluded from the analysis because of too many (over 50 percent) missing data.

Analogically to the factor ingroups' representation, the factor outgroups' representation was manipulated to bicolored simple vs. bicolored complex conditions, plus a control condition with unicolored avatars (see Appendix C for an overview).

2.3.1.3 Dependent Measures

The same dependent variables were used as in the previous experiments: ingroup (α = .80) and outgroup tolerance (α = .82), ingroup and outgroup feeling thermometer, ingroup (α = .75) and outgroup homogeneity (α = .80), overlap complexity measure, outgroup acceptance (α = .81), intergroup variability (α = .78), ingroup identification (α = .86), immersion (α = .72), ideological perspectives and personal data.

The impact of the additional manipulation on outgroups' representation was checked with percentage estimation of outgroup memberships configuration with three items (e.g., "Please estimate, how many bicolored [colors and outgroup-name] live on the neighbor island").

2.3.1.4 Statistical Hypotheses

In this experiment the groups' variability was controlled through simultaneous manipulation of ingroup and outgroup representations. If until now divergent representations of complex ingroup and simple outgroup covered the effect of ingroups' representation on outgroup tolerance, the new design could reveal this through an interaction between ingroups' representation and outgroup representation or through a 3-way interaction in a mixed design with the within factor group (ingroup vs. outgroup).

2.3.2 Results

2.3.2.1 Identification and Immersion

Ingroup and outgroup representations did not influence participant's ingroup identification (M = 5.13, SD = 1.26, Fs < 1.52, ps > .22) and immersion (M = 4.24, SD = 1.28, Fs < 1.89, ps >.16). Ingroup identification and simulation acceptance with M = 5.41 (SD = 1.44) differed significantly from the midpoint of the respective scale, with $t(77) = 7.94$, p < .001 and $t(77) = 8.63$, $p < .001$ accordingly.

2.3.2.2 Manipulation Checks

Ingroups' representation. Estimation of ingroup memberships' configuration was used for the manipulation check of ingroups' representation. A 2 (ingroups' representation:

simple vs. complex) by 3 (outgroup representation: unicolor simple vs. bicolor simple vs. complex) multivariate GLM on the percentage estimation of ingroup memberships revealed the expected significant main effect of ingroups' representation with $F(3, 70) = 26.62$, $p < .001$, $\eta^2 = .53$. Elaborated tests of within-subjects effects for every condition revealed a significant main effect on estimations of subgroups in the simple condition ($F(1.11, 39.92) = 101.42$, $p < .001$, $\eta^2 = .74$) and in the complex condition ($F(1.28, 46.04) = 8.27$, $p = .003$, $\eta^2 = .19$). Bicolored avatars (combined subculture) in the complex condition were overestimated. Altogether, participants estimated the ingroup membership configuration close to the experimentally induced one. Estimated values in comparison to actual proportions are illustrated in Table 6.

Table 6

Estimated and Actual (in Brackets) Configuration of Ingroup Memberships in Percent as Function of Ingroups' Representation in Experiment 3

		Ingroup memberships		
		First subculture	Second subculture	Combined subculture
Ingroups' representation	*n*	*M*	*M*	*M*
Simple	39	14.67^{a} (0)	10.38^{b} (0)	78.77^{c} (100)
Complex	39	31.00^{a} (33)	30.38^{a} (33)	42.46^{b} (33)

Note. Means in rows with different superscripts differ significantly at $p < .05$

Ingroup homogeneity and overlap complexity measure. It was predicted that the ingroup with simple representation will be perceived to be more homogeneous and more overlapping than the ingroup with complex representation. A 2 (ingroups' representation: simple vs. complex) by 3 (outgroup representation: unicolor simple vs. bicolor simple vs. complex) ANOVA revealed an expected single main effect of ingroups' representation on ingroup homogeneity, $F(1, 72) = 5.54$, $p = .02$, $\eta^2 = .07$, such that participants in the simple condition perceived the ingroup to be more homogeneous ($M = 5.40$, $SD = 1.00$) than in the complex condition with $M = 4.85$ and $SD = 1.14$ (see left panel of Figure 7).

These results were corroborated using the overlap complexity measure. Also a main effect of ingroups' representation on overlap was found, $F(1, 71) = 23.52$, $p < .001$, $\eta^2 = .25$, such that participants in the simple condition ($M = 8.26$, $SD = 2.17$) perceived the ingroup to be more overlapping (less complex), than in the complex condition (*M* = 6.18, *SD* = 1.43). There are no other effects in this analysis. Figure 7 demonstrates these results in the right panel.

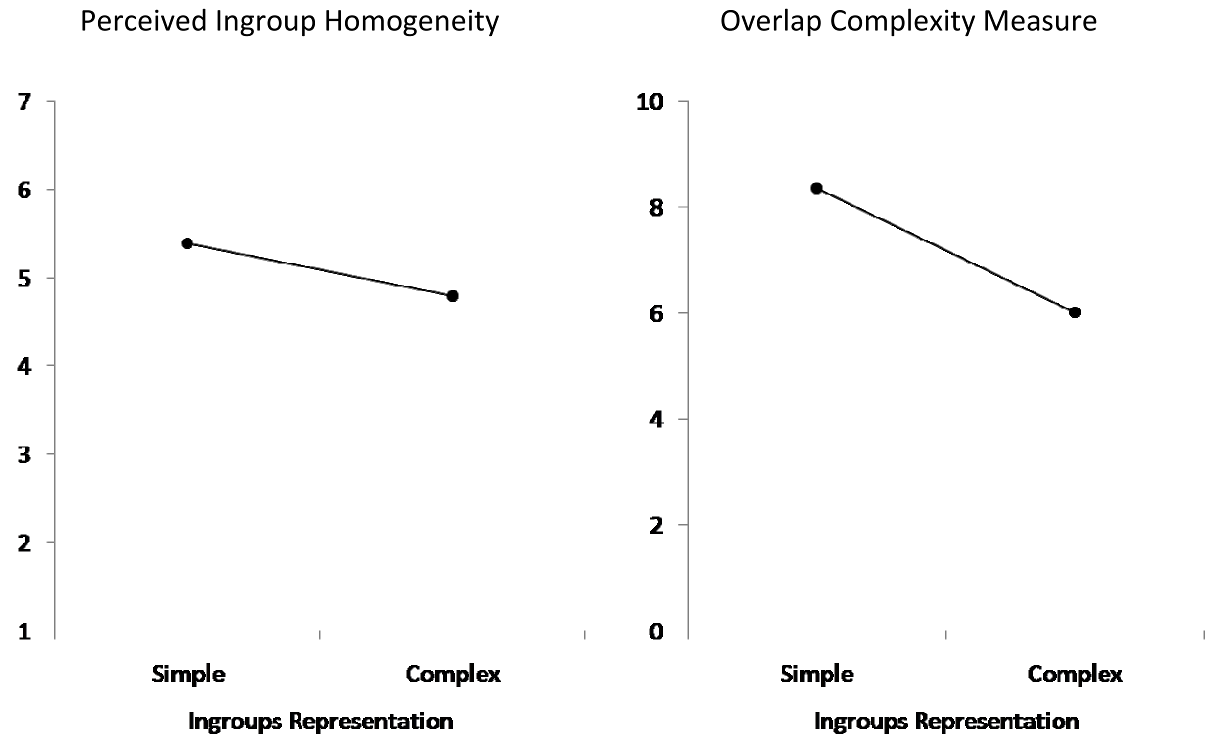


Figure 7. Perceived ingroup homogeneity and overlap complexity measure as a function of ingroups' representation in Experiment 3.

Outgroups' representation. Estimation of outgroup membership configuration was used for the manipulation check of outgroups' representation. A 2 (ingroups' representation: simple vs. complex) by 3 (outgroups' representation: unicolor simple vs. bicolor simple vs. complex) multivariate GLM on the percentage estimation of outgroup' memberships revealed the expected significant single main effect of outgroup' representation on estimations of subgroups' proportions with $F(6, 140) = 44.17$, $p < .001$, $\eta^2 = .65$.

Separate tests of within-subjects effects for every mode revealed the expected significant main effect on estimations of subgroups in the simple unicolored condition ($F(1.07, 15.20) = 94.86$, $p < .001$, $\eta^2 = .87$) and in the simple bicolored condition ($F(1.09, 31.71) = 63.73$, $p < .001$, $\eta^2 = .69$). There are no significant differences in the estimation of subgroups' proportions in the complex outgroup condition. Hence, participants estimated the ingroup membership configuration close to the experimentally induced one. Estimated values in comparison to actual proportions are illustrated in Table 7.

Table 7

Estimated and Actual (in Brackets) Configuration of Outgroup Memberships in Percent as Function of Outgroups' Representation in Experiment 3

		Outgroup memberships		
		First subculture	Second subculture	Combined subculture
Outgroups' representation	*n*	*M*	*M*	*M*
Simple unicolored	8	89.38[a] (100)	2.63[b] (0)	8.19[b] (0)
Simple bicolored	16	17.35[a] (0)	13.65[a] (0)	71.87[b] (100)
Complex	15	33.03[a] (33)	33.37[a] (33)	37.27[a] (33)

Note. Means in rows with different superscripts differ significantly at $p < .05$

Moreover, the outgroup with simple representation was expected to be perceived more homogeneous than the outgroup with complex representation. A 2 (ingroups' representation: simple vs. complex) by 3 (outgroup representation: unicolor simple vs. bicolor simple vs. complex) ANOVA revealed an expected single main effect of outgroups' representation on outgroup homogeneity, $F(2, 72) = 5.36$, $p = .007$, $\eta^2 = .13$, such that participants in the complex condition perceived the outgroup with $M = 5.02$ ($SD = 1.18$) less homogeneous than in the simple conditions ($M_{\text{simple unicolored}} = 5.70$, $SD = 1.00$, $p = .02$ and $M_{\text{simple bicolored}} = 5.78$, $SD = 0.81$, $p = .003$).[1]

2.3.2.3 Tolerance

A stronger intergroup bias in the simple than in the complex condition was predicted in the new contact situation with the complex ingroup and complex outgroup representation. A 2 (ingroups' representation: simple vs. complex) by 3 (outgroups' representation: unicolor simple vs. bicolor simple vs. complex) by 2 (group: ingroup vs. outgroup) GLM with ingroups' representation and outgroups' representation as between-subjects factors and group as a within-subjects factor on liking revealed a main effect of group, $F(1, 72) = 5.39$, $p = .02$, $\eta^2 = .07$. Participants judged the ingroup more likeable ($M = 5.45$, $SD = 1.09$) than the outgroup ($M = 5.08$, $SD = 1.09$) in general. This main effect was not qualified by the predicted 3-way interaction between ingroups' representation, outgroups' representation, and

[1] The perceived intergroup variability was not affected by the experimental manipulation in other 2 (ingroups' representation: simple vs. complex) by 3 (outgroup representation: unicolor simple vs. bicolor simple vs. complex) ANOVA analysis ($M = 4.27$, $SD = 1.18$, ps > .29).

group (F < 1.05, p > .36). There are no other effects in this analysis. Means and standard deviations of liking ratings for ingroup and outgroup as a function of ingroups' representation and outgroups' representation are shown in Table 8.

Table 8

Liking Ratings for Ingroup and Outgroup as a Function of Ingroups' and Outgroups' Representations in Experiment 3

			Liking	
Ingroups'	Outgroups'		Ingroup	Outgroup
representation	representation	*n*	*M* (*SD*)	*M* (*SD*)
Simple	Unicolor simple	8	5.28 (0.86)	5.34 (1.03)
	Bicolor simple	16	5.50 (1.04)	5.09 (0.86)
	Complex	15	5.37 (1.30)	4.88 (1.36)
	Total	39	5.40^{a} (1.09)	5.06^{b} (1.09)
Complex	Unicolor simple	8	5.69 (1.03)	5.13 (1.23)
	Bicolor simple	16	5.28 (1.03)	5.30 (1.19)
	Complex	15	5.60 (1.15)	4.87 (1.17)
	Total	39	5.49^{a} (1.09)	5.10^{b} (1.11)

Note. Means in rows and in columns with different superscripts differ significantly at p < .05

A 2 (ingroups' representation: simple vs. complex) by 3 (outgroups' representation: unicolor simple vs. bicolor simple vs. complex) by 2 (group: ingroup vs. outgroup) ANCOVA with repeated measures on liking and control for the covariant ingroup identification repeated a main effect of group, $F(1, 71) = 20.14$, $p < .001$, $\eta^2 = .22$ and revealed a main effect of the covariant ingroup identification, $F(1, 71) = 32.92$, $p < .001$, $\eta^2 = .32$. These main effects were qualified by an interaction between group and identification, $F(1, 71) = 28.18$, p < 001, $\eta^2 = .28$, such that ingroup favoritism appears only with a strong ingroup identification. These results were specified through a post-hoc blocking analysis by median splitting the sample into two groups with strong and weak ingroup identification (see upper and lower left panel in Figure 8). There are no other effects in this analysis.[1]

[1] The additional tolerance measure – outgroup acceptance and multiculturalism index – were not affected through the experimental manipulation in additional ANOVA analyses (M = 5.18, SD = 1.22, Fs < 2.05, ps > .16 and M = 2.95 (1.75), Fs < 2.62, ps > .11). Acceptance correlated positively with the feeling thermometer measure, r = .22, p < .05, and negatively with intergroup variability, r = -.51, p < .001.

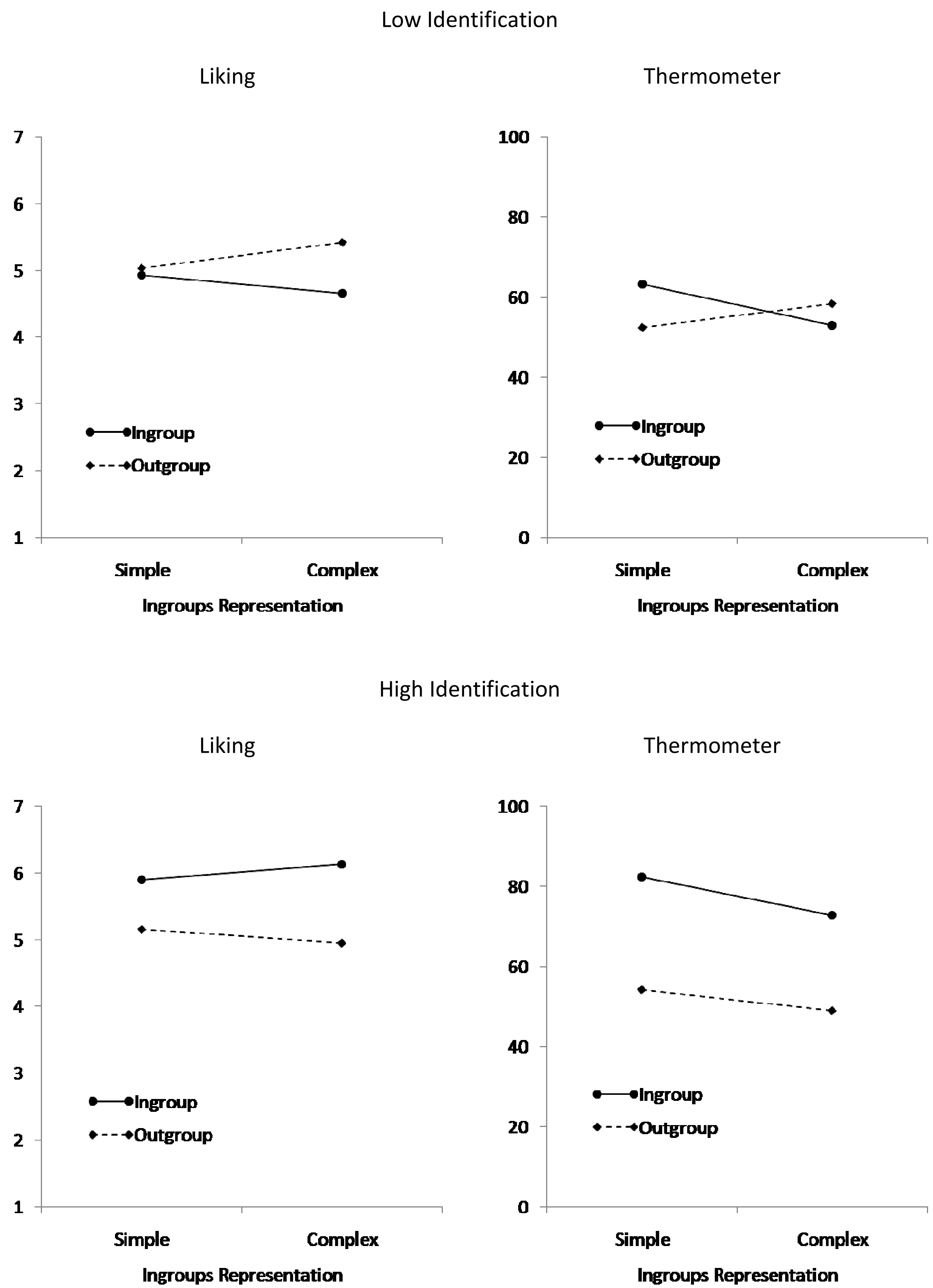


Figure 8. Liking and feeling thermometer judgments of ingroup and outgroup as a function of ingroups' representation and post-hoc blocked ingroup identification in Experiment 3.

A similar results pattern was found on the second main dependent measure – feeling thermometer. A 2 (ingroups' representation: simple vs. complex) by 3 (outgroups' representation: unicolor simple vs. bicolor simple vs. complex) by 2 (group: ingroup vs. outgroup) GLM with ingroups' representation and outgroup representation as between-subjects factors and group as within-subjects factor on the thermometer measure revealed a main effect of group, $F(1, 72) = 16.63$, $p < .001$, $\eta^2 = .19$. Participants judged the ingroup more likeable ($M = 68.05$, $SD = 20.87$) than the outgroup ($M = 53.60$, $SD = 21.16$) in general. Means and standard deviations of feeling thermometer ratings for ingroup and outgroup as a function of ingroups' representation and outgroups' representation are shown in Table 9.

Table 9

Feeling Thermometer Ratings for Ingroup and Outgroup as a Function of Ingroups' and Outgroups' Representations in Experiment 3

			Warmth	
Ingroups'	Outgroups'		Ingroup	Outgroup
representation	representation	*n*	*M* (*SD*)	*M* (*SD*)
Simple	Unicolor simple	8	72.25 (18.21)	51.25 (23.40)
	Bicolor simple	16	71.31 (22.14)	57.13 (18.57)
	Complex	15	71.33 (19.29)	53.13 (25.87)
	Total	39	71.51[a] (19.80)	54.38[b] (22.13)
Complex	Unicolor simple	8	73.25 (19.00)	45.13 (26.28)
	Bicolor simple	16	61.37 (19.40)	57.38 (20.01)
	Complex	15	63.40 (25.01)	52.07 (17.29)
	Total	39	64.59[a] (21.59)	52.82[b] (20.42)

Note. Means in rows and in columns with different superscripts differ significantly at $p < .05$

A 2 (ingroups' representation: simple vs. complex) by 3 (outgroups' representation: unicolor simple vs. bicolor simple vs. complex) by 2 (group: ingroup, outgroup) ANCOVA with repeated measures on the feeling thermometer and control for the covariant ingroup identification revealed a main effect of the covariant ingroup identification, $F(1, 71) = 13.45$, $p < .001$, $\eta^2 = .16$. These main effects were qualified by a marginal interaction between group and identification, $F(1, 71) = 2.97$, $p = .09$, $\eta^2 = .04$, such that ingroup favoritism appears rather with a strong ingroup identification. These results were specified through a post-hoc blocking analysis by median splitting the sample into two groups with strong and weak ingroup identification (see upper and lower right panel in Figure 8). Furthermore, there is a marginal main effect of ingroups' representation, $F(1, 71) = 3.53$, $p = .06$, $\eta^2 = .05$, such that the complex ingroup was found to be less warm.

2.3.3 Summary

In the previous two experiments manipulating ingroup homogeneity while keeping outgroup homogeneity constant could be confounded with the different meta-contrast ratio, in other words the effects of ingroups' representation might have been suppressed by interference of the kind of representation of ingroups and outgroups. The third experiment controlled for this possible interference between ingroup and outgroup representations by simultaneously manipulating both, ingroup and outgroup representations.

But again, in the simple as well as in the complex ingroups' representations an intergroup bias resulted, irrespective of outgroups' representation and new color combination. This bias was moderated only through ingroup identification, such that ingroup favoritism was more likely to appear in conjunction with a strong ingroup identification – yielding similar results to the previous experiments.

Until now in the present experimental paradigm salience of ingroup-outgroup distinction was relatively strong. "By having an outgroup that was completely separate (including physical separation), with no overlap with the ingroup, there may have been little basis for generalization of ingroup complexity to this new outgroup" (M. Brewer, personal communication, March 3, 2009). The new possible alternative paradigms for testing this idea would be either the introduction of outgroup avatars with a shared dimension ("[…] an outgroup composed of avatars with one overlapping and one nonoverlapping color [...]", M. Brewer, personal communication, March 3, 2009) or lower separation, for instance, mixed representation of ingroup and outgroup or the introduction of a superodinate category. The past factor is related to the ingroup projection model that brings together tolerance and a complex and vague representation of an inclusive category (Mummendey & Wenzel, 1999). These intermediate paradigms were realized in the following two experiments.

Moreover, it was important to control for the motivational roots (e.g., uncertainty tolerance, need for structure, personal values and need for cognition) as possible antecedents of social identity complexity (Roccas & Brewer, 2002). The reaction of the participants to the different representations of ingroups might depend on their personal preconditions: those who prefer a complex representation of their ingroups might be astounded to discover that there is high overlap between their multiple ingroups; those who prefer a simple representation might be perplexed to realize that their social identities are not as simple as they thought. These reactions could cancel the possible effects of the manipulation on tolerance (Roccas & Amit, 2011). In the next experiments it would be valuable to verify, if individual differences in motivational variables, which are relating to social complexity, impact the effects of the ingroups' representation on tolerance.

2.4 Experiment 4

In Experiment 4 it was assumed that a weaker ingroup-outgroup distinction operationalized through a shared (color) dimension would facilitate the emergence of an effect of ingroups' representation on tolerance. Overlapping categorization should be compared with extended overlapping categorization. Thereby motivational roots (need for closure, need for cognition, need for structure, uncertainty tolerance and personal values) as possible antecedents of social identity complexity should be considered and controlled in additional analyses.

2.4.1 Method

2.4.1.1 Participants and Design

Eighty one undergraduates from a German university (63 women, 18 men; *M* age = 22.37, *SD* = 3.23; 98% psychology students; 21% with migration background) were randomly allocated to one of the four experimental conditions of the 2 (ingroups' representation: simple vs. complex) by 2 (color sharing: sharing vs. non-sharing) between-participants design.

New color combinations coupled with new avatar names and the side on which the island was represented were counterbalanced, thus there were 16 conditions overall (see Appendix D for an overview). The experiment lasted approximately 30 minutes and participants were rewarded course credits for their study. Motivational roots – need for closure, need for cognition, need for structure, uncertainty tolerance, and personal values – as possible antecedents of social identity complexity were controlled in additional analyses.

2.4.1.2 Procedure and Manipulations

The hardware used was a new standard computer (Intel (R) Pentium (R) D; CPU 3.0 GHz; RAM 1 GB; graphic board: NVIDIA GeForce 6700 XL) and a new LCD monitor (22-inch; 60 Hz; 1440 x 900 Pixel). The procedure was the same as in the previous experiments except for the following pre-experimental questionnaire (see Appendix E for the original version), which should control motivational roots as possible antecedents of social identity complexity (Roccas & Brewer, 2002): Short German Uncertainty Tolerance Scale (Dalbert, 1999; α = .63), Personal Need for Structure Scale (PNS; Neuberg & Newscom, 1993; German version adopted by Machuchinsky & Meiser, 2006; α = .78), Portraits Value Questionnaire[1] (PVQ; Schwartz, 2006; German version adopted by Schmidt, Bamberg, Davidov, Herrmann, & Schwartz, 2007; self-enhancement, α = .80; openness, α = .72 self-transcendence, α = .45; conservation α = .72), and Need for Cognition Scale (NFC; Cacioppo and Petty, 1982; German version adopted by Bless, Wänke, Bohner, Fellhauer, and Schwarz, 1994; α = .84).

The program (SIC 2.5; Baun & Ermel, 2009a) was adjusted to the current experimental design. The double-stage ingroups' representation factor with simple and complex conditions was the same as in the previous experiment. The second factor, ingroup-outgroup distinction, was manipulated through color sharing: ingroup and outgroup shared vs. did not share one color dimension. Moreover, avatars got a new counterbalanced color set coupled with name. If the ingroup consisted of green-yellow *Tanzi-Puntis*, the outgroup was constituted by red-blue *Danzi-Funtis* and vice versa. In the sharing conditions the outgroup avatars were red-yellow *Danzi-Puntis* in the contact situation with a green-yellow ingroup or yellow-blue *Punti-Funtis* in the contact situation with a red-blue ingroup. Also the island's position – ingroup island left with outgroup island right vs. ingroup island right with outgroup island left – was counterbalanced (see Appendix D for an overview).

2.4.1.3 Dependent Measures

The same dependent variables were used as in the previous experiments: percentage estimation of ingroup and outgroup memberships configuration, ingroup (α = .82) and outgroup tolerance (α = .78), ingroup (α = .82) and outgroup homogeneity (α = 78), overlap complexity measure, outgroup acceptance (α = .85), intergroup variability (α = .67), ingroup identification (α = .72), simulation acceptance (α = .87), immersion (α = .79), ideological perspective and personal data. The outgroup acceptance scale was completed through two items of harshness towards the outgroup ("We should reduce the influence of [outgroup name] on our culture" and "I approve the imposing of restrictions on immigration"; adapted from Saucier, 2000).

2.4.1.4 Statistical Hypotheses

A three-way interaction between color sharing, ingroups' representation and group was expected, such that intergroup bias should disappear or decrease with the complex

[1] The individual values on the second level are: (a) Conservation based on security, conformity and tradition, (b) self-transcendence based on benevolence and universalism, (c) openness based on self-direction and stimulation hedonism and (d) self-enhancement based on power and achievement.

ingroups' representation, if ingroup and outgroup share a color dimension. Thereby, individual tolerance for ambiguity should be controlled.

2.4.2 Results

2.4.2.1 Identification and Immersion

Ingroup' representations and color sharing did not influence the participant's ingroup identification (M = 4.94, SD = 1.05, Fs < 2.48, ps > .12) and immersion (M = 4.05, SD = 1.42, Fs < 1.80, ps >.18). Ingroup identification differed significantly from the midpoint of the scale, $t(80) = 8.05$, $p < .001$, as well as simulation acceptance with M = 4.80 (SD = 1.61) and $t(80) = 4.48$, $p < .001$.

2.4.2.2 Manipulation Checks

Ingroups' representation. Estimation of ingroup memberships' configuration was used for the manipulation check of ingroups' representation. A 2 (ingroups' representation: simple vs. complex) by 2 (color sharing: sharing vs. non-sharing) multivariate GLM on the percentage estimation of ingroup memberships revealed the expected significant main effect of ingroups' representation with $F(3, 74) = 67.15$, $p < .001$, $\eta^2 = .73$. Elaborated tests of within-subjects effects for every condition revealed the expected significant main effect on estimations of subgroups in the simple condition ($F(1.06, 40.50) = 341.42$, $p < .001$, $\eta^2 = .90$) but not in the complex condition ($Fs < 2.47$, $ps > .09$). Participants estimated ingroup membership configuration very close to the experimentally induced one. Estimated values in comparison with actual proportions are illustrated in Table 10.

Table 10

Estimated and Actual (in Brackets) Configuration of Ingroup Memberships in Percent as Function of Ingroups' Representation in Experiment 4

	Ingroup memberships		
	First subculture	Second subculture	Combined subculture
Ingroups' representation	*M*	*M*	*M*
Simple	5.75^{a} (0)	5.30^{a} (0)	88.80^{b} (100)
Complex	32.60^{a} (33)	32.47^{a} (33)	38.23^{a} (33)

Note. Means in rows with different superscripts differ significantly at $p < .05$

Ingroup homogeneity and overlap complexity measure. The results of perceived ingroup homogeneity and overlap complexity measure were similar to the corresponding results in the previous experiments. A 2 (ingroups' representation: simple vs. complex) by 2 (color sharing: sharing vs. non-sharing) ANOVA revealed an expected single main effect of ingroups' representation on ingroup homogeneity, $F(1, 77) = 19.74$, $p < .001$, $\eta^2 = .20$, such that participants in the simple condition perceived the ingroup to be more homogeneous ($M = 5.72$, $SD = 1.21$) than in the complex condition ($M = 4.54$, $SD = 1.20$). Color sharing did not impact significantly perceived ingroup homogeneity ($F < 2.05$, $p > .16$). However, participants in the non-sharing condition by trend showed higher values in ingroup homogeneity than participants in the sharing condition (see left panel of Figure 9).

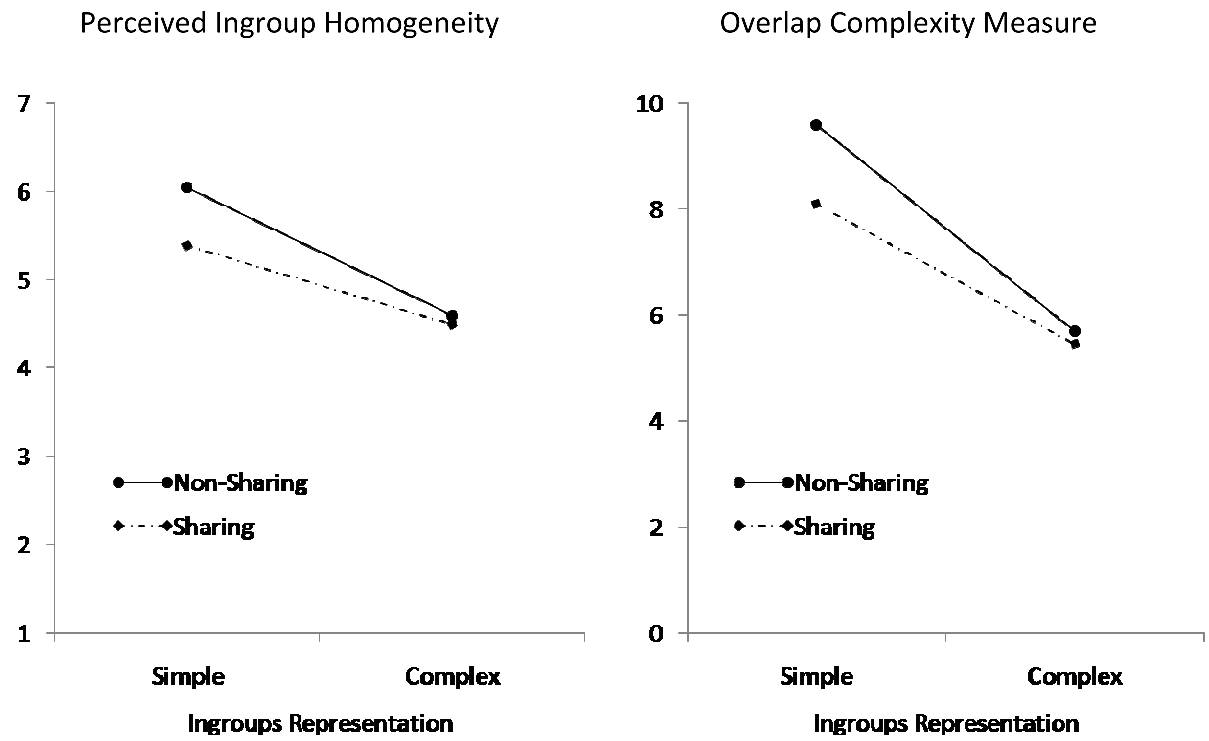


Figure 9. Perceived ingroup homogeneity and overlap complexity measure as a function of ingroups' representation and color sharing in Experiment 4.

These results were corroborated through the same design on the overlap complexity measure. Also a single main effect of ingroups' representation on overlap was found, $F(1, 76) = 18.60$, $p < .001$, $\eta^2 = .40$, such that participants in the simple condition ($M = 8.85$, $SD = 2.23$) perceived the ingroup more overlapping (less complex), than in the complex condition ($M = 5.58$, $SD = 1.99$). Furthermore, there was a marginal main effect of color sharing ($F(1, 76) = 3.56$, $p = .06$, $\eta^2 = .05$), such that participants in the non-sharing condition by trend showed higher values in overlap complexity than participants in the sharing condition, with M = 7.65 (SD = 2.47) vs. M = 6.78 (SD = 2.82) accordingly. Figure 9 illustrates these results in the right panel.

Color sharing. Estimation of outgroup membership configuration was used for the manipulation check of color sharing. A 2 (ingroups' representation: simple vs. complex) by 2 (color sharing: sharing vs. non-sharing) multivariate GLM on the percentage estimation of outgroup memberships revealed the expected significant main effect of outgroup memberships with $F(2, 76) = 149.46$, $p < .001$, $\eta^2 = .80$. Elaborated tests of within-subjects effects for every condition revealed the expected significant main effects on estimations of subgroups ($F_{\text{non-sharing}}$ (1.29, 49.17) = 89.19, $p < .001$, $\eta^2 = .70$; F_{sharing} (1.06, 41.18) = 191.16, $p < .001$, $\eta^2 = .83$). Participants estimated outgroup memberships and thus outgroup color combinations close to the experimentally induced one. Estimated values in comparison with actual proportions are illustrated in Table 11.

Table 11

Estimated and Actual (in Brackets) Configuration of Outgroup Memberships in Percent as Function of Color Sharing in Experiment 4

	Outgroup memberships		
	First subculture	Second subculture	Combined subculture
Color sharing	*M*	*M*	*M*
Non-sharing	13.23^a (0)	12.70^a (0)	74.05^b (100)
Sharing	7.54^a (0)	8.85^a (0)	85.98^b (100)

Note. Means in rows with different superscripts differ significantly at $p < .05$

Remarkably, the perceived intergroup variability was not affected by the experimental manipulation in a 2 (ingroups' representation: simple vs. complex) by 2 (color sharing: sharing vs. non-sharing) ANOVA analysis (M = 4.01, SD = 1.07, ps > .37).

2.4.2.3 Tolerance

For liking and warmth judgments a lower intergroup bias was predicted in the complex than in the simple condition, if groups shared a categorization dimension. A 2 (ingroups' representation: simple vs. complex) by 2 (color sharing: sharing vs. non-sharing) by 2 (group: ingroup vs. outgroup) GLM with ingroups' representation and color sharing as between-subjects factors and group as a within-subjects factor on liking revealed a main effect of group, $F(1, 76) = 4.26$, $p = .04$, $\eta^2 = .05$, such that participants judged the ingroup more likeable ($M = 5.04$, $SD = 1.30$) than the outgroup ($M = 4.79$, $SD = 1.25$) in general, and revealed a 2-way interaction between ingroups' representation and color sharing, $F(1, 76) = 6.50$, $p < .01$, $\eta^2 = .08$. Liking values in the non-sharing condition for both groups were less in the simple than in the complex ingroups' representation ($p < .05$) and in the sharing condition they were less in the complex than in the simple ingroups' representation, whereupon this last difference was not significant as simple contrast. The predicted 3-way interaction between ingroups' representation, color sharing, and group factors did not appear ($F < 0.02$, $p > .88$). All means and standard deviations of liking ratings for ingroup and outgroup are shown in Table 12.

Table 12

Liking Ratings for Ingroup and Outgroup as a Function of Ingroups' Representation and Color Sharing in Experiment 4

			Liking	
Ingroups'			Ingroup	Outgroup
representation	Sharing	*n*	*M* (*SD*)	*M* (*SD*)
Simple	Non-sharing	20	4.41 (1.29)	4.44 (1.25)
	Sharing	20	5.45 (1.04)	5.16 (1.13)
Complex	Non-sharing	20	5.29 (1.14)	5.05 (1.05)
	Sharing	20	5.00 (1.52)	4.52 (1.48)

A 2 (ingroups' representation: simple vs. complex) by 2 (color sharing: sharing vs. non-sharing) by 2 (group: ingroup vs. outgroup) ANCOVA with repeated measures on liking and control for the covariant ingroup identification revealed a stronger main effect of group, $F(1, 75) = 16.33$, $p < .001$, $\eta^2 = .18$, interaction between ingroups' representation and color sharing, $F(1, 75) = 4.70$, $p = .03$, $\eta^2 = .06$ and revealed a main effect of the covariant ingroup identification, $F(1, 75) = 7.22$, $p = .03$, $\eta^2 = .09$. The main effects were qualified further by an interaction between group and identification, $F(1, 75) = 21.22$, $p < 001$, $\eta^2 = .22$, such that ingroup favoritism appears only with a strong ingroup identification. These results were specified through a post-hoc blocking analysis by median splitting the sample into two groups with low and high ingroup identification (see upper and lower left panel in Figure 10).

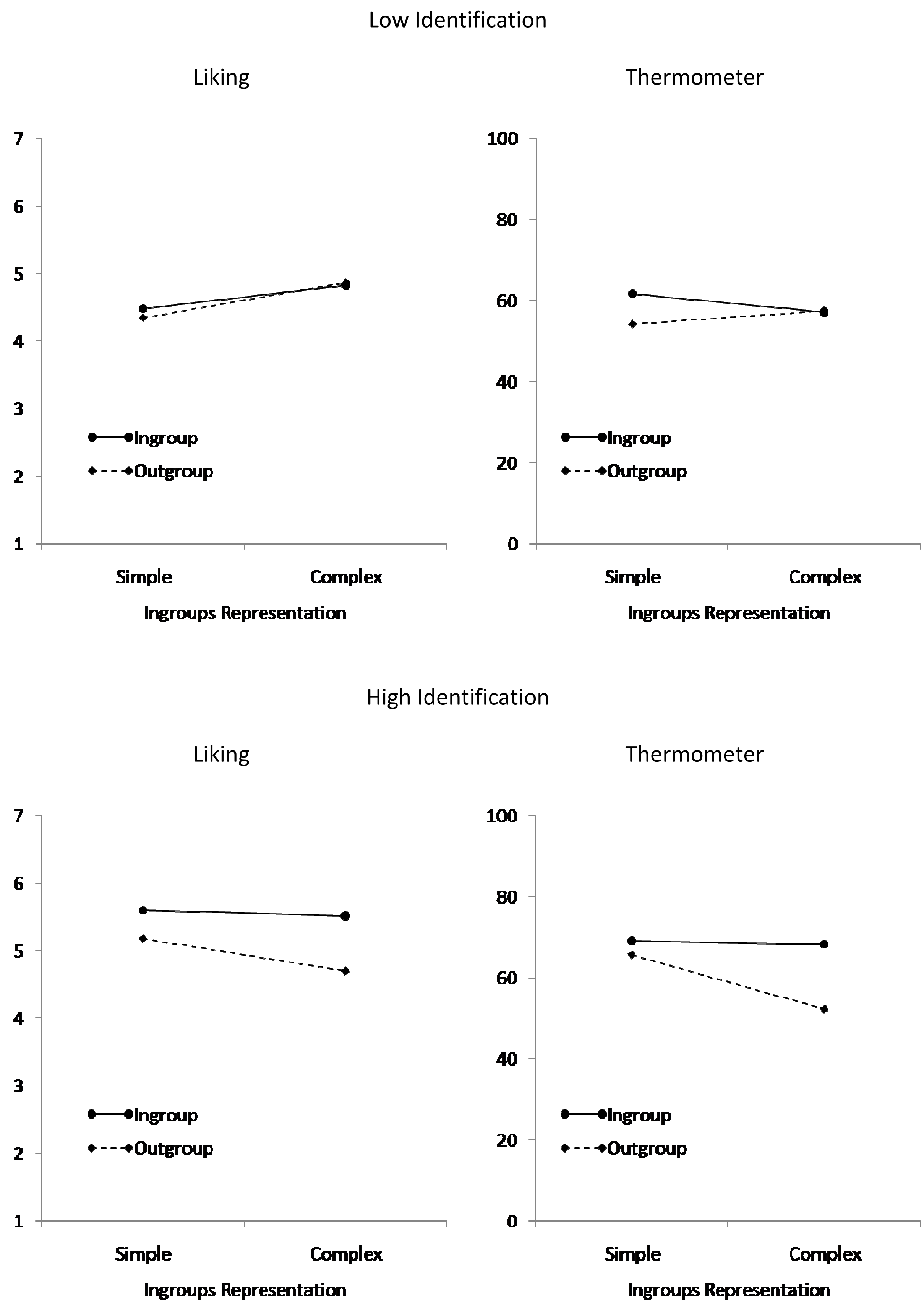


Figure 10. Liking and warmth judgments of ingroup and outgroup as a function of ingroups' representation and post-hoc blocked ingroup identification in Experiment 4.

A 2 (ingroups' representation: simple vs. complex) by 2 (color sharing: sharing vs. non-sharing) by 2 (group: ingroup vs. outgroup) GLM with ingroups' representation and color sharing as between-subjects factors and group as within-subjects factor on the thermometer measure revealed a main effect of group, $F(1, 75) = 7.91$, $p = .006$, $\eta^2 = .10$. Participants judged the ingroup more likeable ($M = 63.80$, $SD = 19.33$) than the outgroup ($M = 57.30$, $SD = 19.52$) in general. All means and standard deviations of warmth ratings for ingroup and outgroup as a function of ingroups' representation and color sharing are shown in Table 13.

Table 13

Feeling Thermometer Ratings for Ingroup and Outgroup as a Function of Ingroups' Representation and Color Sharing in Experiment 4

			Warmth	
Ingroups'			Ingroup	Outgroup
representation	Sharing	*n*	*M* (*SD*)	*M* (*SD*)
Simple	Non-sharing	20	60.40 (20.16)	54.20 (21.93)
	Sharing	20	70.00 (22.22)	64.95 (17.78)
Complex	Non-sharing	20	64.80 (17.89)	54.05 (19.45)
	Sharing	19	59.79 (16.03)	55.95 (17.94)

A 2 (ingroups' representation: simple vs. complex) by 2 (color sharing: sharing vs. non-sharing) by 2 (group: ingroup vs. outgroup) ANCOVA with repeated measures on the feeling thermometer and control for the covariant ingroup identification revealed a marginal interaction between group and identification, $F(1, 74) = 3.75$, $p = .06$, $\eta^2 = .05$, such that ingroup favoritism rather appears with a strong ingroup identification. These results were specified through a post-hoc blocking analysis by median splitting the sample into two groups with strong and weak ingroup identification (see upper and lower right panel in Figure 10)[1].

[1] The additional tolerance measures – outgroup acceptance and multiculturalism index – were not affected through the experimental manipulation in additional ANOVA analyses ($M = 5.47$, $SD = 1.24$, *F*s < 1.57, *p*s > .22 and $M = 3.21$ (1.77), *F*s < 2.53, *p*s > .12), which corresponded to the results of outgroup liking and feeling thermometer. All tolerance measures inter-correlated with each other. Acceptance correlated, for example, positively with multiculturalism, $r = .49$, $p < .001$, with the thermometer measure, $r = .41$, $p <$ 001, with the liking measure $r = .25$, $p = .02$, and negatively with intergroup variability, $r = -.35$, $p < .001$.

2.4.2.4 Motivational Roots – Tolerance for Ambiguity

In this research, moderating effects of motivational roots on the relation between ingroups' representation and tolerance for the outgroup could not be found. In general, the above-mentioned main results were not altered by controlling for motivational roots (need for closure, need for cognition, need for structure, uncertainty tolerance, and personal values) as possible antecedents of social complexity in additional analyses.

However, a link between individual values and outgroup tolerance exists: self-transcendence correlated significantly positive with outgroup acceptance, $r = .43$, $p < .001$, and with multiculturalism, $r = .31$, $p < .001$; self-enhancement correlated significantly negative with outgroup acceptance, $r = -.35$, $p < .001$, with multiculturalism, $r = -.34$, $p < .001$, with feeling thermometer, $r = -.29$, $p < 001$, and marginally significant with liking measure, $r = -.20$, $p < .10$, irrespective of the experimental conditions. The whole pattern of correlations between individual values and outgroup tolerance measures is consistent with findings about real-life-groups (Davidov, Meuleman, Billiet, and Schmidt, 2008; Kuşdil & Şimşek, 2008; Roccas & Amit, 2011; Sagiv & Schwartz, 1995). Thus, a relation between individual values – measured prior to the experimental manipulation – and tolerance towards artificial outgroup avatars was found. The persons, who had high values in conservation and self-enhancement, tended to evaluate the artificial outgroup negatively; the persons, who had high values in openness and self-transcendence, were prone to evaluate the outgroup positively.

2.4.3 Summary

Taken together, salience of ingroup-outgroup distinction was very strong in the initial experimental paradigm. There might have been insufficient basis for generalization of ingroup complexity to outgroup. The new possible alternative paradigm was the introduction of outgroup avatars with a shared dimension. It was assumed that a weaker ingroup-outgroup distinction would generate an effect of ingroups' representation on tolerance. Thereby overlapping categorization was compared with extended overlapping categorization.

However, the intergroup bias was not impacted through experimental manipulations in Experiment 4. There was an ingroup favoritism irrespective of ingroup and outgroup representations covarying with ingroup identification, such that ingroup favoritism appears only with a strong ingroup identification. An unexpected 2-way interaction between social complexity and color sharing on the liking-measure could be explained through a possible subsample effect: participants with a low ingroup identification in the simple, non-sharing condition (n = 11) strongly devalue the ingroup (M = 3.71, SD = 0.85) as well as the outgroup (M = 3.96, SD = 1.02). This pattern was not found within the other tolerance measures. Moreover, contrary to expectation, there was a tendency to devalue the outgroup in the complex sharing condition, which possibly can be explained by threat. However, in this research this could not be verified.

The predicted 3-way interaction between social complexity, color sharing, and group did not appear. This may be due to fact that the perceived intergroup variability was not affected by the experimental manipulation at the intragroup level. However, in order to verify, if until now the ingroup-outgroup distinction was too strong for generalization of social complexity to outgroup, there were two more possibilities: manipulation of an intergroup constellation (higher vs. lower group separation) and manipulation of a hierarchical intragroup constellation (introduction of a superodinate category vs. not). These intermediate paradigms were realized in the last experiment of the research set presented here.

2.5 Experiment 5

In the initial experimental paradigm salience of ingroup-outgroup distinction might have been too strong and may have precluded generalization of ingroup complexity to the outgroup. The new possible alternative paradigms for testing this idea - the introduction of outgroup avatars with a shared dimension - was realized in Experiment 4. The next lower ingroup-outgroup distinction, mixed representation of ingroup and outgroup and introduction of a superodinate category was planned in Experiment 5. The past factor would represent a link to the ingroup projection model that pool together tolerance and a complex and vague representation of a superordinate category (Mummendey & Wenzel, 1999).

2.5.1 Method

2.5.1.1 Participants and Design

One hundred and fifty four undergraduates from a German university (120 women, 34 men, M_{age} = 23.56, *SD* = 5.34; 21% psychology students, 16% with migration background) were randomly allocated to one of the eight experimental conditions of the 2 (ingroups' representation: simple vs. complex) by 2 (superodinate category: present vs. not present) by 2 (intergroup representation: separate vs. mixed) between-participants design.

Color combinations coupled with avatar names (ingroup: green-yellow *Tanzi-Puntis* with outgroup: red-blue *Danzi-Funtis* vs. ingroup: red-blue *Danzi-Funtis* with outgroup: green-yellow *Tanzi-Puntis*) and the side on which the island was represented (ingroup island left with outgroup island right vs. ingroup island right with outgroup island left) were counterbalanced, thus there were 32 conditions overall (see Appendix F for an overview). The experiment lasted approximately 30 minutes and participants were rewarded with 8.5 Euros. Social desirability, uncertainty tolerance, need for structure, personal values and need for cognition were controlled.

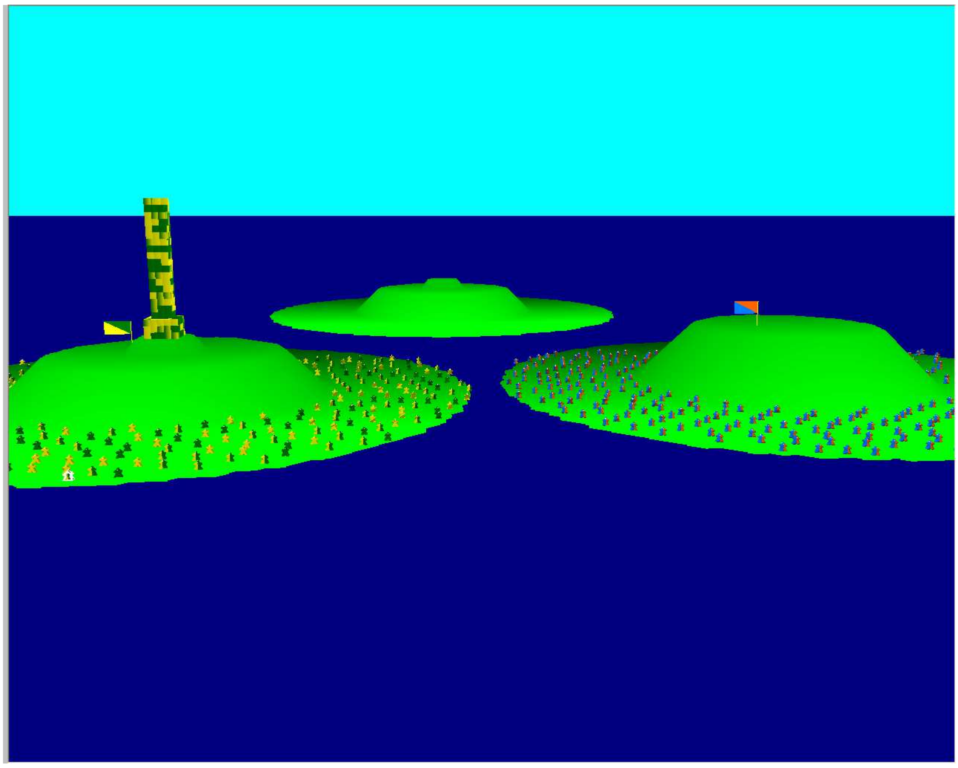
2.5.1.2 Procedure and Manipulations

The hardware used for this project was a new standard computer (Intel (R) Pentium (R) Dual-Core; CPU 2.60 GHz; RAM 3.46 GB; graphic board: Intel (R) Q 45/Q 43 Express Chipset) and a new LCD monitor (22-inch; 60 Hz; 1680 x 1050 pixel). The procedure was the same as in the previous experiments including the pre-experimental questionnaire about tolerance for ambiguity as in Experiment 4 (cf. Appendix E), except that 79% of the participants were non-psychology students and were paid for their participation.

The program (SIC 2.7.1; Baun & Ermel, 2009b) was adjusted to the current experimental design. Generally, it followed the above noted simulation sequence: introductive instruction, personal avatar, other ingroupers, instruction for game 1 (building of a look-out), game 1, feedback to game 1, presentation of the archipelago and outgroupers, instruction for game 2 (collective building of another look-out), game 2, feedback to game 2 and notice about a questionnaire and measurement of dependent variables (see Appendix G for screenshots of program SIC 2.7.1).

The manipulation of the ingroups' representation factor – simple vs. complex – was the same as in the previous experiments. The new conditions – superodinate category presence and mixed intergroup representation – required a new step in the simulation. After ingroup and outgroup appear separately on two islands the participants in the superodinate category conditions read (vs. did not read) that after some time avatars from both islands have federated and built an island-union with a common parliament and flag and see (vs. do not see) that both groups have a four-colored flag on the third "neutral" island (cf. Figure 11). On the other hand, the participants in the mixed intergroup representation condition see in the next scene ingroup and outgroup avatars appearing fifty-fifty mixed on both inhabited islands (cf. Figure 11) and read in the mixed non-superodinate category condition that after some time ingroup and outgroup avatars have met and mingled with each other.

Separated Representation of Ingroup and Outgroup without Superodinate-Category



Mixed Representation of Ingroup and Outgroup with Superodinate-Category

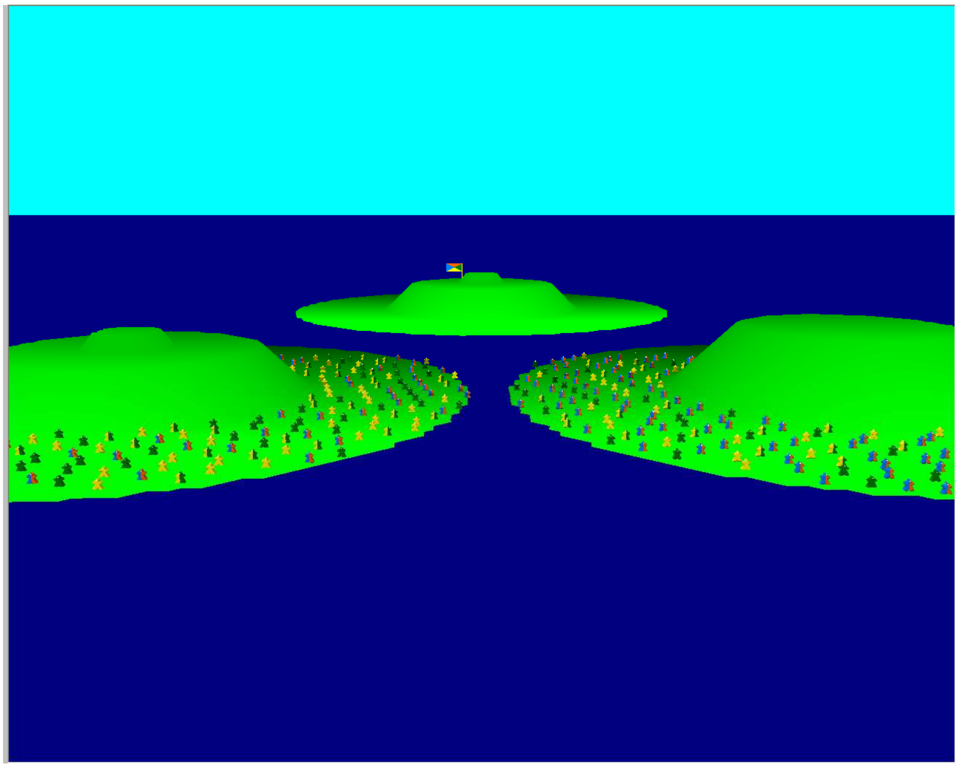


Figure 11. Examples for new experimental factors – intergroup representation and superodinate category – in each case with complex ingroups' representation in Experiment 5.

2.5.1.3 Dependent Measures

The same dependent variables were used as in the previous experiments: percentage estimation of ingroup and outgroup memberships configuration, ingroup (α = .82) and outgroup liking (α = .80) scale, ingroup homogeneity scale (α = .75), overlap complexity measure, outgroup acceptance scale (α = .80), intergroup variability scale (α = .67), ingroup identification scale (α = .83), simulation acceptance scale (α = .87), immersion scale (α = .82), ideological perspective and personal data.

2.5.1.4 Statistical Hypotheses

It was expected that the complexity effect appears either in the mixed intergroup representation condition according to the social identity complexity model (Roccas & Brewer, 2002) or in the mixed plus superodinate category condition according to the ingroup projection model (Mummendey & Wenzel, 1999). Two alternative statistical hypotheses were developed for it: either 3-way interaction between ingroups' representation, intergroup representation, and group – according to the social identity complexity model – or 4-way interaction between ingroups' representation, intergroup representation, superodinate category, and group – according to the ingroup projection model – in a mixed design. Thereby, individual tolerance for ambiguity should be controlled for.

2.5.2 Results

2.5.2.1 Identification and Immersion

Experimental factors did not influence the participant's ingroup identification (M = 5.44, SD = 1.20, Fs < 2.56, ps > .11) and immersion (M = 4.49, SD = 1.52, Fs < 1.27, ps >.26) also in Experiment 5. Ingroup identification differed significantly from the mean of the scale, $t(153) = 14.91$, $p < .001$, as well as immersion, $t(153) = 3.97$, $p < .001$, as well as simulation acceptance with M = 5.27 (SD = 1.62) and $t(153) = 9.73$, $p < .001$.

2.5.2.2 Manipulation Checks

Ingroups' representation. Estimation of ingroup memberships' configuration was used for the manipulation check of ingroups' representation. A 2 (ingroups' representation: simple vs. complex) by 2 (superodinate category: present vs. not present) by 2 (intergroup representation: separate vs. mixed) multivariate GLM on the percentage estimations of ingroup memberships revealed the expected significant main effect of ingroups' representation with $F(3, 144) = 69.55$, $p < .001$, $\eta^2 = .59$. Elaborate tests of within-subjects effects for every condition revealed a significant main effect on estimations of subgroups in the simple condition (F(1.05, 75.50) = 377.62, p < .001, η^2 = .84) but in the complex condition too (F(1.30, 96.48) = 33.49, p < .001, η^2 = .31). Bicolored avatars in the complex condition were overestimated. The superodinate category and intergroup representation had no effects on the perceived ingroup configuration. Participants estimated ingroup memberships' configuration close to the experimentally induced one in general. Estimated values in comparison with actual proportions are illustrated in Table 14.

Table 14

Estimated and Actual (in Brackets) Configuration of Ingroup Memberships in Percent as Function of Ingroups' Representation in Experiment 5

		Ingroup memberships		
		First subculture	Second subculture	Combined subculture
Ingroups' representation	*n*	*M*	*M*	*M*
Simple	76	7.89^a (0)	7.57^a (0)	80.68^b (100)
Complex	78	29.68^a (33)	28.74^a (33)	42.12^b (33)

Note. Means in rows with different superscripts differ significantly at p < .05

Ingroup homogeneity and overlap complexity measure. The results of perceived ingroup homogeneity and overlap complexity measure were similar to the corresponding results in the previous experiments. A 2 (ingroups' representation: simple vs. complex) by 2 (superodinate category: present vs. not present) by 2 (intergroup representation: separate vs. mixed) ANOVA revealed an expected main effect of ingroups' representation on ingroup homogeneity, F(1, 146) = 12.77, p < .001, η^2 = .08, such that participants in the simple condition perceived the ingroup to be more homogeneous (M = 5.55, SD = 1.24) than in the complex conditions with M = 4.86, SD = 1.12 (see left panel of Figure 11).

These results were corroborated through the same design on the overlap complexity measure. Also a single main effect of ingroups' representation on overlap was found, F(1, 144) = 62.99, p < .001, η^2 = .30, such that participants in the simple condition (M = 8.42, SD = 2.42) perceived the ingroup more overlapping (less complex), than in the complex condition (M = 5.68, SD = 1.99). Figure 12 demonstrates these results in the right panel.

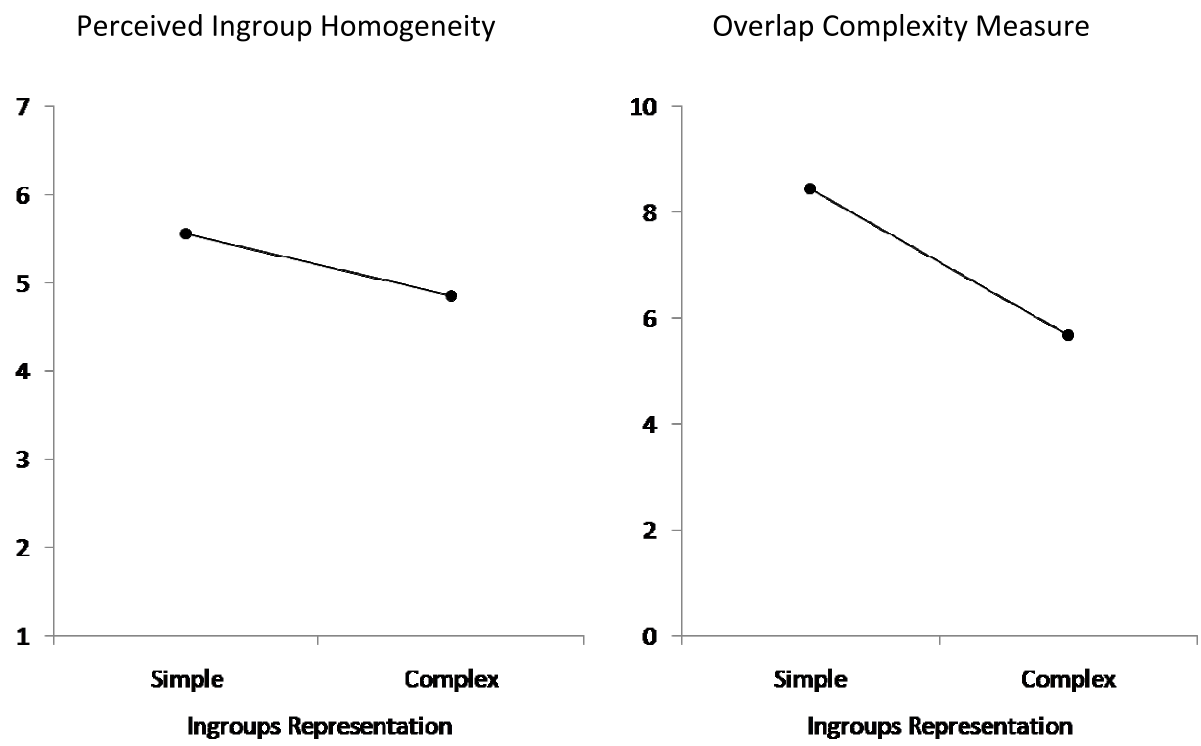


Figure 12. Perceived ingroup homogeneity and overlap complexity measure as a function of ingroups' representation in Experiment 5.

Intergroup representation. For the manipulation check of intergroup representation a statement about the separate living situation was used: "We, the [ingroup-name], and the [outgroup-name] live separately on two different islands". A 2 (ingroups' representation: simple vs. complex) by 2 (superodinate category: present vs. not present) by 2 (intergroup representation: separate vs. mixed) ANOVA revealed an expected main effect of intergroup representation on the perception of the living situation, $F(1, 145) = 100.20$, $p < .001$, $\eta^2 = .41$, such that people in the separate intergroup representation more strongly agree with the above statement ($M = 4.89$, $SD = 1.96$) in comparison to the people in the mixed condition ($M = 2.32$, $SD = 1.48$). Again there was a main effect of superodinate category in this analysis, $F(1, 145) = 14.75$, $p < .001$, $\eta^2 = .09$, such that the participants in the superodinate category condition perceived their virtual living as less separated ($M = 3.13$, $SD = 2.00$) than participants without superodinate category ($M = 4.04$, $SD = 2.22$). This effect was qualified through a significant 2-way interaction between intergroup representation and superodinate category, $F(1, 145) = 12.10$, $p < .001$, $\eta^2 = .08$, that is, the superodinate category effect is significant only in the non mixed contact situation, but not in the mixed intergroup representation, where the values were similar and relatively low (see Table 15). In sum, agreement to the statement about the separate living situation of ingroup and outgroup avatars was significantly different in the separate and mixed intergroup representation conditions as expected for both, participants without superodinate category and with superodinate category. However, for the last it was significantly lower.

Table 15

Statement to Separate Living as a Function of Intergroup Representation and Superordinate-Category Factors in Experiment 5

		Superordinate category	
Intergroup		Not present	Present
representation	*n*	*M* (*SD*)	*M* (*SD*)
Separate	76	5.89[a] (1.33)	3.97[b] (2.11)
Mixed	78	2.38[c] (1.39)	2.26[c] (1.59)

Note. Means with different superscripts differ significantly at p < .05

Superordinate category. A confederation statement – "We, the [ingroup-name] and the [outgroup] are unified" – was used for the manipulation check of superodinate category presence. A 2 (ingroups' representation: simple vs. complex) by 2 (superodinate category: present vs. not present) by 2 (intergroup representation: separate vs. mixed) ANOVA revealed only an expected main effect of superodinate category on the perception of confederation, $F(1, 145) = 14.97$, $p < .001$, $\eta^2 = .09$, such that on average people with superodinate category agree to the above statement more ($M = 5.84$, $SD = 1.42$) than people without superodinate category ($M = 4.84$, $SD = 1.74$).

2.5.2.3 Tolerance

For liking and warmth judgments of ingroup and outgroup two alternative hypotheses were predicted: lower intergroup bias in the complex than in the simple condition with lower ingroup-outgroup distinction according to the social identity complexity model (Roccas & Brewer, 2002) vs. lower intergroup bias in the complex than in the simple condition with an availability of superodinate category according to the ingroup projection model (Mummendey & Wenzel, 1999).

A 2 (ingroups' representation: simple vs. complex) by 2 (intergroup representation: separate vs. mixed) by 2 (superodinate category: present vs. not present) by 2 (group: ingroup vs. outgroup) GLM with ingroups' representation, intergroup representation, and superodinate category as between-subjects factors and group as a within-subjects factor on liking revealed a main effect of group, $F(1, 144) = 6.37$, $p < .01$, $\eta^2 = .04$, such that participants judged the ingroup more likeable ($M = 5.23$, $SD = 1.30$) than the outgroup ($M = 5.01$, $SD = 1.28$) in general, and revealed a 2-way interaction between group and intergroup representation, $F = 6.14$, $p < .01$, $\eta^2 = 04$, such that the ingroup with $M = 5.43$ ($SD = 1.18$) was estimated more likeable than the outgroup ($M = 4.98$, $SD = 1.22$) in the separate representation ($F(1, 72) = 16.44$, $p < .001$, $\eta^2 = .19$) but not in the mixed representation ($F < 2.20$, $p > .14$). The predicted 3-way or 4-way interactions did not appear (Fs < 1.15, ps > .29). All means and standard deviations of liking ratings for ingroup and outgroup are shown in Table 16.

Table 16

Liking Ratings for Ingroup and Outgroup as a Function of Ingroups' Representation, Intergroup Representation, and Superordinate-Category-Presence in Experiment 5

			Liking		
Ingroups' representation	Intergroup representation	Superordinate category	*n*	Ingroup *M* (*SD*)	Outgroup *M* (*SD*)
Simple	Separate	Not present	16	5.67 (1.25)	5.22 (1.40)
		Present	20	5.08 (1.11)	4.79 (1.36)
	Mixed	Not present	20	4.84 (1.09)	5.03 (1.42)
		Present	19	5.49 (1.09)	5.13 (1.08)
Complex	Separate	Not present	20	5.46 (0.89)	5.11 (0.90)
		Present	20	5.58 (1.42)	4.86 (1.23)
	Mixed	Not present	20	4.95 (1.15)	5.18 (1.52)
		Present	17	4.82 (0.93)	4.75 (0.82)

In sum, intergroup bias disappeared in the mixed intergroup representation (see upper and lower left panel in Figure 13).

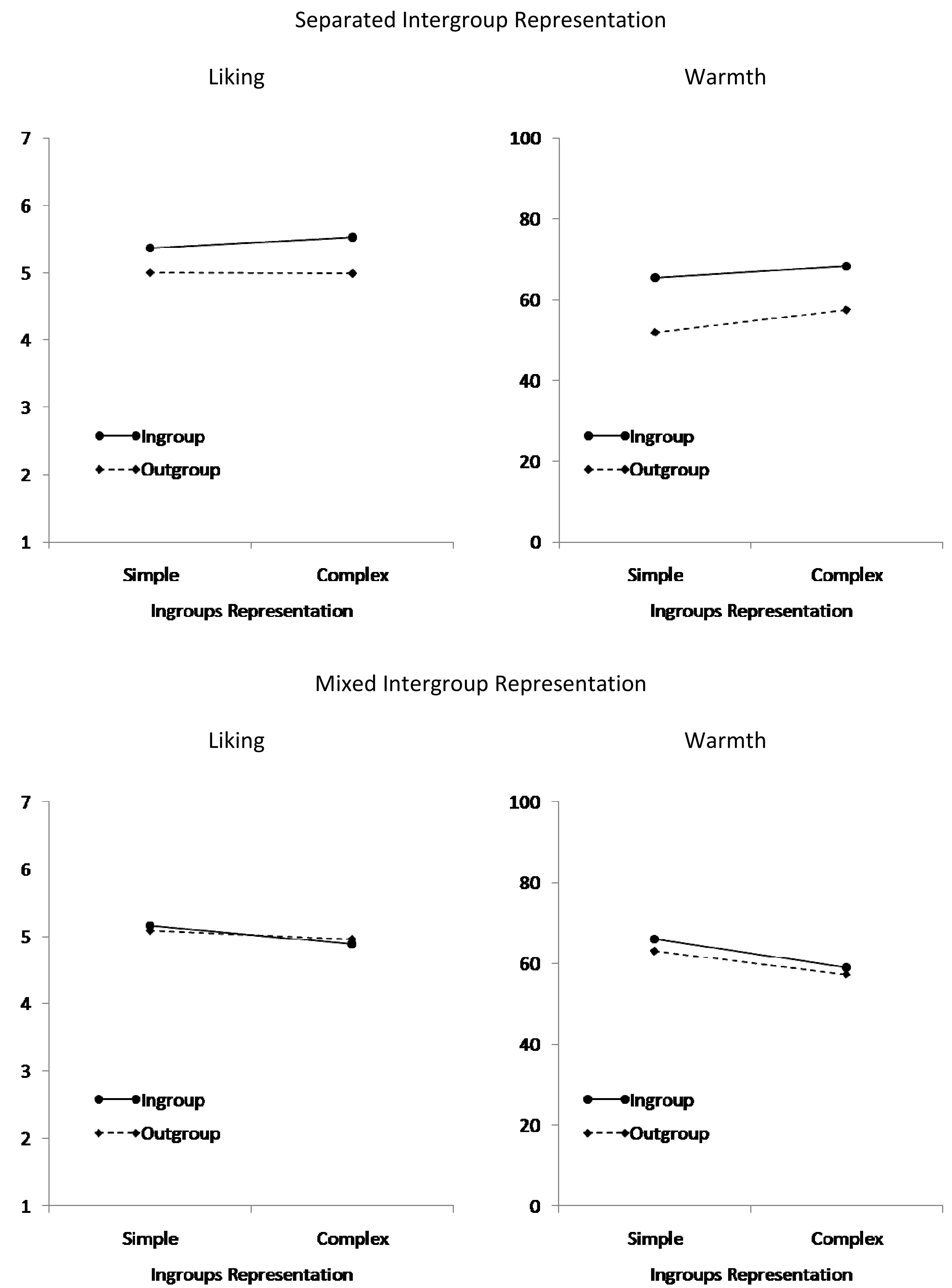


Figure 13. Liking and feeling thermometer judgments of ingroup and outgroup as a function of ingroups' representation and intergroup representation in Experiment 5.

A 2 (ingroups' representation: simple vs. complex) by 2 (intergroup representation: separate vs. mixed) by 2 (superodinate category: present vs. not present) by 2 (group: ingroup vs. outgroup) ANCOVA with repeated measures on liking and control for the covariant ingroup identification revealed a main effect of identification ($F(1, 143) = 62.78$, $p < .001$, $\eta^2 = .31$) and an interaction between group and identification ($F(1, 143) = 4.04$, $p < .05$, $\eta^2 = .03$), such that ingroup favoritism appears with a strong ingroup identification, and a left interaction between group and intergroup representation ($F(1, 143) = 4.95$, $p = .03$, $\eta^2 = .03$), such that ingroup favoritism disappeared in the mixed intergroup representation.

A 2 (ingroups' representation: simple vs. complex) by 2 (intergroup representation: separate vs. mixed) by 2 (superodinate category: present vs. not present) by 2 (group: ingroup vs. outgroup) GLM with ingroups' representation, intergroup representation, and superodinate category as between-subjects factors and group as within-subjects factor on the thermometer measure revealed a main effect of group, $F(1, 144) = 22.61$, $p < .001$, $\eta^2 = .14$. Participants judged the ingroup warmer ($M = 64.85$, $SD = 21.02$) than the outgroup ($M = 57.50$, $SD = 21.02$) in general. Furthermore, there was a 2-way interaction between intergroup representation and group factors ($F(1, 144) = 10.33$, $p = .002$, $\eta^2 = .07$), such that the ingroup with $M = 67.27$ ($SD = 19.83$) was estimated warmer than the outgroup ($M = 54.76$, $SD = 18.72$) in the separate intergroup representation ($F(1, 71) = 32.84$, $p < .001$, $\eta^2 = 32$) but not in the mixed intergroup representation ($M = 62.49$, $SD = 21.99$ vs. $M = 60.71$, $SD = 22.85$, $F < 1.15$, $p > .29$). In sum, intergroup bias disappeared in the mixed intergroup representation (see upper and lower right panel in Figure 13). All means and standard deviations of warmth ratings for ingroup and outgroup as a function of ingroups' representation, intergroup representation, and superodinate category are shown in Table 17.

Table 17

Feeling Thermometer Ratings for Ingroup and Outgroup as a Function of Ingroups' Representation, Intergroup Representation, and Superordinate-Category-Presence in Experiment 5

				Warmth	
Ingroups'	Intergroup	Superordinate		Ingroup	Outgroup
representation	representation	category	*n*	*M* (*SD*)	*M* (*SD*)
Simple	Separate	Not present	16	60.06 (22.13)	50.25 (21.20)
		Present	20	71.05 (18.97)	53.50 (19.47)
	Mixed	Not present	20	61.90 (17.84)	63.00 (18.58)
		Present	19	69.25 (23.94)	63.16 (26.26)
Complex	Separate	Not present	19	67.50 (14.38)	55.74 (13.31)
		Present	20	69.65 (22.86)	58.70 (20.66)
	Mixed	Not present	20	56.70 (24.38)	55.70 (27.93)
		Present	18	61.39 (20.41)	58.83 (17.35)

A 2 (ingroups' representation: simple vs. complex) by 2 (intergroup representation: separate vs. mixed) by 2 (superodinate category: present vs. not present) by 2 (group: ingroup vs. outgroup) ANCOVA with repeated measures on the feeling thermometer and control for the covariant ingroup identification revealed a main effect of the covariate variable ($F(1, 143) = 7.96$, $p = .005$, $\eta^2 = .05$) and an interaction between group and intergroup representation, $F(1, 143) = 9.41$, $p = .003$, $\eta^2 = .06$, such that intergroup bias disappeared in the mixed intergroup representation.

The additional outgroup measure acceptance[1] was not affected through the experimental manipulation ($M_{total} = 5.57$, $SD = 1.06$, Fs < 1.40, ps $> .24$). The multiculturalism measure was not affected either ($M_{total} = 2.90$, $SD = 1.85$), but there was a marginal main effect of superodinate category ($p < .10$), such that participants in the superodinate category condition by trend showed higher values in multiculturalism than

[1] Acceptance correlated positively with multiculturalism index, $r = .32$, $p < .001$, with the thermometer measure, $r = .23$, p = 004, with the liking measure $r = .29$, $p < .001$, and negatively with intergroup variability, $r = -.36$, $p < .001$.

participants in the non-superordinate-category condition, with $M = 3.15$ ($SD = 1.68$) vs. $M = 2.65$ ($SD = 1.99$) accordingly.

2.5.2.4 Motivational Roots – Tolerance for Ambiguity

The results according to the moderating role of tolerance for ambiguity were similar to the corresponding results in Experiment 4: the above referred main results were not altered by controlling for motivational roots (need for closure, need for cognition, need for structure, uncertainty tolerance, and personal values) as possible antecedents of social identity complexity in additional analyses.

Investigating the relation between motivational roots and outgroup tolerance gave the following results: conservation correlated significantly negative[1] with acceptance ($r = -.26$, $p < .001$) and with multiculturalism ($r = -.20$, $p < .01$); self-enhancement correlated significantly negative with warmth according to the feeling thermometer ($r = -.27$, $p < .001$), liking ($r = -.30$, $p < .001$), acceptance ($r = -.27$, $p < .001$), and multiculturalism ($r = -.45$, $p < .001$); self-transcendence correlated significantly positive with liking ($r = .22$, $p < .001$), acceptance ($r = .25$, $p < .001$), and with multiculturalism ($r = .49$, $p < .001$); openness correlated significantly positive with acceptance ($r = .28$, $p < .001$) and multiculturalism measures (.$r = .17$, $p < .01$), irrespective of the experimental conditions. The whole pattern of correlations was – as in Experiment 4 – consistent with findings about real-life-groups (Davidov et al., 2008; Kuşdil & Şimşek, 2008; Roccas & Amit, 2011; Sagiv & Schwartz, 1995).

Also in this experiment a relation between individual values and tolerance towards artificial outgroup avatars was indicated. The persons, who had high values in conservation and self-enhancement, tended to evaluate the outgroup negatively; the persons, who had high values in openness and self-transcendence, were prone to evaluate the outgroup positively, even if outgroup members were not known, artificial and presented in a very short laboratory-situation.

2.5.3 Summary

In sum, in Experiment 5 it was expected that the complexity effect appears either in the mixed intergroup representation condition according to the social identity complexity model (Roccas & Brewer, 2002) or in the mixed plus superodinate category condition according to the ingroup projection model (Mummendey & Wenzel, 1999). Two alternative

[1] The need for closure scale and need for structure scale correlated also significantly negative with acceptance and multiculturalism measures.

statistical hypotheses were developed: either a 3-way interaction between ingroups' representation, intergroup representation, and group – according to the social identity complexity model – or a 4-way interaction between ingroups' representation, intergroup representation, superodinate category, and group – according to the ingroup projection model – in a mixed design. But the expected 3-way or 4-way interactions did not appear. An ingroups' representation effect was not found in the mixed intergroup representation condition nor was it found in relation with a superodinate category. There was a clear effect of intergroup representation, such that intergroup bias disappeared in the mixed intergroup representation, irrespective of ingroups' representation and presence of superodinate category. Mixed intergroup representation with superordinate category and separate intergroup representation with superordinate category had an identical accompanying text. Mixed intergroup representation with superordinate category and mixed intergroup representation without superordinate category had different texts. This indicates that disappearance of intergroup bias following a mixed ingroup-outgroup presentation might be linked rather to the kind of visual intergroup presentation than to the kind of verbal instruction. However, further studies with others control groups (e.g., without verbal instruction) are desirable.

Moreover, intergroup bias was lower among participants with low ingroup identification and among participants who placed high value on openness and self-transcendence.

3 GENERAL DISCUSSION

3.1 Summary

The finding from the minimal group paradigm by Tajfel et al. (1971) is that mere division into groups in the absence of a conflict and without different interests may be sufficient for intergroup bias, both – ingroup favoritism and outgroup disregard. This inspires theoretical debates about the interplay between social categorization and intergroup behavior even today. Tajfel and Turner (1979) explained minimal group effects in their social identity theory cognitive-motivationally so that individuals try to differentiate their own group positively from other groups in order to attain a positive social identity. The self-categorization theory (Turner et al. 1987) that grew out of the social identity theory analyzed when and how individuals act as a group in general while mainly concentrating on cognitive elaboration of the perception of oneself and of others. Many subsequent theories and models of intergroup phenomena (e.g., decategorization, recategorization, subcategorization, cross-categorization, dual categorization, and multiple categorization) focused more on cognitive aspects, especially on the link between social categorization and group behavior; consequently, they held that a change of categorical structures was nearly the only possible solution for prejudice reduction (Park & Judd, 2005).

The decategorization approach (Brewer & Miller, 1984; Wilder, 1978) proposes diluted or loosening categorization to demolish the perception of the outgroup as an entity. Meanwhile, the recategorization approach (Allport, 1954; Doise, 1978; Gaertner, Davidio, Anastasio, Bachman & Rust, 1993) suggests a new categorization on the next higher level so that outgroup bias disappears by including the outgroup in the superodinate ingroup. The subcategorization or mutual differentiation approach (Hewstone & Brown, 1986) discusses situations where special social categories cannot be abandoned; it proposes to maintain different identities and assign complementary roles to the groups when solving cooperative tasks. De-, re- and subcategorization models separately provide situation-specific, but not long run, solutions for reducing intergroup bias (Brewer, 2003; Park & Judd, 2005); hence, the interplay between de-, re- and subcategorization processes with respect to optimal and complementary effectiveness in intergroup contacts is discussed next. This includes temporal sequence of personalization, mutual differentiation and recategorization (Pettigrew, 1998), reciprocity of the mentioned processes based on reanalyses by Gaertner et al. (2000) of the classic Robbers Cave study by Sherif et al. (1961), and integration of re- and subcategorization processes (Gaertner et al., 1993; Gaertner & Dovidio, 2000; Hornsey & Hogg, 2000).

The last mentioned ideas on integration do not refer to simple categorization, where memberships of a social category are based on a single dichotomous categorization; instead, they discuss dual categorization, where intergroup and superodinate categorization levels are simultaneously salient (Gaertner et al., 1993; Gaertner & Dovidio, 2000; Hornsey & Hogg, 2000).

Another dual categorization model, the ingroup projection model by Mummendey and Wenzel (1999), indicates that outgroups can be valued negatively if the characteristics of the ingroup are perceived to be typical for the superodinate category. Mummendey and Wenzel (1999) conclude that tolerance accrues, for example, when the prototype of the superodinate category is broadly or not precisely defined, so that many characteristics are acceptable and correspond with the norm. A broad definition or "complex and vague representation" (Mummendey and Wenzel, 1999, p. 167) of the category prototype, inter alia, builds a link to multiple social categorization, which considers representation of social objects on several different dimensions simultaneously (Crisp, 2010; Crisp & Hewstone, 2006; Deaux, 1993).

The idea of simultaneous categorizations instead of dilution or restructuring of a simple categorization (e.g., decategorization or recategorization approaches) was dealt with in an earlier cross-categorization model (Deschamps & Doise, 1978). This model considers categorization of people in two dichotomous dimensions simultaneously, so that some individuals are a member of the ingroup in one dimension and a member of the outgroup in the other. These simultaneous accentuations of perceived differences and similarities both within and between categories should neutralize each other and, therefore, reduce intergroup bias.

The varying complexities of subjective ingroups' representations also became essential in the model of social identity complexity devised by Roccas und Brewer (2002). The complexity of social identity reflects the perceived overlap between memberships of multiple ingroups. When this overlap appears strong, i.e., when members of different ingroups are perceived as equals, identity structure is deemed exclusive and simple. When multiple ingroups do not overlap subjectively, i.e., when different identities are both differentiated and integrated, and the members of these social categories appear different, social identity structure becomes inclusive and complex. The social identity complexity model further implies that variably complex and, thereby, variably inclusive ingroups' representations influence perceptions of others. Complex ingroups' representation should reduce intergroup bias because of awareness of cross-categorization (Deschamps & Doise, 1978) and decreasing motivational bases for intergroup bias (Brewer, 1991; Vanbeselaere, 1991). Compared to previous models, the social identity complexity model deals with not just two, but also several salient ingroup categories simultaneously. These may not necessarily have hierarchical representations (cf. McGarty, 2006) nor only binary categorization dimensions. This makes the model more general, flexible and expandable.

Besides loosening categorization (e.g., decategorization approach) and restructuring categorization (e.g., recategorization and dual categorization approaches), complexity, multiplicity, and simultaneity of social categorization (e.g., cross-categorization, subcategorization, and multiple categorization approaches) are now becoming increasingly important in the theoretical and empirical debate about the link between social categorization and intergroup behavior (e.g., Crisp, 2010; Crisp & Hewstone, 2006; Park & Judd, 2005). Hence, present research proposed to test the impact of multiple categorized ingroup representations on intergroup bias. The social identity complexity model (Roccas & Brewer, 2002), in particular, as well as the cross-categorization model (Deschamps & Doise, 1978) and the ingroup projection model by Mummendey and Wenzel (1999), provided the theoretical setting for this purpose, the last with its assumption of a broadly, not precisely, defined prototype of the superodinate category.

To experimentally test the effects of multiple categorization on intergroup relation from different theoretical perspectives, specific programs were developed for and adjusted to each experiment, wherein different virtual micro-societies were built (Baun & Ermel, 2007a, 2007b, 2008, 2009a, 2009b, Baun, Ermel, & Dubiski, 2009). These programs are a simple form of virtual reality (three-dimensional, interactive, and computer-based) representing a minimal intergroup situation (equal of status, anonymous, and without conflicts). The most important simulation steps are induction of biculturalism, salience of ingroup, elaboration of ingroup, salience of outgroup, and ingroup-outgroup elaboration.

The first two experiments began by asking whether different ingroups' compositions in the social identity complexity model (Roccas & Brewer, 2002) affect perceived ingroup homogeneity and intergroup bias so that more complex representations with lower membership overlap lead to lower perceived ingroup homogeneity and to reduction of intergroup bias. The results showed that the ingroup with complex representation was perceived to be more heterogeneous than the ingroup with simple representation. However, ingroups' representations did not affect the tolerance for ingroups and outgroups. In general, the ingroup was evaluated as being more likable and warmer than the outgroup. Further experiments tested a set of influencing factors that could have interacted with ingroups' representation. Experiment 3 controlled a possible interference between ingroup and outgroup representations by simultaneously manipulating both, ingroup and outgroup. Simultaneous manipulation was necessary because changing ingroup homogeneity while keeping outgroup homogeneity constant, as in the previous experiments, could be confounded with different intergroup variability or different meta-contrast ratios. Experiment 4 tested the role of a shared dimension of categorization to study the effect of ingroups' representation on intergroup bias. Meanwhile, Experiment 5 investigated the impact of representation of ingroups on intergroup bias with respect to the presence of a superodinate category and of intergroup representation (separated vs. mixed). This was done because the salience of ingroup-outgroup distinction in the initial experimental paradigm might have been too strong and may have precluded generalization of social complexity of the ingroup to the outgroup.

Taken together, the ingroup representation with different constellations of ingroup memberships had the predicted impact on perceived ingroup homogeneity in all experiments, but not on tolerance towards the outgroup; hence, intergroup bias was about the same in both, simple and complex ingroups' representation. The results did not change – neither by controlling ingroup and outgroup representations simultaneously (cf. Experiment 3) nor when there was a shared dimension (cf. Experiment 4) nor with the presence of a superodinate category (cf. Experiment 5). However, intergroup bias was lower among participants with low ingroup identification (cf. Experiment 2-5) and among participants who placed high value on openness and self-transcendence (cf. Experiment 4 and 5). Eventually, the intergroup bias disappeared completely if the intergroup representation was altered, i.e., if ingroup and outgroup avatars were presented mixed, irrespective of other experimental factors (cf. Experiment 5).

3.2 Interpretation, Limitations and Perspectives

Why did variously heterogeneous ingroups' representations not affect outgroup tolerance even though the manipulation was successful and many other possible contributory factors were considered? Why did intergroup bias disappear only following a mixed representation of ingroup and outgroup? We start with a discussion on the absence of effects of ingroups' representation.

Firstly, the absence of effects of ingroups' representation could be due to subtle operationalization of social identity complexity. Variously operationalized representations of ingroups were really perceived to be variously homogeneous and overlapping. However, the values of perceived ingroup homogeneity for both simple and complex representations were relatively high, well above the midpoint of the scale. Thus, complex ingroups were perceived to be homogeneous too, even if significantly less than simple ingroups. It is possible that the operationalization of complex representation was too subtle to demonstrate an increase in outgroup tolerance. Future research could induce stronger ingroup variability – for example, through multiple dimensionality, possibly through insertion of a third categorization dimension such as form (round vs. quadratic) or pattern (dotted vs. shaded). The simple ingroups' composition in the last case could consist of, for example, blue-yellow-dotted figures; the complex ingroups' composition would comprise blue, yellow, dotted, blue-yellow, blue dotted and yellow dotted avatars.

Secondly, the absence of effects of ingroups' representation could be due to projection of the self to the ingroup. If the complexity of social identity is operationalized as different constellations of ingroup membership, in a complex ingroups' representation, the personal avatar is variable and can belong to several subgroups; in the present case – to one of three (two unicolored and one bicolored). Research on multiple categorization differs between simultaneous categorization in terms of a greater number of different identity domains and multiple categorization within a single identity domain (Crisp, 2010; Crisp & Hewstone, 2006; Deaux, 1993). However, this differentiation is yet to be seen in a consistent model. Moreover, the social identity complexity model does not differ exactly between individual-based and group-based representations. Thus, the potential interdependence between individual-based and group-based representations of biculturalism with a constant bicolored personal avatar was not excluded in the present experiments.

Experiment 2 tried to clarify this possibility by initially controlling the presence of a personal avatar. It showed marginal effect of avatar presence on percentage estimation of the ingroups' configuration: compared to participants without a personal avatar, those that had one overestimated the bicolored subgroup (the group with the same color as the personal avatar) and underestimated one of the unicolored subcultures. In addition, the estimated configuration of ingroups in complex conditions in all other present experiments showed that the combined bicolored subculture was permanently overestimated, even though participants' estimation of the ingroup memberships' configuration was very close to the experimentally induced one in both, pattern and percentage. These results indicate a possible projection from oneself to the ingroup and, therefore, increased association with the bicolored groups; i.e., simple ingroups' representations with bicolored members only.

There is another difference along similar lines. Hewstone, Turner, Kenworthy, and Crisp (2006) write:

> A complete understanding of multiple categorization must include both categorization by others (or person perception; Macrae, Bodenhausen, & Milne, 1995; van Rijswijk & Ellemers, 2002) and aspects of self-categorization (Turner et al., 1987). Tajfel (1978) referred to this as the distinction between external categorizations (how people are categorized) and internal categorizations (how they see themselves). […] Phinney and Alipuria […] draw the same distinction between what they term assignment (what others say individuals are) and assertion (who or what individuals claim to be; see Daniel; 2002). (p. 275)

Future theoretical and empirical research must clarify these different interacting perspectives: individual-based, group-based, internal or external categorizations.

Thirdly, the absence of effects of ingroups' representation may be due to the impact of individual differences. Besides stable experimental (e.g., structure of the society) and situational factors (e.g., attention diminishing factors) Roccas & Brewer (2002) also mentioned personal attributes in terms of tolerance for ambiguity (e.g., uncertainty tolerance, need for structure, need for cognition and personal values) as possible antecedents of the complexity of social identity. Accordingly, Roccas and Amit (2011) proposed that participants' reactions to different ingroups' representations might depend on their individual preconditions. Three of their studies showed that especially conservation values (values relating to maintenance of the social status quo) moderate the effect of the group's heterogeneity on tolerance: participants that scored high on conservation values, were more tolerant when the group's homogeneity was made salient, while participants that scored low on conservation values, were either insensitive to ingroups' representation or more tolerant when the group's heterogeneity was made salient.

That is why the two last experiments of the present research studied whether individual differences in motivational variables could influence the effects of ingroups' representation on tolerance. Even if the moderating effects of motivational variables on the relationship between ingroups' representation and outgroup tolerance were not found, there was a direct link between individual values and tolerance towards artificial outgroup avatars; this link was partially consistent with results from Roccas and Amit (2011) as well as with other empirical findings about real-life groups (Davidov et al., 2008; Kuşdil & Şimşek, 2008; Sagiv & Schwartz, 1995). Participants that scored high on conservation and self-enhancement tended to evaluate the artificial outgroup negatively; those that scored high on openness and self-transcendence were more likely to evaluate the outgroup positively. These results support the view that future studies should place greater importance on individual and motivational variables and integrate them into theories of intergroup processes (e.g., Park and Judd, 2005; Roccas & Amit, 2011).

Finally, the absence of effects of ingroups' representation could be due to magnitude of ingroup-outgroup distinction. By recognizing the crucial function of categorization for intergroup phenomena within the social cognition perspective, Park and Judd (2005) indicate that this perspective sees social categorization as a causal factor in intergroup animosity, and questioned existing support for the assumption that change of categorization strength necessarily leads to change of intergroup bias. They conclude:

> Our review of the literature suggests that experimental evidence for this causal effect does not exist. Studies that others have seen as establishing the causal link, on closer inspection, are open to a variety of alternative explanations. Additionally, three lines of work from our own laboratory have shown that factors that moderate either category strength (e.g., crossed categories and category boundary salience) or intergroup bias (e.g., intergroup contact) do not seem to show consistent effects on the other construct. Crossing one categorization distinction with another can decrease categorization strength without any effect on intergroup bias. Similarly, increasing perceived category differentiation by calling attention to the boundaries that separate two groups does not affect intergroup bias. Reciprocally, intergroup contact can lead to warmer and more positive outgroup evaluations without any effect on the strength of ingroup–outgroup differentiation on stereotype relevant attributes. In sum, it is extremely difficult from the existing empirical data to support the proposition that increased category differentiation inevitably leads to increased intergroup bias. (pp. 118-119)

Two studies from this reanalysis are particularly interesting because their results correspond with results from the present research. In the first, study Deffenbacher, Park, Judd, & Corell (2003, unpublished manuscript cited in Park & Judd, 2005) investigated the effects of group membership and salience of group differences on intergroup bias in a 2 (group membership vs. not) by 2 (salient group differences vs. not) design. The manipulation was successful in the sense that those whom group differences were made salient saw the groups more different than the control group; however, salience of group differences had no effect on groups' evaluation. Nevertheless, participants who were assigned a group membership showed intergroup bias in favor of their group, irrespective of the salience of group differences. The second study successfully manipulated salience of category membership too. However, there was no effect on intergroup bias, which remained strong despite perceived group differences. Both studies provided only an effect of group membership on intergroup bias; they did not suggest any link between categorization strength and intergroup bias.

In the first four experiments of the present research, (a) the intergroup bias was induced by creating ingroup and outgroup, (b) intergroup bias was not impacted by variation of categorization strength, (c) and ingroup favoritism – consistent with the social identity theory (Tajfel and Turner, 1979) that individuals try to differentiate their own group positively from other groups in order to achieve a positive social identity – was more likely to appear in conjunction with strong ingroup identification. These results prompt the question of whether categorization strength and intergroup bias are arranged in a particular function where change of categorical structure reduces intergroup bias.

The question remains as to why intergroup bias disappeared completely following a mixed ingroup-outgroup representation in an additional simulated step (Experiment 5 of the present research). In the scene following the one where ingroup and outgroup appeared separately on two islands, participants in the mixed avatars presentation conditions noted in the next scene ingroup and outgroup avatars appearing in a mixed fifty-fifty pattern on both inhabited islands.

Was this an effect of the decreased magnitude of ingroup-outgroup distinction? It could be, but with a difference: the impact arose from the variation of *intergroup* constellations (e.g., separate vs. mixed ingroup-outgroup representation) and not from the variation of *intragroup* constellations (e.g., presence of ingroup with a complex representation or outgroup with a shared dimension).

Future research will therefore have to account for possibly different roles of intragroup representation and intergroup representation in the reduction of intergroup bias. Future researchers will also have to differentiate between the impact of social aspects (e.g., frequency and duration of intergroup interaction), psychological aspects (e.g., perceived social distance) and physical proximity. Possible decreasing anonymity of contact situations and the presence of anticipated interactions (cf. Diehl, 1990) should also be controlled in future experiments with a process-relational design, as was done in Experiment 5.

Another interpretation of why intergroup bias disappears only in a mixed ingroup-outgroup situation posits another processing style in comparison to all other experimental conditions. Tajfel et al. (1971) note in their famous article that differences, which are perceived as continuously distributed, do not lead to discriminatory intergroup behavior:

> The same “objective” differences between people which, instead of having a clear-cut classification superimposed on them, would be perceived as continuously distributed, should not release discriminatory intergroup behaviour. On the level of judgements of simple physical magnitudes a related process has been found to operate in a study by Tajfel and Wilkes (1963). In the case of intergroup behaviour, there are indications from studies conducted at present at Columbia University by Morton Deutsch and his colleagues [...] that differences in the extent of an attribute, which is perceived by the Ss as being continuously distributed amongst a group of people, do not lead to the kind of behaviour found in our experiments even when Ss perceive themselves to be at one of the extremes of the distribution. (p. 175)

However, the most social-cognitivistically-shaped categorization approaches focused their attention on the role of “discontinuities” (Tajfel et al., 1971, p. 175) rather than on the functioning of a *continuous* processing style. To clarify this idea we look shortly on the corresponding thoughts from a cultural-psychological perspective.

By regarding culture and psyche as mutually constitutive, Fiske, Kitayama, Markus and Nisbett (1998) contrasted European-American and East Asian conceptions of the self and social relations. They found that it “shows dramatic divergence in psychological functioning between European-Americans and East Asians in some of the phenomena that social psychologists have been most concerned with and that they have regarded as universal” (p. 916). They differ, inter alia, between *holistic* (East-Asian) and *analytic* (European-American) modes of thinking, which results from participating in different cultural milieus. Holistic reasoning style implies that different elements and their relations are processed at the same time, all aspects of the perceived objects become bases for responses, object grouping becomes relational and contextual, categories are used to a lesser extent, reasoning is dialectic (both A and not-A can be true), and description of people is narrative. Analytical reasoning style implies that objects are broken up into separate parts and their impact is seen in a linear and deterministic manner, single aspects of the perceived object become bases for responses, object grouping occurs on categorical bases rather than on relational ones, reasoning is linear (A and not-A cannot be true), and description of people is categorical.

Furthermore, a number of experimental and meta-analytic findings (Haberstroh, Oyserman, Schwarz, Kühnen, & Ji, 2002; Kühnen & Oyserman, 2002; Oyserman, 2011; Oyserman, Coon, & Kemmelmeier, 2002a; Oyserman, Coon, & Kemmelmeier, 2002b) suggest that cultural features (e.g., philosophical tradition) do not directly affect values, self-concept, motivation, and cognition. Instead, the characteristics of a situation can induce different *cultural mindsets* (individualistic or separating cognitive schemata vs. collectivistic or connecting cognitive schemata), which then influence relevant content and process knowledge by task realization. These mindsets are cross-cultural and can be primed. Oyserman (2011) explains: “When in an *individualistic mindset* people attend to content, procedures, and goals relevant to distinction; when they are in a *collectivistic mindset* people attend to content, procedures, and goals relevant to connection”(p. 165).

By analogy, it is possible that mixed presentation of the intergroup situation in the last experiment of the present research evokes a *continuous-holistical* rather than a *distinct-analytical* processing style and, hence, influences the disappearance of intergroup bias. Future research should test this assumption, investigating mechanisms of processing intergroup relations that provides alternatives to categorizing linear and deterministic reasoning style.

3.3 Conclusion and Implications

The present research demonstrates that intergroup bias in a minimal group situation is not affected by different representations of multiple categorized ingroups, not even considering other possible interacting factors, such as, outgroup variability, sharing of a dimension, and presence of a superodinate category. However, intergroup bias completely disappears, if, in an additional step of simulation, ingroup and outgroup are presented mixed together, irrespective of the other factors.

The present findings reveal that ingroup identification has a moderating role on intergroup bias in accordance with social identity theory (Tajfel and Turner, 1979), such that ingroup favoritism appears alongside high ingroup identification, and indicate a direct relation between individual values and tolerance towards artificial outgroup avatars such that high scores on conservation and self-enhancement were attended with negative outgroup evaluation and high scores on openness and self-transcendence were attended with positive evaluation of artificial outgroups, in accordance with empirical findings about real-life-groups (Davidov et al., 2008; Kuşdil & Şimşek, 2008; Roccas & Amit, 2011; Sagiv & Schwartz, 1995).

We discussed the absence of predicted effects of multiple categorized ingroup representation on intergroup bias in relation to possible subtle operationalization of social identity complexity, projection of the self to the ingroup, the impact of individual differences (cf., Roccas and Amit, 2011), and the role of categorization as a causal factor for reduction of intergroup bias (cf., Park and Judd, 2005).

Therefore, the present research suggests that future investigations should test stronger ingroup variability and must differ exactly between individual-based and group-based representations as well as between internal and external categorization perspectives (e.g., Hewstone et al., 2006). The present results support the view that future studies should take individual and motivational variables into greater consideration and integrate them into the theories of intergroup processes (cf., Park and Judd, 2005; Roccas & Amit, 2011).

The disappearance of intergroup bias following a mixed ingroup-outgroup presentation in an additional step of simulation indicates that it will be important to account for possibly different roles of intragroup and intergroup process to reduce intergroup bias, while focusing more on the intergroup rather than the intragroup situation. We also discussed that the mixed presentation possibly activates a continuous-holistical instead of a distinct-analytical processing style that then influences disappearance of intergroup bias. Therefore, future tolerance research should investigate more mechanisms of continuous processing style and not only mechanisms of categorizing perception and linear deterministic reasoning.

The present research project supports considerations that: indicate risks of segregation, isolation and separate habitation of different social groups, accentuate the drawbacks of divided cities, divided islands or divided countries for harmonious coexistence, and emphasize the assets of consciousness for permeability of boundaries.

With respect to methodical implication, the presented method of virtual micro-societies proved useful in inducing temporary identifications with artificial social categories and in demonstrating intergroup phenomena similar to those from real life, such as intergroup bias or its disappearance. The method proved flexible and arbitrarily expandable: many variables could be simultaneously or sequentially considered (e.g., asymmetry of status, kind of group interaction), and simulation and analyses of processes (e.g. changeableness of social categories) were also possible. The use of virtual micro-societies is especially interesting; it is also qualified for integration, comparison and development of different social psychological theoretical models. The development of the empirical program may already show logical inconsistencies in theoretical considerations; these could not have been revealed through simple intuitive thinking. With the computer as the representation medium we achieved ideal experimental control as well as accurate intra-experimental and inter-experimental comparability.

Altogether, the present research makes theoretical and empirical contributions to the understanding of the relation between social categorization and tolerant intergroup behavior, provides an expandable and flexible method for validation, integration, and development of theoretical models and indicates the drawbacks of segregation, isolation, and separate habitation of different social groups as well as of divided cities, islands, or countries for harmonious coexistence of people.

> The Fizzli-Puzzlis crawled curiously out of their hideout and watched how their blue friend hugged the red Fuzzli-Puzzli. “Look”, one of them shouted, “they hug each other and a new color arises.” And the others said “Yes, there is something fishy here”. “Oh, no,” said the blue Fizzli-Puzzli that hugged the red one, “Everything is all right” and thereby he smiled. (Rau, 1988, p. 26)[1]

[1] Translated from German by the author.

4 ACKNOWLEDGEMENTS

My research has benefited substantially from the thoughtful support and comments of my doctoral thesis supervisor Michael Diehl. Special thanks go to Marilynn Brewer for her agreement to be the second examinator of this PhD-thesis. I also thank her and Sonia Roccas for their constructive comments and helpful suggestions with the development of Experiments 4 and 5. Many thanks go to Pamela McCann and Agostino Mazziotta for their insightful comments and valuable suggestions on earlier drafts of this manuscript. The author thanks all colleagues at the University of Tübingen who steadily cared for a pleasant and inspiring working atmosphere: Sina Bader, Jens Binder, Philip Brömer, Silke Eschert, Sonja Holzwarth, Christian Klett, Jan Kraemer, Britta Möhle, Sabine Müller, Michael Riketta (†), Hea-Kyung Ro, Margret Schall, and René Ziegler. Additionally, I thank Lidia Suchan for her data collection for Experiment 5 within the framework of her diploma thesis. Also, the present research would not have been possible without Eugen Baun. I thank him for his support in programming in this project. And, last but not least, my family made this research possible. I thank Frieder, Natalia and Anastasia for their patience and support of all kinds at all times. The results of Experiment 1, 2, 3, and 4 were presented at the 2009 FGSP held at University of Luxembourg.

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6 APPENDICES

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Appendix A

Dialogs in the Simulation Part of Programs SIC

	Simulation Step	Dialog[a]
1	Introduction	Hallo and thank you that you participate in our research! This research is about social perception of figures or groups of figures in computer games. Please imagine the following story: the [name of the first subculture], which had a highly developed [first color] culture, and the [name of the second subculture], which had a highly developed [second color] culture, have discovered an island, populated it and mixed among each other. You are a descendant of this cultures, thus you are a [hyphenated name of combined culture]. Next you see an actual picture of your island. Please look at this very attentively and follow the further instructions.
2	Biculturalism induction[b]	This is you as one of the [ingroup-name]. Please give yourself a fictive name and write it in the box. My name is …
3	Ingroup salience	This is the actual picture of the [ingroup-name], to which you belong. At one day the [ingroup-name] decide to build a look-out, in order to look around their island.
4	Ingroup elaboration: instruction for game 1	Your task in this game is to build a look-out together with other [ingroup-name] by clicking at the figures with the left mouse button. You have 90 seconds to do that.
5	Ingroup elaboration: feedback to game 1	You have built a look-out with height [x] meters! This is enough to see, …
6	Outgroup salience	This is enough to see that your island is one of a group of islands and that on the neighboring island the [outgroup-color] [outgroup-name] are living.
6.1	Additional step in the mixed non-superodinate condition in Experiment 5	After some time you, the [ingroup-name], and the [outgroup-name] have met and mingled with each other.

	Simulation Step	Dialog[a]
6.2	Additional step in the superodinate condition in Experiment 5	After some time you, the [ingroup-name], and the [outgroup-color] [outgroup-name] have federated and built an island-union with a common parliament and flag.
7	Ingroup-outgroup elaboration: instruction for game 2	Please build another look-out by clicking with the left mouse button at the [ingroup-name] or [outgroup-name].
8	Ingroup-outgroup elaboration: feedback to game 2 and notice about a questionnaire	Your new look-out has the height of [x] meters. And now, please answer the questions on the next pages to which there are no correct or incorrect answers. It is only about your personal opinion and your personal subjective impression as one of the [ingroup-name].

[a]Translated from German by author. [b]In Experiment 2, a personal avatar was presented only to half of the participants.

Appendix B

Dependent Variables

Construct	Items	Experiments
Ingroup configuration	Please estimate, how many percent unicolored [color 1] [ingroup-name] live on our island. Please estimate, how many percent unicolored [color 2] [ingroup-name] live on our island. Please estimate, how many percent bicolored [bicolor] [ingroup-name] live on our island.	2 - 5
Outgroup configuration	Please estimate, how many percent unicolored [color 1] [outgroup-name] live on the neighbor island. Please estimate, how many unicolored [color 2] [outgroup-name] live on the neighbor island. Please estimate, how many bicolored [bicolor] [outgroup-name] live on the neighbor island.	3, 4
Ingroup tolerance	I find us [ingroup-name] likeable. I don't like us [ingroup-name]. (R) I find us [ingroup-name] not so interesting. (R) My opinion about us [ingroup-name] is positive.	1 - 5
Ingroup feeling thermometer	How warm or cold do you feel the [ingroup-name] to be? Please place the register on the "thermometer" accordingly.	1 - 5
Outgroup tolerance	I find the [outgroup-name] likeable. I don't like the [outgroup-name]. (R) I find the [outgroup-name] not interesting. (R) My opinion about the [ingroup-name] is positive.	1 - 5
Outgroup feeling thermometer	How warm or cold do you feel the [outgroup-name] to be? Please place the register on the "thermometer" accordingly.	1 - 5
Ingroup homogeneity	We, the [ingroup-name], are among each other similar. We, the [ingroup-name], differ from each other. (R) We, the [ingroup-name], have a lot in common. We, the [ingroup-name], appear differently. (R)	1 - 5

Construct	Items	Experiments
Outgroup homogeneity	The [outgroup-name] are similar among each other. The [outgroup-name] differ from each other. (R) The [outgroup-name] have a lot in common. The [outgroup-name] appear differently. (R)	2 - 4
Overlap complexity	Sometimes members of one group also belong to other groups. I´d like you to rate how much the membership of the different groups overlaps on a scale from 0 to 10. - If all of the members of the [color 1] [ingroup-name] are also [color 2], i.e., bicolored, than rate the overlap as 10. - If about half of the [color 1] members are also [color 2], than rate the overlap as 5. - And if no [color 1] members are also [color 2], i.e. bicolored, than rate the overlap as 0. You can use any number from 0 to 10 to rate the amount of overlap between [color 1] and [color 2] membership on your island.	2 - 5
Outgroup acceptance	In my opinion our [ingroup-name]-island would be ready to include the [outgroup-name]. In my opinion the [outgroup-name] would fit in well with our island.	1 - 5
Harshness toward outgroup	We ought to welcome the [outgroup-name] to enter and become part of our culture. (R) We should reduce the influence of [outgroup-name] on our culture. I approve the imposing of restrictions on immigration.	4, 5
Intergroup variability	The [outgroup-name] and we, the [ingroup-name], are similar. (R) The [outgroup-name] and we, the [ingroup-name], are different. We, the [ingroup-name], are rather different in comparison with the [outgroup-name]. Between us, the [ingroup-name], and the [outgroup-name] can be very well distinguished.	2 - 5

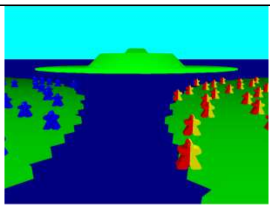
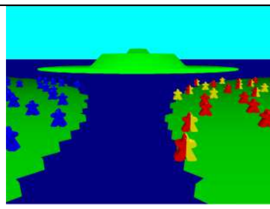
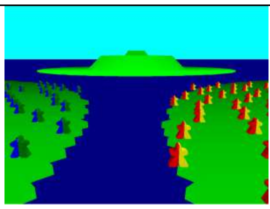
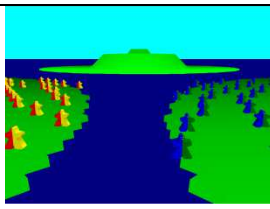
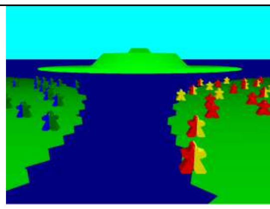
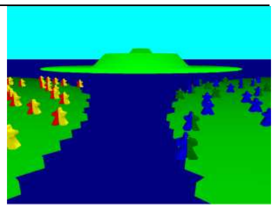
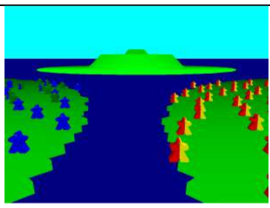
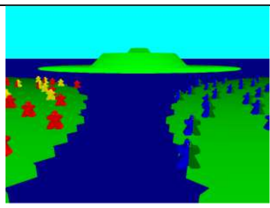
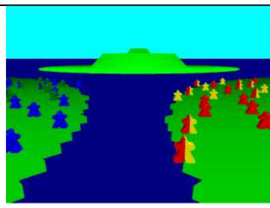
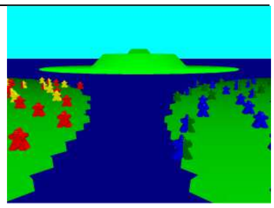
Construct	Items	Experiments
Ingroup identification	I regret that I belong to the [ingroup-name]. (R) I am glad to be a member of the [ingroup-name]. I feel that I belong to the [ingroup-name]. I am one of the [ingroup-name]. I do not fit in well with the [ingroup-name]. (R)	2 - 5
Simulation acceptance	And now, please leave your role as a [ingroup-name] and respond the following questions: It was interesting to me, to build a look-out with other [ingroup-name]. It was interesting to me, to build a look-out with the [outgroup-name].	1 - 5
Immersion	It was simple to me, to imagine the [ingroup-name] and the [outgroup-name] as creatures. It was difficult to me, to imagine myself as one of the [ingroup-name]. (R) I felt to be immersed in the world of the [ingroup-name] and [outgroup-name]. I paid attention to the real environment outside the display. (R) I had been struck to be in the world of the [ingroup-name] and [outgroup-name].	1 - 5
Social desirability	I accept all other opinions, even if they do not coincide with mine. I would never live at the expense of the community. I am allways friendly and courteous to others, even if I am stressed.	2 - 5

Construct	Items	Experiments
Ideological perspective	Harmony in a society is best achieved by downplaying or ignoring subgroups differences.	2 - 5
	To have a smoothly functioning society, members of minorities must better adapt to the ways of mainstream culture.	
	If we want to help create a harmonious society, we must recognize that each cultural group has the right to maintain its own unique traditions.	
	Cultural minority groups will never really fit with a mainstream culture.	
Perception of personal avatar	Please choose from the following statements the one that fits best to your role in this game:	2 - 5
	I have imagined to be a [color 1] [ingroup-name] figure.	
	I have imagined to be a [color 2] [ingroup-name] figure.	
	I have imagined to be a bicolored [bicolor] [ingroup-name] figure.	
	I haven't imagined me as a specific figure.	
Personal data	Your age?	1 - 5
	Your sex? f/m	
	Your occupation? job/studies/other	
	Migration background: yes/no	2 - 5

Note. (R) - reversed item.

Appendix C

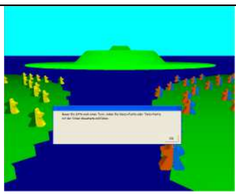
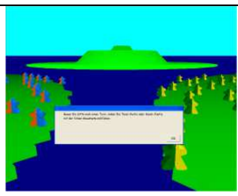
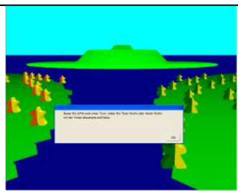
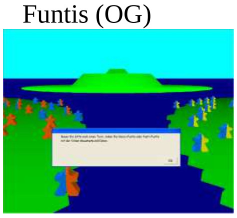
Complete Design in Experiment 3

		Ingroups' representation simple		Ingroups' representation complex	
		Color set 1	Color set 2	Color set 1	Color set 2
	Unicolor simple	 Red-yellow Funti-Puntis (IG) vs. blue Ranzi-Tanzis (OG)		 Red, yellow and red-yellow Funti-Puntis (IG) vs. blue Ranzi-Tanzis (OG)	
Outgroups' representation	Simple	 Red-yellow Funti-Puntis (IG) vs. blue-green Ranzi-Tanzis (OG)	 Blue-green Funti-Puntis (IG) vs. red-yellow Ranzi-Tanzis (OG)	 Red, yellow and red-yellow Funti-Puntis (IG) vs. blue-green Ranzi-Tanzis (OG)	 Blue, green and blue-green Funti-Puntis (IG) vs. red-yellow Ranzi-Tanzis (OG)
	Complex	 Red-yellow Funti-Puntis (IG) vs. blue, green and blue-green Ranzi-Tanzis (OG)	 Blue-green Funti-Puntis (IG) vs. red, yellow and red-yellow Ranzi-Tanzis (OG)	 Red, yellow and red-yellow Funti-Puntis (IG) vs. blue, green and blue-green Ranzi-Tanzis (OG)	 Blue, green and blue-green Funti-Puntis (IG) vs. red, yellow and red-yellow Ranzi-Tanzis (OG)

Notes. Ingroups in every condition of Experiment 3 on the right.

Appendix D

Complete Design in Experiment 4

		Ingroups' representation simple		Ingroups' representation complex	
		Color and name set 1	Color and name set 2	Color and name set 1	Color and name set 2
Non color sharing	IG position right	 Red-blue Danzi-Funtis (IG) right vs. green-yellow Tanzi-Puntis (OG)	 Green-yellow Tanzi-Puntis (IG) right vs. red-blue Danzi-Funtis (OG)	 Red, blue and red-blue Danzi-Funtis (IG) right vs. green-yellow Tanzi-Puntis (OG)	 Green, yellow and green-yellow Tanzi-Puntis (IG) right vs. red-blue Danzi-Funtis (OG)
	IG position left	 Red-blue Danzi-Funtis (IG) left vs. green-yellow Tanzi-Puntis (OG)	 Green-yellow Tanzi-Puntis (IG) left vs. red-blue Danzi-Funtis (OG)	 Red, blue and red-blue Danzi-Funtis (IG) left vs. green-yellow Tanzi-Puntis (OG)	 Green, yellow and green-yellow Tanzi-Puntis (IG) left vs. red-blue Danzi-Funtis (OG)
Color sharing	IG position right	 Red-blue Danzi-Funtis (IG) right vs. yellow-blue Punti-Funtis (OG)	 Green-yellow Tanzi-Puntis (IG) right vs. red-yellow Danzi-Puntis (OG)	 Red, blue and red-blue Danzi-Funtis (IG) right vs. yellow-blue Punti-Funtis (OG)	 Green, yellow and green-yellow Tanzi-Puntis (IG) right vs. red-yellow Danzi-Puntis (OG)
	IG position left	 Red-blue Danzi-Funtis (IG) left vs. yellow-blue Punti-Funtis (OG)	 Green-yellow Tanzi-Puntis (IG) left vs. red-yellow Danzi-Puntis (OG)	 Red, blue and red-blue Danzi-Funtis (IG) left vs. yellow-blue Punti-Funtis (OG)	 Green, yellow and green-yellow Tanzi-Puntis (IG) left vs. red-yellow Danzi-Puntis (OG)

Notes. IG –ingroup, OG – outgroup.

Appendix E

Original Pre-Experimental Questionnaire in Experiment 4

Psychologisches Institut
Friedrichstrasse 21, Tübingen

Abteilung für Sozial -und
Persönlichkeitspsychologie

EBERHARD KARLS
UNIVERSITÄT
TÜBINGEN

Fragebogen

Uhrzeit:

Vpn.:

Im Rahmen unserer Studie bitten wir Sie den vorliegenden Fragebogen auszufüllen. Der Fragebogen besteht insgesamt aus drei Teilen. Geben Sie für jede Aussage an, wie sehr Sie ihr zustimmen. Bitte lassen Sie keine Frage aus.

Teil I

1) Ich probiere gerne Dinge aus, auch wenn nicht immer etwas dabei herauskommt.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

2) Ich beschäftige mich nur mit Aufgaben, die lösbar sind.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

3) Es ist schon einmal vorgekommen, dass ich jemanden ausgenutzt habe.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

4) Ich mag es, wenn unverhofft Überraschungen auftreten.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

5) Ich lasse die Dinge gerne auf mich zukommen.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

6) Manchmal zahle ich es lieber anderen heim, als dass ich vergebe und vergesse.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

7) Ich habe es gerne, wenn die Arbeit gleichmäßig verläuft.

stimmt überhaupt nicht	1	2	3	4	5	6	7	stimmt voll und ganz

8) Ich warte geradezu darauf, dass etwas Aufregendes passiert.

stimmt überhaupt nicht	1	2	3	4	5	6	7	stimmt voll und ganz

9) Ich gebe grundsätzlich alles an, was ich zu verzollen habe.

stimmt überhaupt nicht	1	2	3	4	5	6	7	stimmt voll und ganz

10) Wenn um mich herum alles drunter und drüber geht, fühle ich mich so richtig wohl.

stimmt überhaupt nicht	1	2	3	4	5	6	7	stimmt voll und ganz

11) Ich weiß gerne, was auf mich zukommt.

stimmt überhaupt nicht	1	2	3	4	5	6	7	stimmt voll und ganz

12) Manchmal fahre ich schneller, als es erlaubt ist.

stimmt überhaupt nicht	1	2	3	4	5	6	7	stimmt voll und ganz

13) Es bringt mich aus der Fassung, wenn ich in eine Situation komme, in der ich nicht weiß, was zu erwarten hat.

stimmt überhaupt nicht	1	2	3	4	5	6	7	stimmt voll und ganz

14) Es stört mich nicht, wenn mich Dinge aus meiner täglichen Routine bringen.

stimmt überhaupt nicht	1	2	3	4	5	6	7	stimmt voll und ganz

15) Manchmal lüge ich, wenn ich muss.

stimmt überhaupt nicht	1	2	3	4	5	6	7	stimmt voll und ganz

16) Es gefällt mir, wenn ich ein klares und strukturiertes Leben habe.

stimmt überhaupt nicht	1	2	3	4	5	6	7	stimmt voll und ganz

17) Ich mag es, wenn alles seinen Platz hat und alles an seinem Platz ist.

stimmt überhaupt nicht	1	2	3	4	5	6	7	stimmt voll und ganz

18) Ich habe schon einmal zu viel Wechselgeld herausbekommen, ohne es der Verkäuferin zu sagen.

stimmt überhaupt nicht	1	2	3	4	5	6	7	stimmt voll und ganz

19) Ich genieße es, spontan zu sein.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

20) Ich finde, dass ein wohlgeordnetes Leben mit regelmäßigen Abläufen langweilig ist.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

21) Ich habe Dinge getan, von denen ich anderen nichts erzähle.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

22) Ich mag unklare Situationen nicht.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

23) Ich hasse es, meine Pläne in der letzten Minute zu ändern.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

24) Ich bin schon einmal wegen einer angeblichen Krankheit nicht zur Arbeit oder Schule gegangen.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

25) Ich bin ungern mit Leuten zusammen, deren Verhalten nicht vorhersehbar ist.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

26) Ich finde, dass eine gewisse Routine es mir ermöglicht, mein Leben mehr zu genießen.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

27) Ich fluche niemals.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

28) Ich genieße die Herausforderung, mich in unvorhersehbaren Situationen zu befinden.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

29) Ich fühle mich unwohl, wenn die Regeln in einer Situation unklar sind.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

30) Ich nehme niemals Dinge an mich, die mir nicht gehören.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

Teil II

In diesem Teil der Befragung werden Ihnen kurze Portraits von verschiedenen Personen dargeboten. Beantworten Sie bitte für jedes Portrait folgende Frage:

„Wie ähnlich ist Ihnen diese Person?“

1) Der Person ist es wichtig, neue Ideen zu entwickeln und kreativ zu sein. Sie macht Sachen gern auf ihre eigene originelle Art und Weise.

überhaupt nicht ähnlich | 1 | 2 | 3 | 4 | 5 | 6 | 7 | sehr ähnlich

2) Der Person ist es wichtig, reich zu sein. Sie möchte viel Geld haben und teuere Sachen besitzen.

überhaupt nicht ähnlich | 1 | 2 | 3 | 4 | 5 | 6 | 7 | sehr ähnlich

3) Die Person hält es für wichtig, dass alle Menschen auf der Welt gleich behandelt werden sollten. Sie glaubt, dass jeder Mensch im leben gleiche Chancen haben sollte.

überhaupt nicht ähnlich | 1 | 2 | 3 | 4 | 5 | 6 | 7 | sehr ähnlich

4) Der Person ist es wichtig, ihre Fähigkeiten zu zeigen. Sie möchte, dass die Leute bewundern, was sie tut.

überhaupt nicht ähnlich | 1 | 2 | 3 | 4 | 5 | 6 | 7 | sehr ähnlich

5) Der Person ist es wichtig, in einem sicheren Umfeld zu leben. Sie vermeidet alles, was ihre Sicherheit gefährden könnte.

überhaupt nicht ähnlich | 1 | 2 | 3 | 4 | 5 | 6 | 7 | sehr ähnlich

6) Die Person mag Überraschungen und hält immer Ausschau nach neuen Aktivitäten. Sie denkt, dass im Leben Abwechslung wichtig ist.

überhaupt nicht ähnlich | 1 | 2 | 3 | 4 | 5 | 6 | 7 | sehr ähnlich

7) Die Person glaubt, dass die Menschen tun sollen, was man ihnen sagt. Sie denkt, dass Menschen sich immer an Regeln halten sollten, selbst dann, wenn es niemand sieht.

überhaupt nicht ähnlich | 1 | 2 | 3 | 4 | 5 | 6 | 7 | sehr ähnlich

8) Der Person ist es wichtig, Menschen zuzuhören, die anders sind als sie. Auch wenn sie anderer Meinung ist als andere, will sie sie trotzdem verstehen.

überhaupt nicht ähnlich | 1 | 2 | 3 | 4 | 5 | 6 | 7 | sehr ähnlich

9) Der Person ist es wichtig, zurückhaltend und bescheiden zu sein. Sie versucht, die Aufmerksamkeit nicht auf sich zu lenken.

überhaupt nicht ähnlich | 1 | 2 | 3 | 4 | 5 | 6 | 7 | sehr ähnlich

10) Der Person ist es wichtig, Spaß zu haben. Sie gönnt sich selbst gern etwas.

überhaupt nicht ähnlich	1	2	3	4	5	6	7	sehr ähnlich

11) Der Person ist es wichtig, selbst zu entscheiden, was sie tut. Sie ist gern frei und unabhängig von anderen.

überhaupt nicht ähnlich	1	2	3	4	5	6	7	sehr ähnlich

12) Der Person ist es sehr wichtig, den Menschen um sie herum zu helfen. Sie will für deren Wohl sorgen.

überhaupt nicht ähnlich	1	2	3	4	5	6	7	sehr ähnlich

13) Der Person ist es wichtig, sehr erfolgreich zu sein. Sie hofft, dass die Leute ihre Leistungen anerkennen.

überhaupt nicht ähnlich	1	2	3	4	5	6	7	sehr ähnlich

14) Der Person ist es wichtig, dass der Staat ihre persönliche Sicherheit vor allen Bedrohungen gewährleistet. Sie will einen starken Staat, der seine Bürger verteidigt.

überhaupt nicht ähnlich	1	2	3	4	5	6	7	sehr ähnlich

15) Die Person sucht das Abenteuer und geht gern Risiken ein. Sie will ein aufregendes Leben haben.

überhaupt nicht ähnlich	1	2	3	4	5	6	7	sehr ähnlich

16) Der Person ist es wichtig, sich jederzeit korrekt zu verhalten. Sie vermeidet es, Dinge zu tun, die andere Leute für falsch halten könnten.

überhaupt nicht ähnlich	1	2	3	4	5	6	7	sehr ähnlich

17) Der Person ist es wichtig, dass andere sie respektieren. Sie will, dass die Leute tun, was sie sagt.

überhaupt nicht ähnlich	1	2	3	4	5	6	7	sehr ähnlich

18) Es ist ihm wichtig, ihren Freunden gegenüber loyal zu sein. Sie will sich für Menschen einsetzten, die ihr nahe stehen.

überhaupt nicht ähnlich	1	2	3	4	5	6	7	sehr ähnlich

19) Die Person ist fest davon überzeugt, dass die Menschen sich um die Natur kümmern sollten. Umweltschutz ist ihr wichtig.

überhaupt nicht ähnlich	1	2	3	4	5	6	7	sehr ähnlich

20) Der Person ist die Tradition wichtig. Sie versucht, sich an die Sitten und Gebräuche zu halten, die ihr von ihrer Religion oder ihrer Familie überliefert wurden.

überhaupt nicht ähnlich | 1 | 2 | 3 | 4 | 5 | 6 | 7 | sehr ähnlich

21) Die Person lässt keine Gelegenheit aus, Spaß zu haben. Es ist ihr wichtig, Dinge zu tun, die ihr Vergnügen bereiten.

überhaupt nicht ähnlich | 1 | 2 | 3 | 4 | 5 | 6 | 7 | sehr ähnlich

Teil III

1) Die Aufgabe, neue Lösungen für Probleme zu finden, macht mir wirklich Spaß.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

2) Ich würde lieber eine Aufgabe lösen, die Intelligenz erfordert, schwierig und bedeutend ist, als eine Aufgabe, die zwar irgendwie wichtig ist, aber nicht viel Nachdenken erfordert.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

3) Ich setze mir eher solche Ziele, die nur mit erheblicher geistiger Anstrengung erreicht werden können.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

4) Die Vorstellung, mich auf mein Denkvermögen zu verlassen, um es zu etwas zu bringen, spricht mich nicht an.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

5) Ich finde es besonders befriedigend eine bedeutende Aufgabe abzuschließen, die viel Denken und geistige Anstrengung erfordert hat.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

6) Ich denke lieber über kleine, alltägliche Vorhaben nach, als über langfristige.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

7) Ich würde lieber etwas tun, das wenig Denken erfordert, als etwas, das mit Sicherheit meine Denkfähigkeit herausfordert.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

8) Ich finde wenig Befriedigung darin, angestrengt und stundenlang nachzudenken.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

9) In erster Linie denke ich, weil ich muss.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

10) Ich trage nicht gerne die Verantwortung für eine Situation, die sehr viel Denken erfordert.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

11) Denken entspricht nicht dem, was ich unter Spaß verstehe.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

12) Ich versuche, Situationen vorauszuahnen und zu vermeiden, in denen die Wahrscheinlichkeit groß ist, dass ich intensiv über etwas nachdenken muss.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

13) Ich habe es gerne, wenn mein Leben voller kniffliger Aufgaben ist, die ich lösen muss.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

14) Ich würde komplizierte Probleme den einfachen vorziehen.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

15) Es genügt mir, einfach die Antwort zu kennen, ohne die Gründe für die Antwort eines Problems zu verstehen.

stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

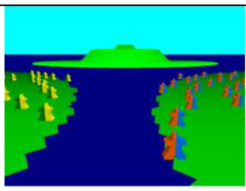
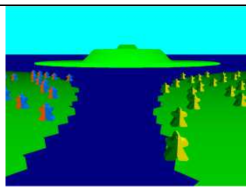
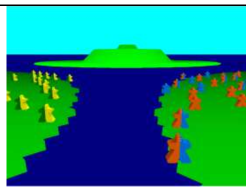
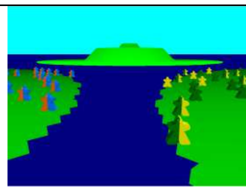
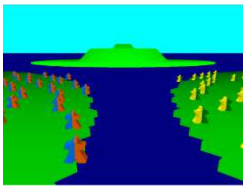
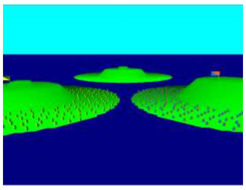
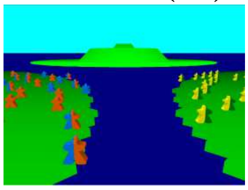
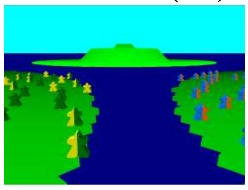
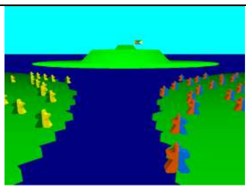
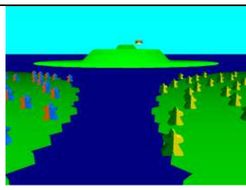
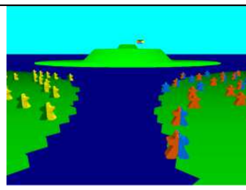
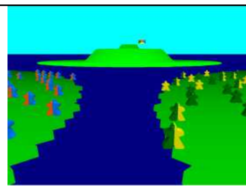
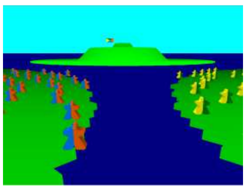
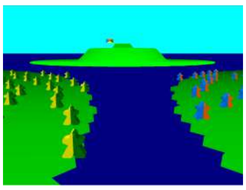
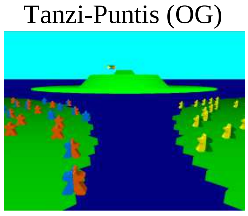
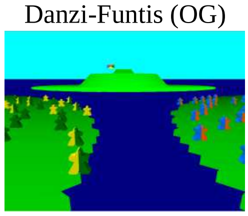
16) Es genügt, dass etwas funktioniert, mir ist es egal, wie oder warum.

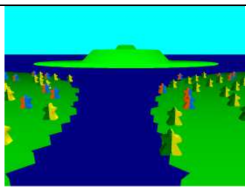
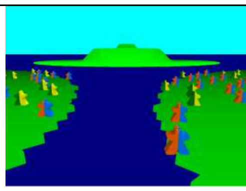
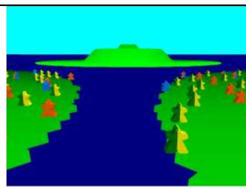
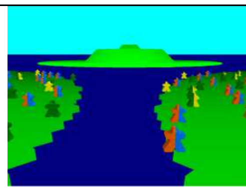
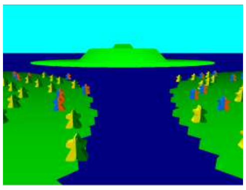
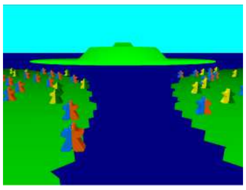
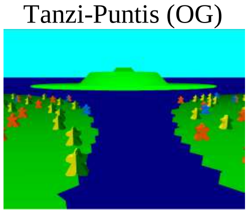
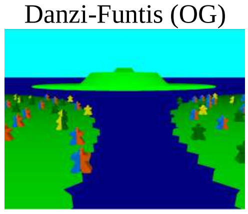
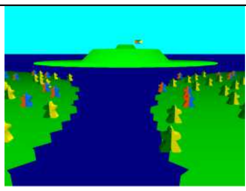
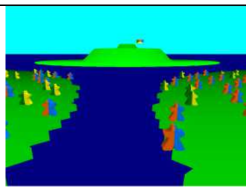
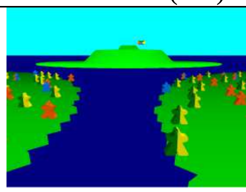
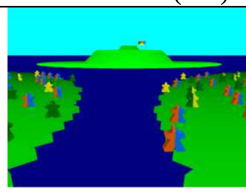
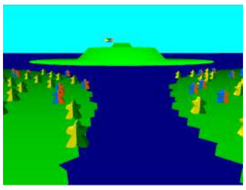
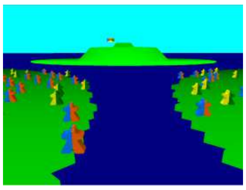
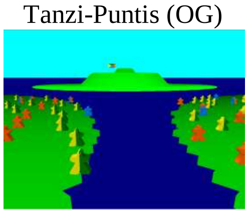
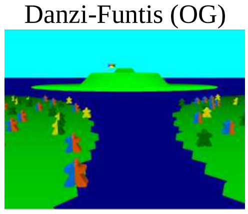
stimmt überhaupt nicht | 1 | 2 | 3 | 4 | 5 | 6 | 7 | stimmt voll und ganz

Sie haben alle Fragen beantwortet. Vielen Dank für Ihre Teilnahme!

Appendix F

Complete Design in Experiment 5

			Ingroups' representation simple		Ingroups' representation complex	
			Color and name set 1	Color and name set 2	Color and name set 1	Color and name set 2
Separate ingroup-outgroup representation	Superordinate category not present	IG island position right	 Red-blue Danzi-Funtis (IG) right vs. green-yellow Tanzi-Puntis (OG)	 Green-yellow Tanzi-Puntis (IG) right vs. r ed-blue Danzi-Funtis (OG)	 Red, blue and red-blue Danzi-Funtis (IG) right vs. green-yellow Tanzi-Puntis (OG)	 Green, yellow and green-yellow Tanzi-Puntis (IG) right vs. red-blue Danzi-Funtis (OG)
		IG island position left	 Red-blue Danzi-Funtis (IG) left vs. green-yellow Tanzi-Puntis (OG)	 Green-yellow Tanzi-Puntis (IG) left vs. red-blue Danzi-Funtis (OG)	 Red, blue and red-blue Danzi-Funtis (IG) left vs. green-yellow Tanzi-Puntis (OG)	 Green, yellow and green-yellow Tanzi-Puntis (IG) left vs. red-blue Danzi-Funtis (OG)
	Superordinate category present	IG island position right	 Red-blue Danzi-Funtis (IG) right vs. green-yellow Tanzi-Puntis (OG)	 Green-yellow Tanzi-Puntis (IG) right vs. red-blue Danzi-Funtis (OG)	 Red, blue and red-blue Danzi-Funtis (IG) right vs. green-yellow Tanzi-Puntis (OG)	 Green, yellow and green-yellow Tanzi-Puntis (IG) right vs. red-blue Danzi-Funtis (OG)
		IG island position left	 Red-blue Danzi-Funtis (IG) left vs. green-yellow Tanzi-Puntis (OG)	 Green-yellow Tanzi-Puntis (IG) left vs. red-blue Danzi-Funtis (OG)	 Red, blue and red-blue Danzi-Funtis (IG) left vs. green-yellow Tanzi-Puntis (OG)	 Green, yellow and green-yellow Tanzi-Puntis (IG) left vs. red-blue Danzi-Funtis (OG)

			Ingroups’ representation simple		Ingroups’ representation complex	
			Color and name set 1	Color and name set 2	Color and name set 1	Color and name set 2
Mixed ingroup outgroup representation	Superordinate category not present	IG island position right	 Red-blue Danzi-Funtis (IG) right vs. green-yellow Tanzi-Puntis (OG)	 Green-yellow Tanzi-Puntis (IG) right vs. red-blue Danzi-Funtis (OG)	 Red, blue and red-blue Danzi-Funtis (IG) right vs. green-yellow Tanzi-Puntis (OG)	 Green, yellow and green-yellow Tanzi-Puntis (IG) right vs. red-blue Danzi-Funtis (OG)
		IG island position left	 Red-blue Danzi-Funtis (IG) left vs. green-yellow Tanzi-Puntis (OG)	 Green-yellow Tanzi-Puntis (IG) left vs. red-blue Danzi-Funtis (OG)	 Red, blue and red-blue Danzi-Funtis (IG) left vs. green-yellow Tanzi-Puntis (OG)	 Green, yellow and green-yellow Tanzi-Puntis (IG) left vs. red-blue Danzi-Funtis (OG)
	Superordinate category present	IG island position right	 Red-blue Danzi-Funtis (IG) right vs. green-yellow Tanzi-Puntis (OG)	 Green-yellow Tanzi-Puntis (IG) right vs. red-blue Danzi-Funtis (OG)	 Red, blue and red-blue Danzi-Funtis (IG) right vs. green-yellow Tanzi-Puntis (OG)	 Green, yellow and green-yellow Tanzi-Puntis (IG) right vs. red-blue Danzi-Funtis (OG)
		IG island osition left	 Red-blue Danzi-Funtis (IG) left vs. green-yellow Tanzi-Puntis (OG)	 Green-yellow Tanzi-Puntis (IG) left vs. red-blue Danzi-Funtis (OG)	 Red, blue and red-blue Danzi-Funtis (IG) left vs. green-yellow Tanzi-Puntis (OG)	 Green, yellow and green-yellow Tanzi-Puntis (IG) left vs. red-blue Danzi-Funtis (OG)

Notes. IG –ingroup, OG – outgroup.

Appendix G

Screenshots of Program SIC 2.7.1 in Experiment 5

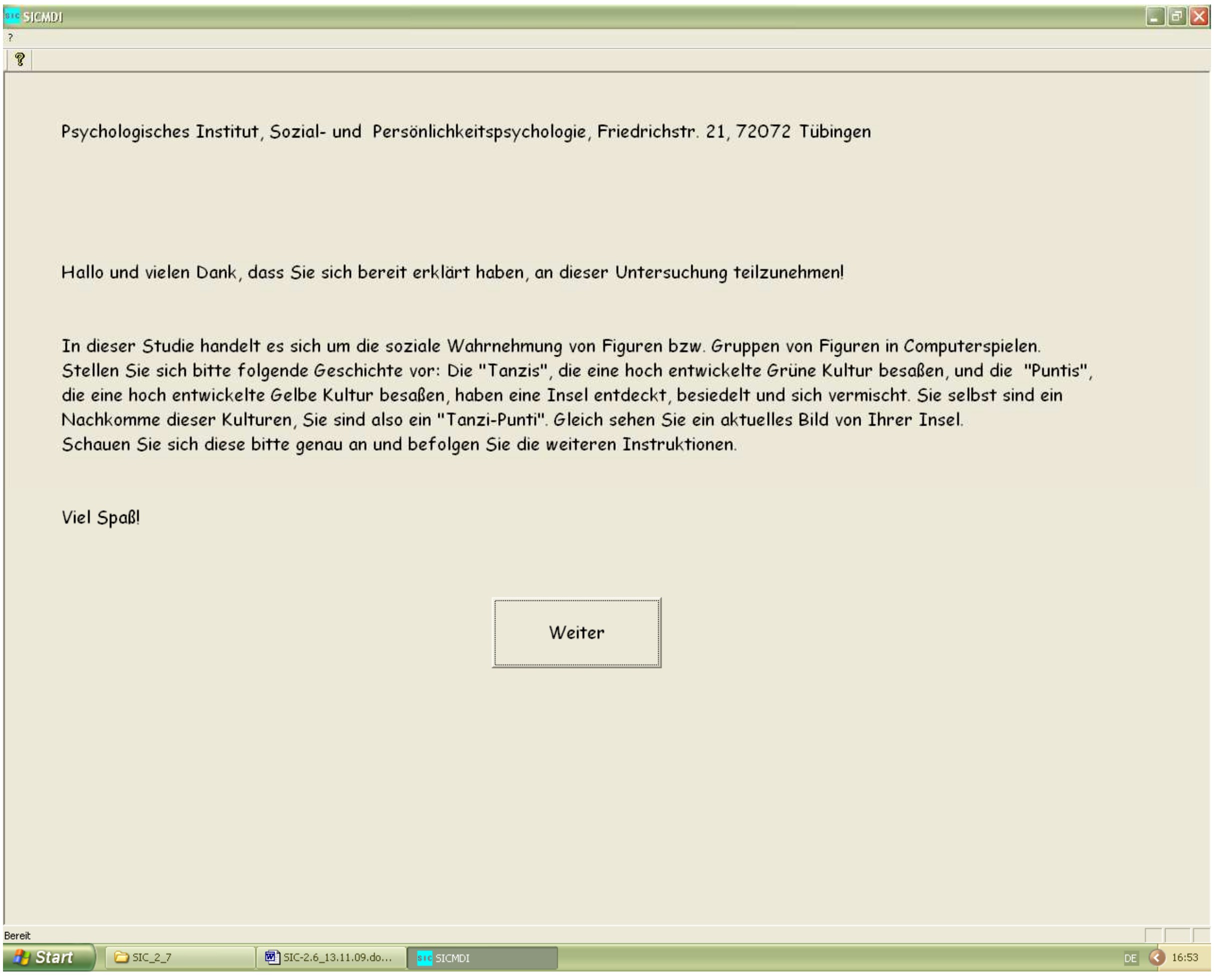


Figure G1. Screenshot of introductory dialog 1: "Hallo and thank you that you participate in our research! This research is about social perception of figures or groups of figures in computer games. Please imagine the following story: the Tanzis [Danzis], which had a highly developed green [red] culture, and the Puntis [Funtis], which had a highly developed yellow [blue] culture, have discovered an island, populated it and mixed among each other. You are a descendant of this cultures, thus you are a green-yellow Tanzi-Punti [red-blue Danzi-Funti]. Next you see an actual picture of your island. Please look at this very attentively and follow the further instructions."

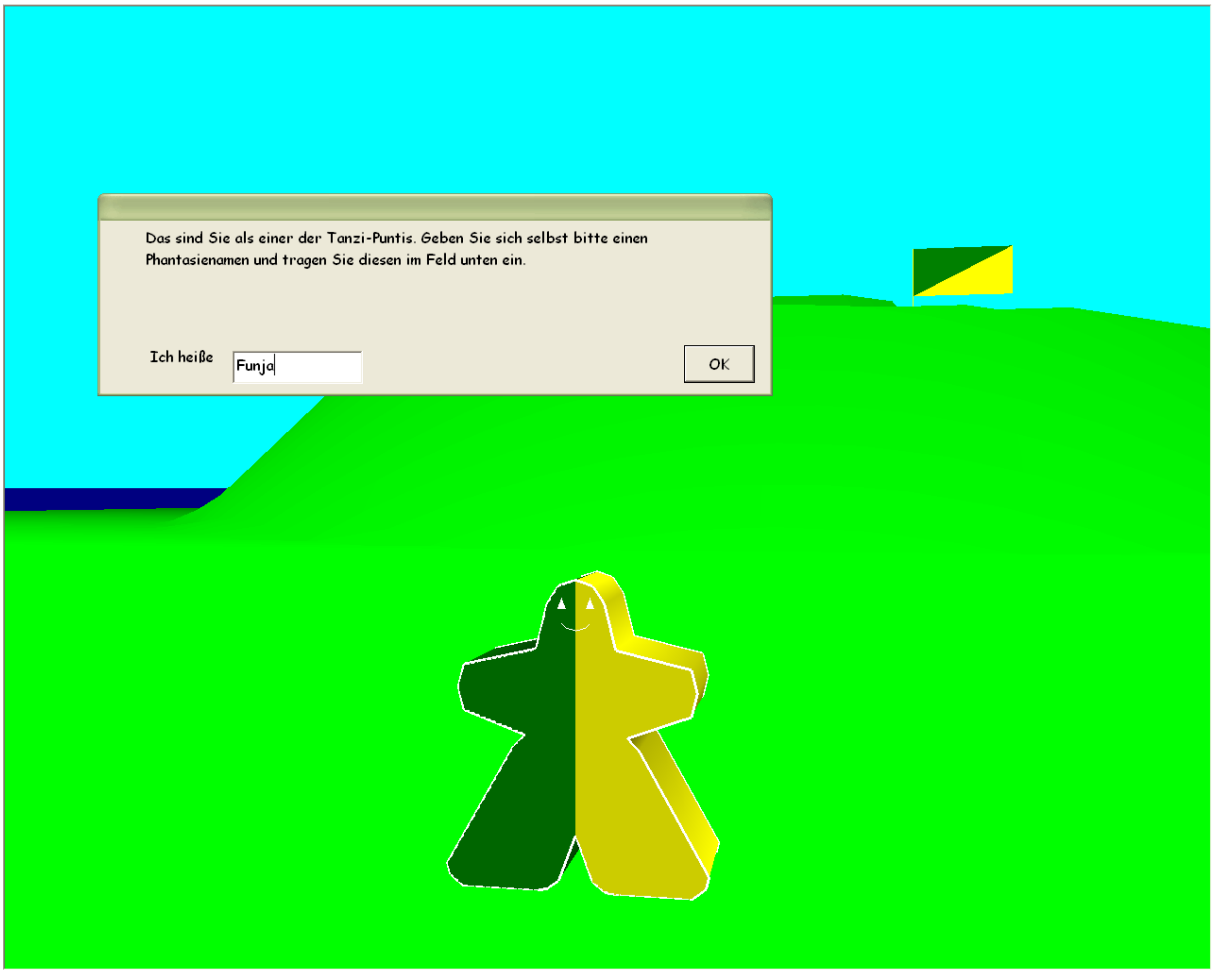


Figure G2. Screenshot of the simulation step “personal avatar” with dialog 2: “This is you as one of the Tanzi-Puntis [Danzi-Funtis]. Please give yourself a fictive name and write it in the box. My name is …”

Figure G3. Screenshot of the simulation step “ingroup salience” with dialog 3: “This is the actual picture of the Tanzi-Puntis [Danzi-Funtis], to which you belong. At one day the Tanzi-Puntis [Danzi-Funtis] decide to build a look-out, in order to look around their island.”

Figure G4. Screenshot of the instruction for game 1 (dialog 4): “Your task in this game is to build a look-out together with other Tanzi-Puntis [Danzi-Funtis] by clicking at the figures with the left mouse button. You have 90 seconds to do that.”

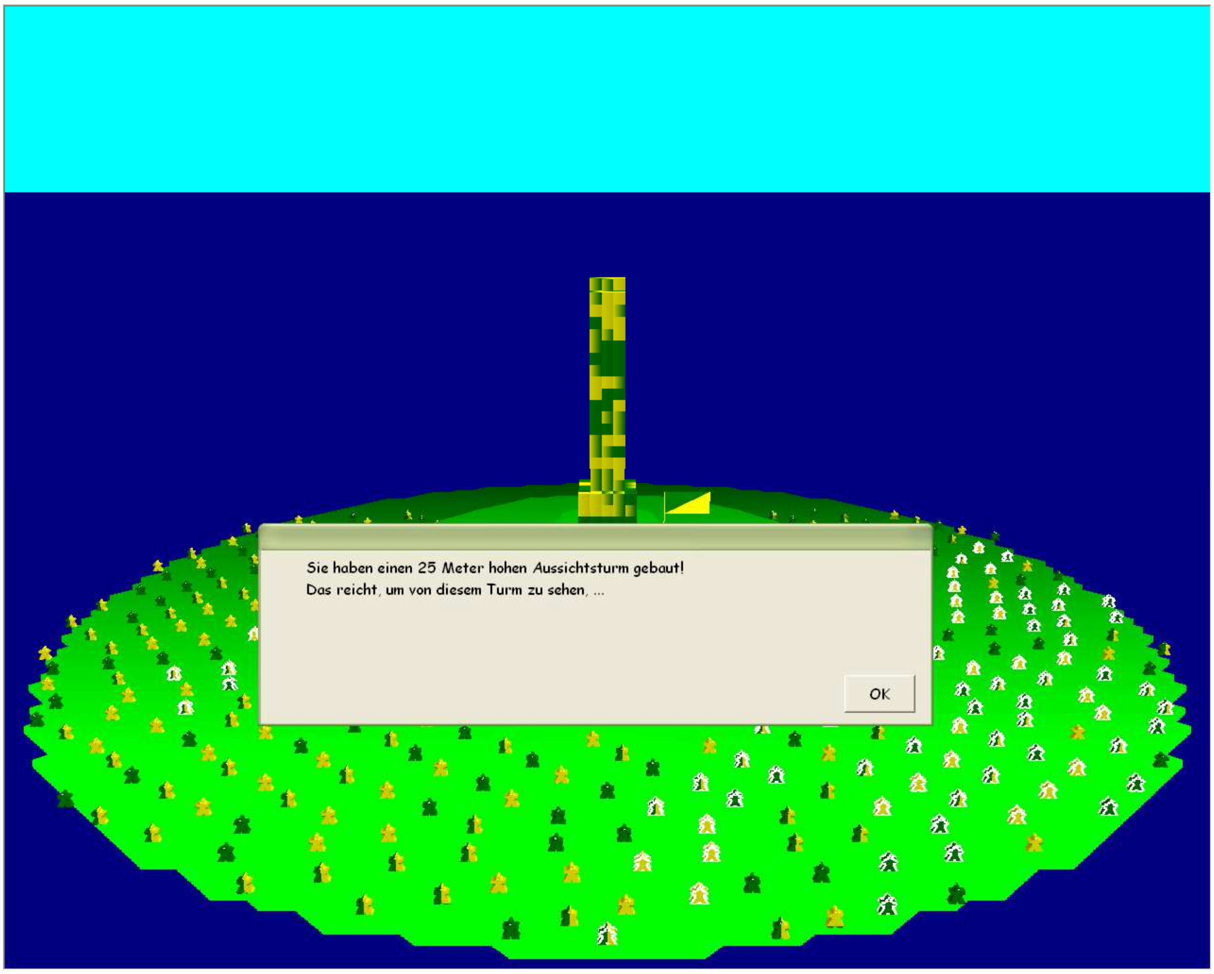


Figure G5. Screenshot of the feedback to game 1 (dialog 5): “You have built a look-out with height [x] meters! This is enough to see …”

Figure G6. Screenshot of the simulation step “presentation of the outgroup” with dialog 6: “This is enough to see that your island is one of a group of islands and that on the neighboring island the red-blue Danzi-Funtis [green-yellow Tanzi-Puntis] are living.”

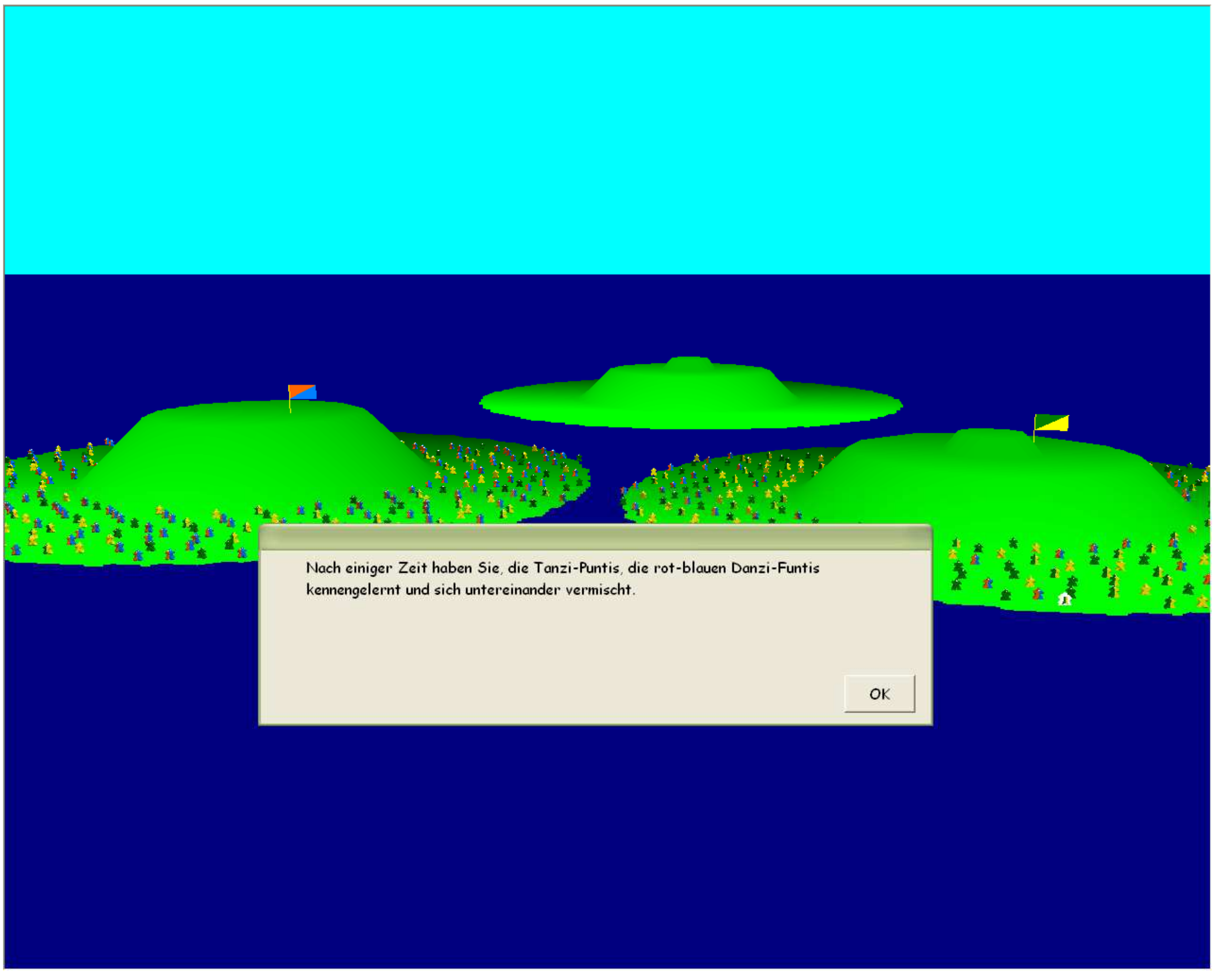


Figure G7. Screenshot of the additional simulation step in the mixed non-superodinate condition with dialog 6.1: "After some time you, the Tanzi-Puntis [Danzi-Funtis], and the Danzi-Funtis [Tanzi-Puntis] have met and mingled with each other.

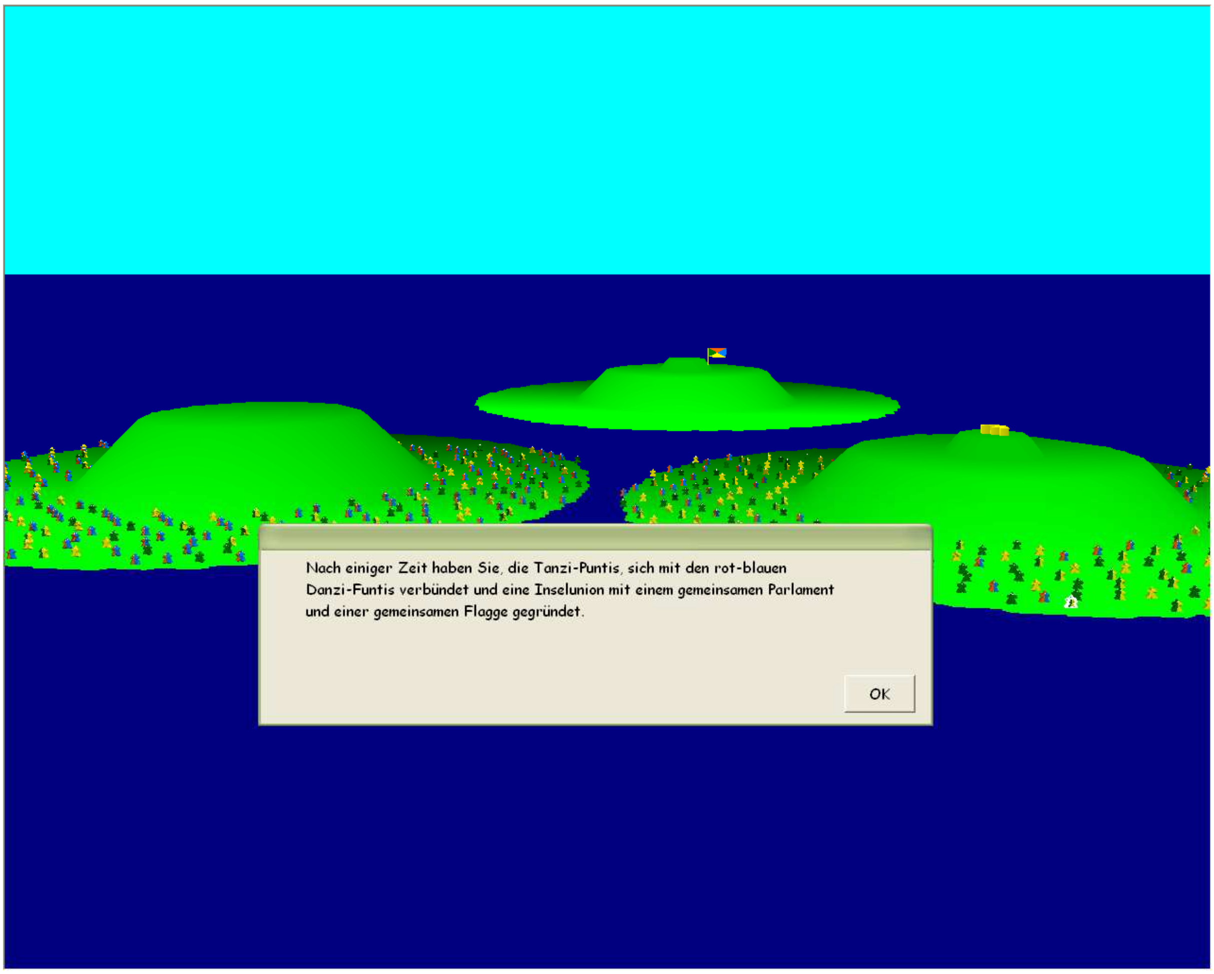


Figure G8. Screenshot of the additional simulation step in the mixed superodinate condition with dialog 6.2: "After some time you, the Tanzi-Puntis [Danzi-Funtis], and the red-blue [green-yellow] Danzi-Funtis [Tanzi-Puntis] have federated and built an island-union with a common parliament and flag.

Figure G9. Screenshot of the instruction to game 2 with dialog 7: "Please build another look-out by clicking with the left mouse button at the Tanzi-Puntis [Danzi-Funtis] or Danzi-Funtis [Tanzi-Puntis].

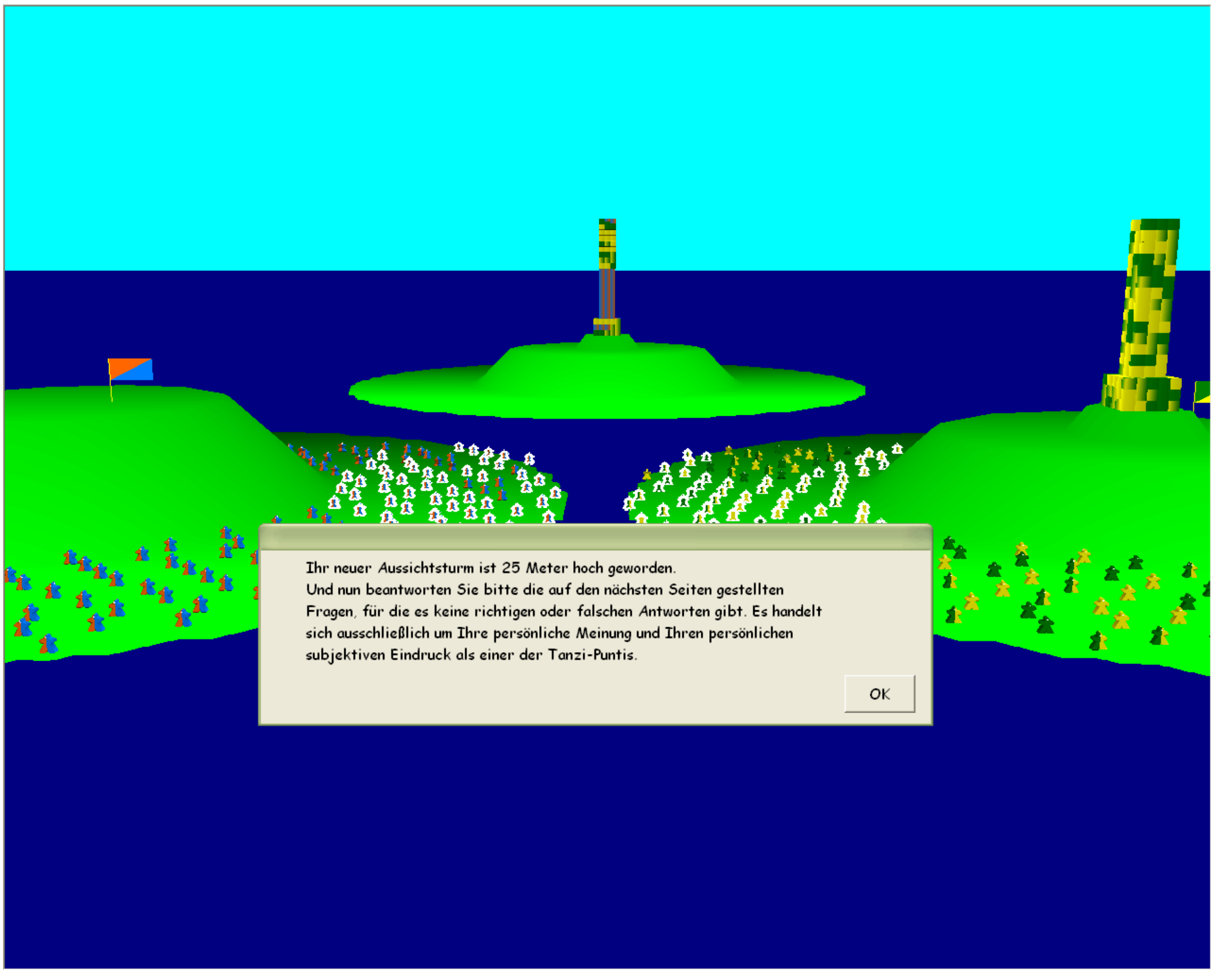


Figure G10. Screenshot of the feedback to game 2 and notice about a questionnaire (dialog 8): “Your new look-out has the height of “X” meters. And now, please answer the questions on the next pages to which there are no correct or incorrect answers. It is only about your personal opinion and your personal subjective impression as one of the Tanzi-Puntis [Danzi-Funtis].”

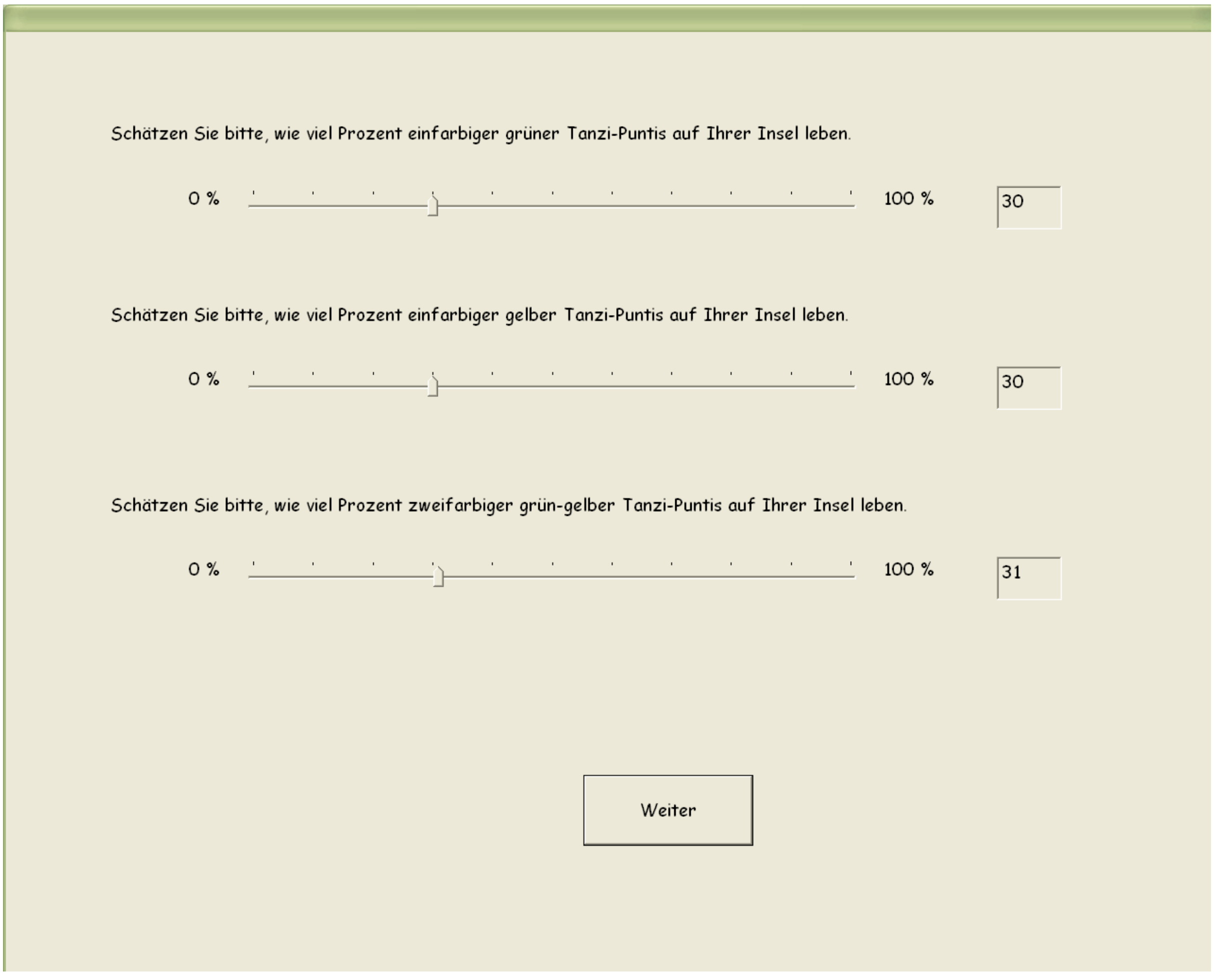


Figure G11. Screenshot of the ingroup configuration measure: „Please estimate, how many percent unicolored green Tanzi-Puntis [red Danzi-Funtis] live on our island. Please estimate, how many percent unicolored yellow Tanzi-Puntis [blue Danzi-Funtis] live on our island. Please estimate, how many percent bicolored green-yellow Tanzi-Puntis [red-blue Danzi-Funtis] live on our island."

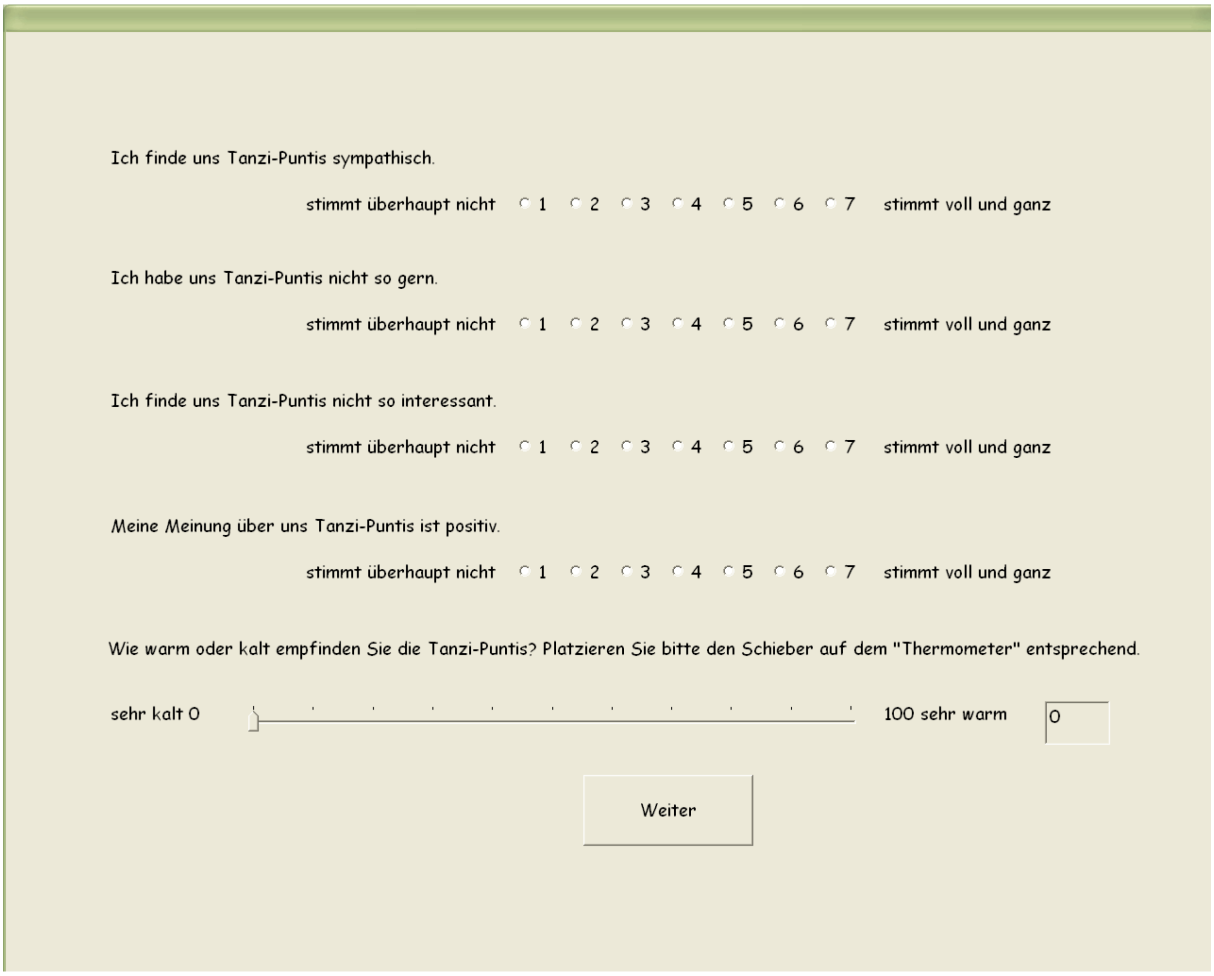


Figure G12. Screenshot of the measure of ingroup tolerance and ingroup feeling thermometer: "I find us Tanzi-Puntis [Danzi-Funtis] likeable. I don't like us Tanzi-Puntis [Danzi-Funtis]. I find us Tanzi-Puntis [Danzi-Funtis] not so interesting. My opinion about us Tanzi-Puntis [Danzi-Funtis] is positive. How warm or cold do you feel the Tanzi-Puntis [Danzi-Funtis] to be? Please place the register on the 'thermometer' accordingly."

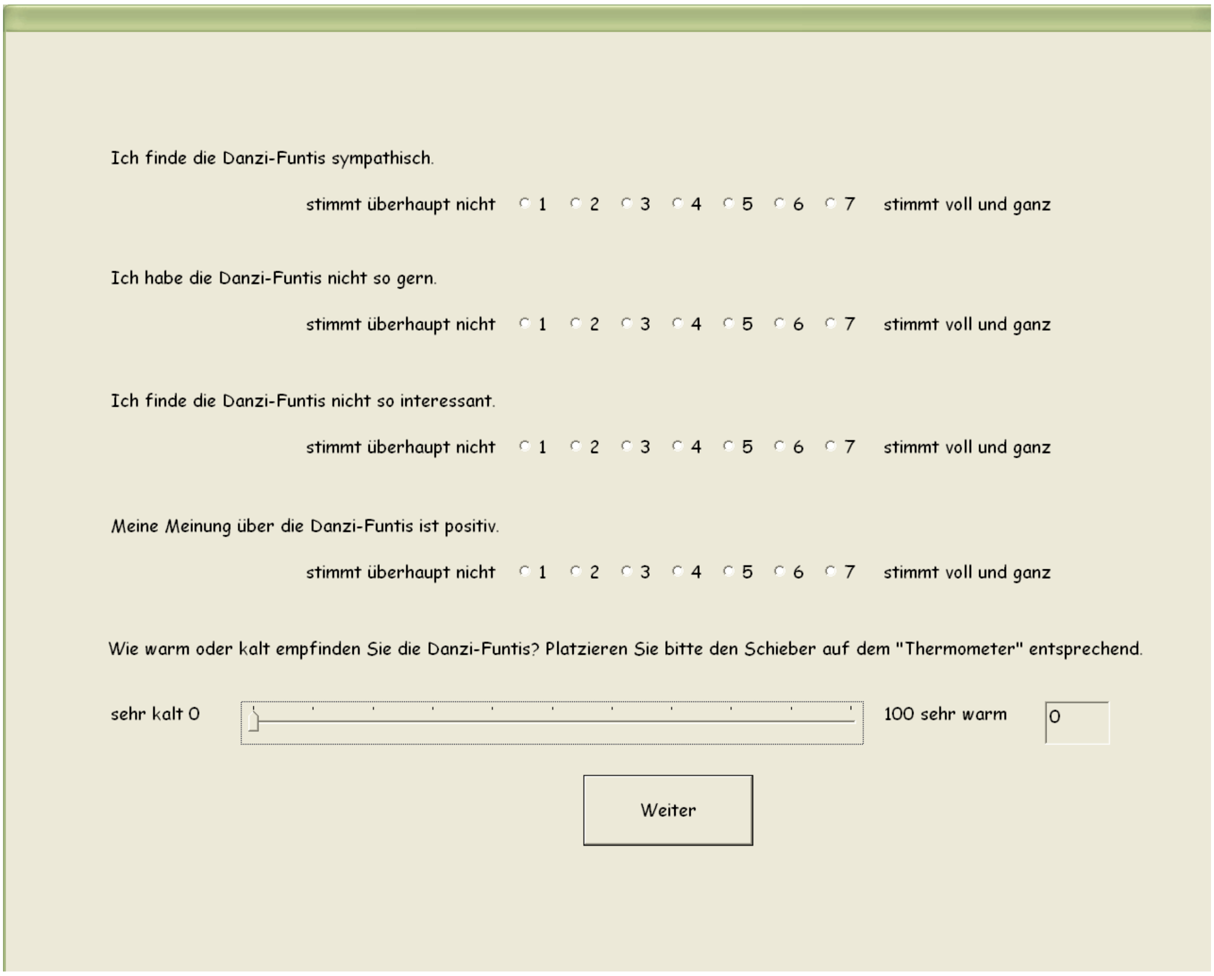


Figure G13. Screenshot of the measure of outgroup tolerance and outgroup feeling thermometer: “I find the Danzi-Funtis [Tanzi-Puntis] likeable. I don’t like the Danzi-Funtis [Tanzi-Puntis]. I find the Danzi-Funtis [Tanzi-Puntis] not interesting. My opinion about the Danzi-Funtis [Tanzi-Puntis] is positive. How warm or cold do you feel the Danzi-Funtis [Tanzi-Puntis] to be? Please place the register on the ‘thermometer’ accordingly.”

Wir, die Tanzi-Puntis, sind untereinander ähnlich.

stimmt überhaupt nicht ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 stimmt voll und ganz

Wir, die Tanzi-Puntis, unterscheiden uns voneinander.

stimmt überhaupt nicht ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 stimmt voll und ganz

Wir, die Tanzi-Puntis, haben viel gemeinsam.

stimmt überhaupt nicht ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 stimmt voll und ganz

Wir, die Tanzi-Puntis, sehen unterschiedlich aus.

stimmt überhaupt nicht ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 stimmt voll und ganz

Manchmal gehören Mitglieder einer Gruppe gleichzeitig auch anderen Gruppen an. Wie stark stimmen, Ihrer Meinung nach, die Mitgliedschaften Ihrer Insel auf einer Skala von 0 bis 10 überein?
- Wenn alle grünen Tanzi-Puntis gleichzeitig auch gelb sind, d.h. zweifarbig, dann beurteilen Sie bitte die Übereinstimmung mit 10.
- Wenn etwa nur die Hälfte der Mitglieder gleichzeitig sowohl grün als auch gelb ist, dann beurteilen Sie bitte die Übereinstimmung mit 5.
- Und wenn keine Mitglieder gleichzeitig grün und gelb sind, d. h. zweifarbig, dann beurteilen Sie bitte die Übereinstimmung mit 0.

Sie können beliebige Zahlen von 0 bis 10 nutzen, um den Umfang der Übereinstimmung zwischen der grünen und gelben Mitgliedschaft auf Ihrer Insel zu schätzen.

keine Übereinstimmung ○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 volle Übereinstimmung

Weiter

Figure G14. Screenshot of the measure of ingroup homogeneity and overlap complexity: "We, the Tanzi-Puntis [Danzi-Funtis], are among each other similar. We, the Tanzi-Puntis [Danzi-Funtis], differ from each other. We, the Tanzi-Puntis [Danzi-Funtis], have a lot in common. We, the Tanzi-Puntis [Danzi-Funtis], appear differently. Sometimes members of one group also belong to other groups. I'd like you to rate how much the membership of the different groups overlaps on a scale from 0 to 10. If all of the members of the green Tanzi-Puntis [red Danzi-Funtis] are also yellow [blue], i.e., bicolored, than rate the overlap as 10. If about half of the green [red] members are also yellow [blue], than rate the overlap as 5. And if no green [red] members are also yellow [blue], i.e., bicolored, than rate the overlap as 0. You can use any number from 0 to 10 to rate the amount of overlap between green [red] and yellow [blue] membership on your island."

Figure G15. Screenshot of the measure of outgroup acceptance and harshness toward outgroup: “We ought to welcome the Danzi-Funtis [Tanzi-Puntis] to enter and become part of our culture. We should reduce the influence of Danzi-Funtis [Tanzi-Puntis] on our culture. I approve the imposing of restrictions on immigration. In my opinion the Danzi-Funtis [Tanzi-Puntis] would fit in well with our island. In my opinion our Tanzi-Punti-island [Danzi-Funti-island] would be ready to include the Danzi-Funtis [Tanzi-Puntis].”

Figure G16. Screenshot of the manipulation check of intergroup representation and of presence of the superordinate category: “The Danzi-Funtis [Tanzi-Puntis] and we, the Tanzi-Puntis [Danzi-Funtis] are one group. The Danzi-Funtis [Tanzi-Puntis] and we, the Tanzi-Puntis [Danzi-Funtis] interact a lot. We, the Tanzi-Puntis [Danzi-Funtis], and the Danzi-Funtis [Tanzi-Puntis] live separated on two different islands. We, the Tanzi-Puntis [Danzi-Funtis], and the Danzi-Funtis [Tanzi-Puntis] are unified.”

Figure G17. Screenshot of the intergroup variability measure: "The Danzi-Funtis [Tanzi-Puntis] and we, the Tanzi-Puntis [Danzi-Funtis], are similar. The Danzi-Funtis [Tanzi-Puntis] and we, the Tanzi-Puntis [Danzi-Funtis], are different. We, the Tanzi-Puntis [Danzi-Funtis], are rather different in comparison with the Danzi-Funtis [Tanzi-Puntis]. Between us, the Tanzi-Puntis [Danzi-Funtis], and the Danzi-Funtis [Tanzi-Puntis] can be very well distinguished."

Figure G18. Screenshot of the ingroup identification measure: “I regret that I belong to the Tanzi-Puntis [Danzi-Funtis]. I am glad to be a member of the Tanzi-Puntis [Danzi-Funtis]. I feel that I belong to the Tanzi-Puntis [Danzi-Funtis]. I am one of the Tanzi-Puntis [Danzi-Funtis]. I do not fit in well with the Tanzi-Puntis [Danzi-Funtis].”

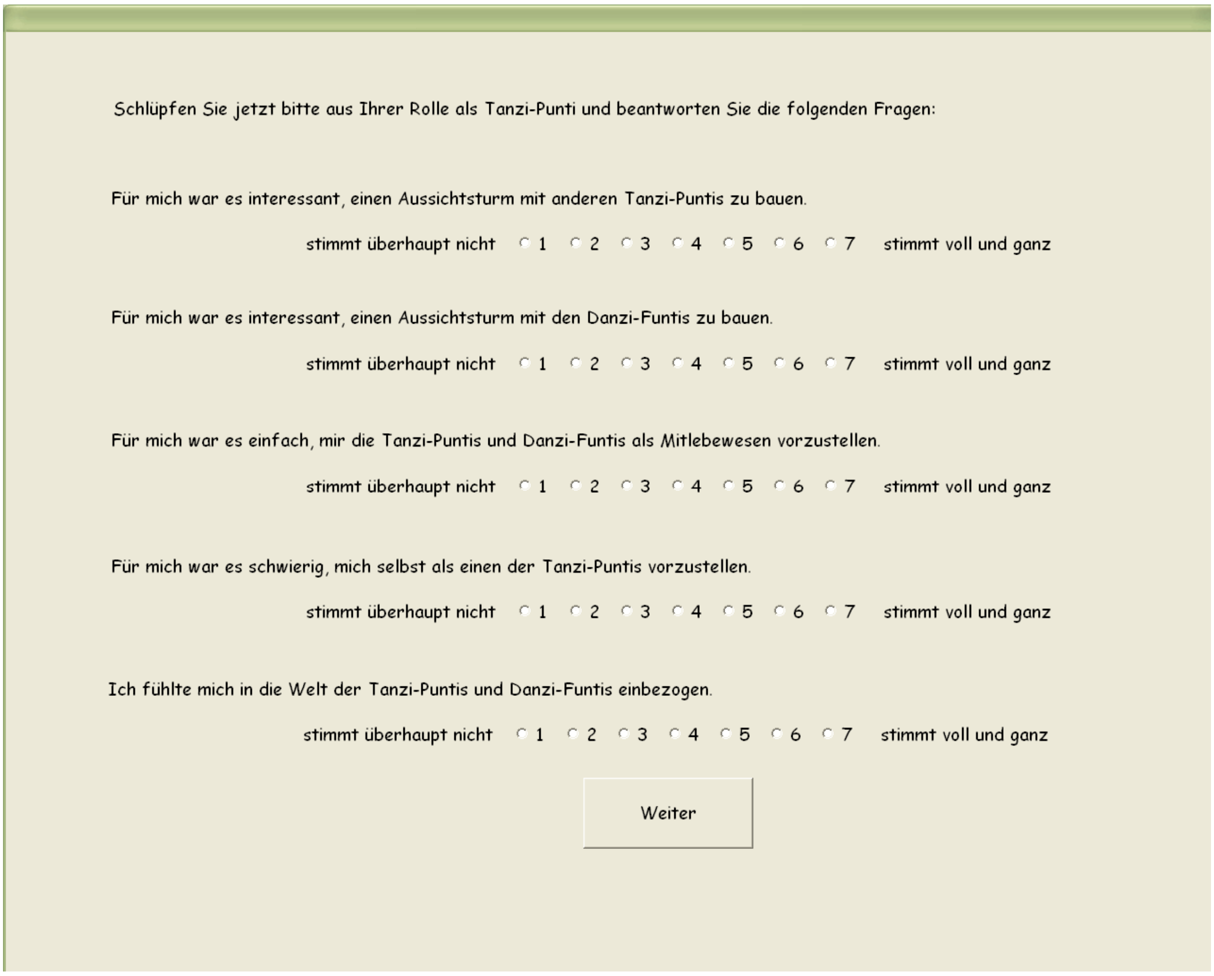


Figure G19. Screenshot of simulation acceptance and immersion measure: “And now, please leave your role as a Tanzi-Punti [Danzi-Funti] and respond the following questions: It was interesting to me, to build a look-out with other Tanzi-Puntis [Danzi-Funtis]. It was interesting to me, to build a look-out with the Danzi-Funtis [Tanzi-Puntis]. It was simple to me, to imagine the Tanzi-Puntis [Danzi-Funtis] and the Danzi-Funtis [Tanzi-Puntis] as creatures. It was difficult to me, to imagine myself as one of the Tanzi-Puntis [Danzi-Funtis]. I felt to be immersed in the world of the Tanzi-Puntis [Danzi-Funtis] and Danzi-Funtis [Tanzi-Puntis].”

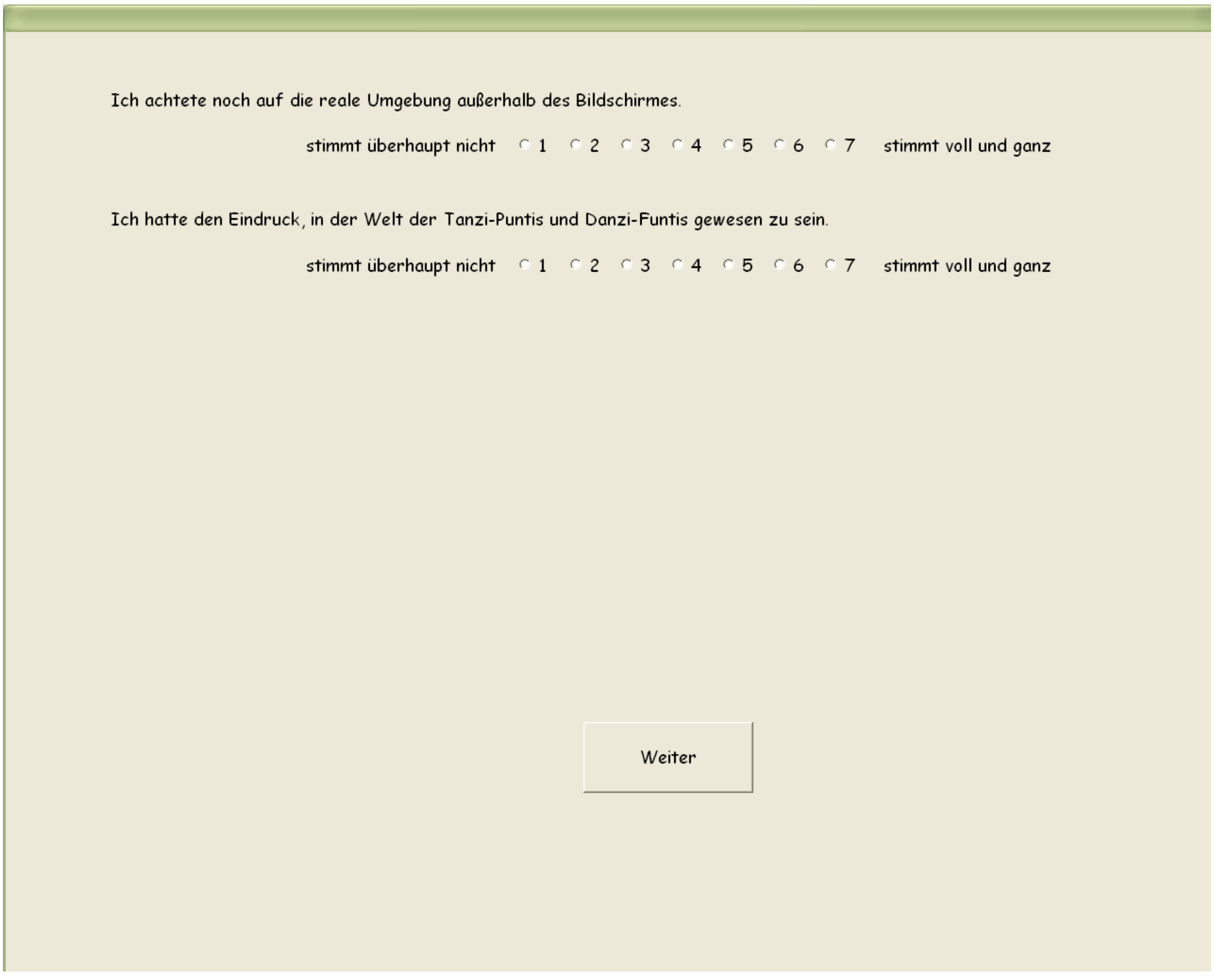


Figure G20. Screenshot of simulation acceptance and immersion measure (continued): "I paid attention to the real environment outside the display. I had been struck to be in the world of the Tanzi-Puntis [Danzi-Funtis] and Danzi-Funtis [Tanzi-Puntis]."

Figure G21. Screenshot of the ideological perspective measure: “Harmony in a society is best achieved by downplaying or ignoring subgroups differences. To have a smoothly functioning society, members of minorities must better adapt to the ways of mainstream culture. If we want to help create a harmonious society, we must recognize that each cultural group has the right to maintain its own unique traditions. Cultural minority groups will never really fit with a mainstream culture.”

Figure G22. Screenshot of the measure of personal avatar perception and personal data: “Please choose from the following statements the one that fits best to your role in this game: I have imagined to be a green Tanzi-Punti [red Danzi-Funti] figure. I have imagined to be a yellow Tanzi-Punti [blue Danzi-Funti] figure. I have imagined to be a bicolored green-yellow Tanzi-Punti [red-blue Danzi-Funti] figure. I haven’t imagined me as a specific figure. Your sex? f/m. Your age? Your occupation? Job/Studies/Other. Migration background: yes/no. Thank you very much!”