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Crossed categorization outside the lab: Findings from a factorial survey experiment

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Abstract

Crossed categorization studies investigate intergroup attitudes in situations when two categorization dimensions are simultaneously salient, often looking at artificial groups in laboratory settings. The current study tests (a) patterns of evaluation in crossed categorization scenarios when more than two real-life categorization dimensions are crossed, and (b) the moderating role of identity importance. We conduct a factorial survey experiment with a diverse sample ($N = 524$), crossing eight categorization dimensions. The results provide strong support for the additive pattern of crossed categorization, challenging the view that with an increased number of categories category-based information processing will not be used. Identity importance predicts the strength of intergroup bias only on the dimension of religion, which was the dominant dimension in this sample. The study contributes to multiple and crossed categorization literature by testing some of its key assumptions using a design that increases the ecological validity of the findings.

KEYWORDS
crossed categorization, factorial survey, intergroup bias, multiple categorization, out-group attitudes

1 | INTRODUCTION

The social psychology of intergroup relations largely focuses on the in-group versus out-group dichotomy, often leaving out the fact that there are always many possible in-groups and out-groups for each individual. Every single person with whom one interacts will be an in-group member on some dimensions, but an out-group member on others. Studies of multiple categorization indicate that people are able and do use multiple bases for social categorization simultaneously (Crisp & Hewstone, 2007; Crisp, Hewstone, & Cairns, 2001).

Crossed categorization paradigm is one of the approaches to studying impression formation in multiple categorization scenarios. In this paradigm, two dimensions of social categorization

intersect, forming four targets that are then evaluated by participants (Deschamps & Doise, 1978). The paradigm has been successfully used to demonstrate that adding the second dimension of categorization reduces intergroup bias (Crisp, Hewstone, & Rubin, 2001; Migdal, Hewstone, & Mullen, 1998; Mullen, Migdal, & Hewstone, 2001). It has also allowed testing the patterns of evaluation that occur when two dimensions of categorization are simultaneously made salient (Crisp & Hewstone, 1999, 2007; Hewstone, Islam, & Judd, 1993). The crossed categorization paradigm has another valuable property that has rarely been explored: it enables evaluating the relative importance of different group memberships of a target person in predicting the attitude towards that person. Indeed, when real-life social categories are used, some categories produce stronger intergroup bias than others (Brewer, Ho, Lee, &

Miller, 1987; Hewstone et al., 1993). Crisp and Hewstone (2007) suggest that category dominance is determined by category salience. However, the question of what determines category salience in crossed categorization scenarios remains open.

Although crossed categorization is a case of multiple categorization, in this article we will refer to "crossed categorization" to indicate that different dimensions of categorization intersect, and to "multiple categorization" to indicate that more than two dimensions are used in a study. The aim of this study is twofold. First, we explore patterns of crossed categorization when multiple real-life group memberships that cut across one another are made salient, thereby combining crossed and multiple categorization approaches. Second, we investigate the mechanism behind category dominance by looking at identity importance.

The motivation behind this study is to contribute to multiple and crossed categorization literature by focusing on the ecological validity of this body of research. Nicolas, de la Fuente, and Fiske (2017) point to three limitations of this literature. First, to the best of our knowledge, there are no studies so far that would explore crossed categorization effects with more than two groups. Multiple categorization studies that use more than two dimensions of categorization employ one of the two strategies: they either (a) combine a manipulation of a single categorization dimension with a manipulation of either all shared or all non-shared group memberships on other dimensions (Prati, Crisp, Meleady, & Rubini, 2016; Prati, Menegatti, & Rubini, 2015; Urada, Stenstrom, & Miller, 2007) or (b) generate mixed alternative group memberships, without manipulating them (Albarello & Rubini, 2012; Hall & Crisp, 2005). Nicolas et al. (2017) suggest that this can be explained by methodological complexity associated with such attempts. Second, the majority of crossed categorization research has been conducted using artificial groups in a laboratory setting (Ensari & Miller, 2001). And finally, samples used in previous studies have often been homogeneous, usually including only the majority group members (Vescio, Judd, & Kwan, 2004).

The current study addresses these limitations in the following ways. First, we employ a factorial survey design (Rossi & Anderson, 1982), which allows manipulating multiple dimensions of categorization. A factorial survey is essentially a factorial experiment implemented in a survey format. Several independent variables (factors) are manipulated, to test their effects on a single dependent variable. Similar to a factorial experiment, each factor has several levels and the combination of different levels for different dimensions produces a variety of cases that can be presented to participants in a form of a scenario or a vignette. Factorial surveys have the benefits of experimental designs, allowing the researchers to manipulate the dimensions of interest in the vignettes (higher internal validity), and the benefits of survey designs, allowing the researchers to conduct a study outside of the laboratory setting (higher external validity) (Jasso, 2006). Finally, a factorial survey is less affected by social desirability compared to a conventional questionnaire (Armacost, Hosseini, Morris, & Rehbein, 1991). For research on intergroup perceptions and attitudes, all these features of factorial surveys are of high significance, which can explain why more and more studies in this area are using this approach (Diehl, Andorfer, Khoudja, & Krause, 2013; Hainmueller &

Hopkins, 2015; Havekes, Coenders, & van der Lippe, 2013; Schlueter, Ullrich, Glenz, & Schmidt, 2018). Second, we use real-life categories that are relevant for the given social context and conduct the study outside of the laboratory, which considerably improves the external validity of the findings. Third, we sample a heterogeneous group of participants from Russia, a country that has been underrepresented in psychological literature so far. We recruit a diverse group of participants to represent all social groups included in the study design.

In the following section we first discuss the theoretical background of the study, which is largely based on the assumptions of social identity theory (Tajfel, 1978; Tajfel & Turner, 1979) and self-categorization theory (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987), as well as findings from crossed categorization research. We then develop predictions and propose an analytical strategy to test these predictions.

2 | THEORETICAL BACKGROUND

2.1 | Social identity theory and self-categorization theory

Two major theories that brought the processes of social categorization to the center of intergroup relations studies are social identity theory (SIT) and self-categorization theory (SCT). SIT is a comprehensive theoretical framework that deals with the consequences of social categorization for intergroup relations. The key assumption of the theory is that people have a need for positive social identity, and this need is met by achieving positive distinctiveness of their group compared to other groups (Tajfel & Turner, 1979; Turner & Reynolds, 2001). The evidence for the preference for in-group versus out-group members both in judgments and in behaviors is overwhelming (Hewstone, Rubin, & Willis, 2002; Wilder, 1986). However, the relationship between in-group favoritism and out-group derogation is not straightforward (Brewer, 1999; de Figueiredo & Elkins, 2003). Several moderators of this relationship have been identified in the past research, such as the strength of identification, threat, group size and status, individual differences and others (Brewer, 1999; Mullen, Brown, & Smith, 1992; Turner & Reynolds, 2001). In the current study, we do not differentiate between in-group favoritism and out-group derogation. Instead, we use the term *intergroup bias* to refer to the differential assessment of the in-group members compared to out-group members.

Social identity theory provides a comprehensive account of prejudice formation following basic cognitive processing. However, it does not say much about the psychological processes behind impression formation in situations when more than one relevant and salient categorization dimension is present. Self-categorization theory (SCT; Turner et al., 1987), introduced a decade later, takes us one step closer to addressing this question. SCT is concerned with questions of how categories are activated and used in impression formation. It stands in opposition to the view that categories are automatically activated when relevant cues are present (Bargh, 1989; Devine, 1989). Instead, SCT describes categorization as a process (Turner, Oakes, Haslam, & McGarty, 1994).

Studies conducted within this framework (Blanz, 1999; Oakes, 1987; Oakes, Turner, & Haslam, 1991) demonstrate that categorization is determined by the interaction between perceiver's characteristics (perceiver readiness, e.g., motivation, values) and the context characteristics (comparative and normative fit: how well the category captures similarities and differences and how appropriate it is in the given context). A multitude of studies on categorization of multiracial individuals with both children and adult samples provides strong support for the theory, demonstrating how categorization outcomes vary depending on both perceiver and context characteristics (Gaither, Pauker, Slepian, & Sommers, 2016; Ho, Roberts, & Gelman, 2015; Pauker, Meyers, Sanchez, Gaither, & Young, 2018; Pauker, Williams, & Steele, 2016). From the SCT arguments we can expect the strength of bias on different dimensions of categorization to vary depending on participant characteristics, given that the contextual variables are kept constant (all participants are presented with the same stimuli).

2.2 | Patterns of crossed categorization

Studies of crossed categorization were inspired by findings from the field of social anthropology showing that societies that have more cross-cutting group memberships have less internal tension (Gluckman, 1956; LeVine & Campbell, 1972). In the social-psychological literature, crossed categorization refers to the combination of two dimensions of social categorization that produce four targets: a double in-group, two targets with overlapping group memberships, and a double out-group (Deschamps & Doise, 1978). For example, if a respondent is German and male, then the four targets in a typical crossed categorization study could be German male (double in-group, II), German female (partial in-group, IO), French male (partial in-group, OI), and French female (double out-group, OO).

Experimental studies of crossed categorization in social psychology started with the category differentiation model of Deschamps and Doise (1978). The idea behind this model is that while using one categorization dimension ("simple categorization") makes the intergroup differences and intragroup similarities salient (which eventually may result in intergroup bias), crossed categorization reduces perceived intragroup similarity by dividing the in-group into two groups on the second dimension, and also reduces perceived intergroup differences by introducing part of the out-group members on one dimension as in-group members on the other. This mechanism, according to the authors, should reduce or even eliminate intergroup bias in crossed categorization conditions.

Several experimental studies found support for this argument. Usually studies report either elimination of intergroup bias in crossed categorization conditions, combined with negative assessment of the double out-group targets (Diehl, 1990) or, more often, reduction of bias in overlapping conditions, in a way that double in-groups are evaluated most positively, partial in-groups less positively, but not negatively, and finally the double out-groups are evaluated negatively (Brown & Turner, 1979; Vanbeselaere, 1987). This pattern is usually referred to as the *additive pattern* (Brewer, 1968; Hewstone et al., 1993).

Two meta-analyses (Migdal et al., 1998; Urban & Miller, 1998) found the additive pattern to be the fundamental crossed categorization effect. Urban and Miller (1998) reported that although the additive pattern is the baseline, there is significant variability of the patterns beyond it. This variation mainly emerges in those studies that use real-life social categories and can be explained by the unequal psychological significance of categorization dimensions. The list of different patterns identified in the literature is presented in Table 1.

The category *dominance* pattern suggests that only the important categorization dimension will be considered, and the second, subordinate dimension will be ignored (Brewer et al., 1987; Commins & Lockwood, 1978). The category conjunction pattern (Rogers, Miller, & Hennigan, 1981) has two variants: conjunction similarity (social inclusion) and conjunction dissimilarity (social exclusion). In the *conjunction similarity* pattern, targets that share at least one group membership with the participant are favored as much as the targets that share both group memberships. In the *conjunction dissimilarity* pattern, targets that are different from the participant on at least one dimension are evaluated as negatively as targets that are different from the participant on both dimensions.

The hierarchical ordering pattern suggests that the use of the second category will depend on whether the target person was categorized as an in-group or an out-group member on the first dimension (the "first" here refers to the category that is deemed more important). In the *hierarchical acceptance* pattern, only those targets that were classified as in-group members on the first, important, dimension will be further differentiated based on the second dimension; those classified as out-group members on the important dimension will not be further differentiated based on the second dimension (Brewer et al., 1987; Park & Rothbart, 1982). In the *hierarchical rejection* pattern, the differentiation on the second, less important dimension will occur only for the targets classified as an out-group member on the first dimension (Hewstone et al., 1993). Finally, there is also a possibility that no differentiation occurs on any of the dimensions: the *equivalence pattern*.

All these patterns were proposed and tested only with two dimensions of categorization. Multiple categorization studies mainly focus on the bias reduction potential of multiple categorization (Hall & Crisp, 2005; Prati et al., 2016, 2015). The only study so far that investigated the patterns of crossed categorization when multiple categories are used is the study by Urada et al. (2007). The authors argue and provide evidence for a qualitatively different way of information processing in the multiple categorization settings compared to traditional two-group designs. They show that the perception of targets is heuristic rather than additive and that there is a certain threshold that separates targets that are being perceived as more in-grouplike versus more out-grouplike. These findings are in line with feature detection strategy of data processing (Prinz & Scheerer-Neumann, 1974), which suggests that when individuals are presented with complex stimuli, they tend to evaluate it as a Gestalt, rather than as a combination of specific characteristics that add up to each other to form an impression. This study, however, has the same limitation as other multiple categorization studies: the design

TABLE 1 Patterns of crossed categorization (adopted from Crisp & Hewstone 2007)

Conditions	Pattern	Dimension 1: in-group		Dimension 1: out-group	
		Dimension 2: in-group	Dimension 2: out-group	Dimension 2: in-group	Dimension 2: out-group
Baseline	1. Additive	2	0	0	−2
		ii	> io	= oi	> oo
Differential importance (here dimension 1 more important)	2. Dominance	1	1	−1	−1
		ii	= io	> oi	= Oo
Positive affect/in-group prime	3. Social inclusion	1	1	1	−3
		ii	= io	oi	> oo
Negative affect/out-group prime	4. Social exclusion	3	−l	−1	−1
		li	> io	= oi	= oo
Positive affect/differential importance (here dimension 1 more important)	5. Hierarchical acceptance	4	0	−2	−2
		ii	> io	> oi	= oo
Negative affect/differential importance (here dimension 1 more important)	6. Hierarchical rejection	2	2	0	−4
		ii	= io	> oi	> oo
Extreme positive affect/low importance groups/absence of salience categorizations	7. Equivalence	ii	= io	= oi	= oo

Note: Differences in sign (+/−) specify where differences are to be expected across the four crossed category subgroups. No contrast weights can be shown for the equivalence pattern because it is a null effect.

Abbreviations: i, in-group constituent of group; o, out-group constituent of group.

does not allow crossing multiple group memberships, and the effects are tested only for the cases when either multiple in-group or multiple out-group memberships are added to the primary dimension.

In the differentiation–decategorization model of multiple categorization effects, Crisp and Hewstone (2007) propose that when the number of cross-cutting dimensions increases, the complexity of cognitive task increases as well, and decategorization occurs. This argument is in line with Brewer's (1988) dual-process model of impression formation, which suggests that when the target does not easily fit into one of the pre-existing categories, the impression will not be category-based, but rather individuated. Evidence on evaluation patterns in multiple crossed categorization settings would also provide some insight into these assertions. On the basis of the existing findings on patterns of crossed categorization with two groups, we developed predictions for patterns of evaluation that can occur in multiple crossed categorization settings. Table 2 summarizes these predictions.

These patterns are highly informative for understanding impression formation processes in multiple categorization settings. However, the question of *why* certain categorization dimensions become dominant remains unaddressed. Hagendoorn and Kleinpenning (1991) indicate that the importance of certain characteristics depends on the specific society, group type, and period of history. Brown (2010) states that "the question of which category dimension will assume pre-eminence in any situation is dependent on particular local circumstances" (p. 47). Given that in our study we only use those categories that are relevant for the given social context at the given time, it allows further exploration of psychological underpinnings of category dominance.

2.3 | Identity importance as a moderator

Importance of a categorization dimension is one of the key moderators predicting deviations from the additive pattern (Urban & Miller, 1998). However, the way crossed categorization literature operationalizes category importance is problematic. It is implicitly assumed that those dimensions of categorization that are more important for the perceiver will be the ones that are dominant in a crossed categorization setting. On this assumption, the dominance of a category is treated as a proxy for its subjective importance to the perceiver. However, this assumption was never explicitly tested. Up to now, category importance and affective valence have always been investigated in conjunction. Ensari and Miller (1998) manipulated affective states to increase the importance of categorization dimensions. In a series of studies, they demonstrated that positive affect from an out-group resulted in a hierarchical rejection pattern and negative affect in a hierarchical acceptance pattern of crossed categorization. Urada and Miller (2000) focused on importance as a prerequisite for the effects of positive affect to occur. They demonstrated that positive affect influences judgments only if it is related to the dominant category. Urban and Miller (1998) stated that although the explanatory role of category importance is supported by several studies, it has received little attention in the literature. Crisp, Ensari, Hewstone, and Miller (2003) indicate, "No new work has examined category importance independent from affective state" (p. 51). And to the best of our knowledge, this is still the case.

Crisp and Hewstone (2007) attribute the differential strength with which various categorization dimensions affect attitudes to category salience. According to SCT (Turner et al., 1987), category salience is a

TABLE 2 Predicted patterns of multiple crossed categorization

Pattern	Prediction
Additive	There is a positive linear relationship between the number of shared group memberships and the attitude
Dominance	Once observations are divided into in- and out-group members on the dominant dimension, the number of shared group memberships does not affect the attitude within the subsamples
Hierarchical acceptance	There is a positive linear relationship between the number of shared group memberships and the attitude in the subsample of in-group members on the dominant dimension, but not in the subsample of out-group members on the dominant dimension
Hierarchical rejection	There is a positive linear relationship between the number of shared group memberships and the attitude in the subsample of out-group members on the dominant dimension, but not in the subsample of in-group members on the dominant dimension
Social inclusion/ Conjunction similarity	(1) Targets with no shared group memberships (subsample 1) are evaluated more negatively than targets with any number of shared group memberships (subsample 2), *and* (2) There is no relationship between the number of shared group memberships and the attitude in subsample 2
Social exclusion/ Conjunction dissimilarity	(1) Targets with shared group membership on all dimensions (subsample 1) are evaluated more positively than targets with any number of non-shared group memberships (subsample 2), *and* (2) There is no relationship between the number of shared group memberships and the attitude in subsample 2
Equivalence	The number of shared group memberships does not affect the attitude

product of the readiness of a perceiver to use a specific category (accessibility) and the fit between category representations and the stimulus. In crossed categorization scenarios, however, the fit is a constant, as the variation in stimuli is identical for all participants. Therefore, only perceiver readiness, that is, perceiver's expectations and motivations (Bruner, 1957), can lead to differences in category salience.

Perceiver readiness is usually operationalized through category accessibility (Oakes, 1987), which can be either situational, resulting from the recent use of a category, or chronic, resulting from frequent use of a category (Higgins, 1989). If situational accessibility is not experimentally manipulated, as is the case in the crossed categorization paradigm, category salience should be predominantly affected by chronic accessibility. Strength of identification with the in-group is one of the crucial factors contributing to the category's chronic accessibility (Oakes et al., 1991). Those categorization dimensions that are more important and central to the perceiver's self-concept will create a stronger motivational drive for positive distinctiveness, and hence, result in stronger intergroup bias relative to the dimensions that are less important and central. Therefore, we hypothesize that the importance of a given categorization dimension to the perceiver's self-concept explains the strength of intergroup bias on this dimension of comparison; specifically, intergroup bias is stronger when a dimension is deemed important.

2.3.1 | Conceptualizing identity importance

Identity importance has been conceptualized and operationalized in various ways. Researchers talk about identity significance, salience, strength, centrality, prominence, etc. We briefly review different conceptualizations of identity importance to provide the background of the conceptualization that we rely on in the current study.

Ashmore, Deaux, and McLaughlin-Volpe (2004) in their comprehensive review of collective identify literature suggest that various terms used to describe identity importance refer to two distinct, but related types of identity importance: explicit and implicit importance. Explicit importance is defined as "individual's subjective appraisal of the degree to which a collective identity is important to her or his overall sense of self" (p. 87) and implicit importance as "the placement, from low to high, of a particular group membership in the person's hierarchically organized self-system" (p. 87). Explicit importance is often referred to as "identity centrality" and implicit importance as "identity salience" (Stryker & Serpe, 1994). Significance, strength, and prominence, according to Ashmore et al. (2004), are also examples of explicit importance.

Ashmore et al. (2004) argue that salience is similar to chronic accessibility (Stryker & Serpe, 1994), which unlike psychological centrality, individuals might not be aware of. However, as the cognitive-developmental model of social identity integration suggests (Amiot, de la Sablonnière, Terry, & Smith, 2007), chronic accessibility of social categories also serves as the basis for their psychological centrality. Those identities that are used frequently become more meaningful and important to the individual's sense of self over time.

Our conceptualization of identity importance is most closely aligned with the concept of identity centrality as described in the hierarchical model of in-group identification (Leach et al., 2008). According to this model, "centrality of a group membership is shown in its chronic salience as well as the subjective importance that individuals give their group membership" (Leach et al., 2008, p. 147). In the current study, we define identity importance as the subjective importance and salience of a group membership relative to other group memberships that an individual identifies with.

2.4 | The present study

This study goes beyond the traditional two-group model of crossed categorization. We use multiple dimensions of social

categorization that are relevant in a given social context and test the patterns of crossed categorization in multiple categorization settings. We further hypothesize that the higher the importance of a given categorization dimension to the perceiver's self-concept, the stronger is intergroup bias on that dimension. This is the first study to investigate patterns of crossed categorization and predictors of category use in multiple crossed categorization settings.

The study was conducted in Russia, a culturally diverse country that is home to over 180 ethnic groups and a large number of immigrants coming mainly from the former USSR countries (Russian Census, 2010). This diversity coincides with high levels of ethnic intolerance (Grigoryan & Ponizovskiy, 2018), and gender (Mezentseva, 2005) and income (Treisman, 2012) inequality, which makes this context uniquely suitable for a study on multiple crossed categorization.

We employed a sequential mixed methods design. First, we conducted expert interviews to determine which dimensions are most relevant in the given social context. These resulted in a set of eight dimensions that we then used in a factorial survey experiment to test the proposed hypotheses: ethnicity, religion, gender, age, education, proficiency in Russian language, job skill level, and immigration status. We sampled a diverse group of people from the general population in a way that all group memberships that are used in the target stimuli are also represented in the sample of participants.

3 | METHOD

3.1 | Participants

We sampled representatives of six ethnocultural groups living in Russia, including Russians as a majority group, Tatars and Bashkirs as indigenous ethnic minorities, and Ukrainians, Armenians, and Azerbaijanis as minority groups with different statuses and different degrees of cultural distance from Russians. These six groups also represent two major religions in Russia: Christianity (Russians, Ukrainians, Armenians) and Islam (Tatars, Bashkirs, and Azerbaijanis). The sample included people with and without a higher education degree, low skilled workers and skilled professionals, people with and without immigration background, etc. The data was collected online. The link to the online survey was distributed via social networks, such as Facebook and VKontakte (the Russian analog of Facebook), as well as online forums of ethnic diasporas. The characteristics of the sample are presented in Table 3.

In accordance with the power considerations for multilevel regression analysis that we use in this study, we aimed to sample at least 50 participants (Maas & Hox, 2005) per questionnaire version. The overall desired sample size, given the study design (see details in the Design and procedure section), was 500 participants. In total, 735 people accessed the questionnaire. We excluded 194 participants who did not continue to the questionnaire after reading the instructions; 15

participants as they reported to be <18 years old; and two participants due to technical errors in data recording.[1] The final sample included 524 participants and 5,036 observations (as each respondent evaluated 10 vignettes: 524 × 10 = 5,240 observations, minus 204 missing values, as not all respondents reacted to all 10 vignettes). This dataset has been used previously to test a different set of hypotheses (Grigoryan, 2019) and we refer to this earlier publication whenever applicable.

3.2 | Design and procedure

The two-step research design included expert interviews aimed at identifying the most relevant dimensions of social categorization in the given cultural context, and a factorial survey, which allowed the manipulation of these social categories and testing of the causal effects of the dimensions on attitudes.

3.2.1 | Expert interviews

In the first stage, we interviewed eight experts in intergroup relations (social psychologists, sociologists, anthropologists). In a semi-structured interview experts were first asked to rate the importance of different dimensions of social categorization in the Russian context from a pre-selected list of dimensions, and then to add other relevant dimensions that were not mentioned. The results were analyzed by calculating the means on importance of the pre-selected dimensions and by applying quantitative content analysis to the responses to the open-ended question. As a result, we obtained a set of characteristics that were particularly relevant for intergroup relations in the Russian context. The list of these characteristics (dimensions of social categorization) and respective categories are presented in Table 4. A more detailed report of the results of expert interviews is provided in Grigoryan (2019).

3.2.2 | Factorial survey

In the second stage, six ethnic groups were surveyed using a factorial survey design. In this study, the dimensions of social categorization represent factors or vignette dimensions, respective social categories represent levels of these dimensions, and evaluation of a vignette person is the dependent variable. Each vignette describes a person with a specific set of group memberships, followed by questions about this vignette person.

Given the number of dimensions and levels presented in Table 4, the vignette universe (all possible combinations of levels of different dimensions) contains 8.748 cases (6 × 3 × 2 × 3 × 3 × 3 × 3 × 3). The following implausible combinations were excluded before sampling the vignettes: (a) No higher education + Highly skilled specialist; (b) Was

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[1] In these two cases, the online software recorded responses to more than 10 vignettes under the same ID, which could not be accurate, as each questionnaire contained only 10 vignettes.

TABLE 3 Sample characteristics

Ethnic group	N	% Female	Age M (SD)	Religion (%)			% Russian citizens	% with tertiary education	% native Russian speaker	% professional
				None	Christian	Muslim				
Russians	216	74.1	27.8 (7.9)	25.5	67.1	1.4	97.7	96.8	98.6	92.1
Tatars	57	66.7	27 (5.5)	21.1	5.3	71.9	98.3	91.3	66.7	94.7
Ukrainians	37	48.6	31.2 (10.9)	16.2	81.1	0	45.9	81.1	83.8	83.8
Bashkirs	95	57.9	31.1 (10.2)	14.7	1.1	80	97.9	85.3	25.3	84.2
Armenians	74	52.7	34.2 (12.3)	13.5	82.4	1.4	95.9	89.2	55.4	87.8
Azerbaijanis	45	44.4	22.4 (5)	6.7	0	91.1	75.6	86.6	53.3	88.9
Total	524	63	29 (9.4)	19.1	45.8	30.9	92	91.1	70.8	89.5

Note: Abbreviations: M, Mean; SD, Standard deviation.

born in Russia + Almost does not speak Russian; (c) Russian + Almost does not speak Russian or Speaks Russian, but not well. We also excluded the vignettes that featured a person who belongs to one of the ethnic groups that are indigenous to Russia (Russians, Tatars, or Bashkirs) and has an immigration background. This decision was made after the pretest when many participants from these ethnic groups negatively reacted to the vignettes where a vignette person who featured a member of their ethnic group was described as an immigrant.

After excluding these implausible combinations, we sampled 100 vignettes from the vignette universe, using a D-efficient fractionalized design. The D-efficiency coefficient[2] is a measure of strength of the design that takes into account orthogonality and balanced representation of vignette dimensions. This coefficient varies from 0 to 100, where the maximum value of 100 is reached with an absolutely balanced and orthogonal design. A computer algorithm searches for the best solution that will provide maximum orthogonality and balance in the set of sampled vignettes (Duelmer, 2007). The sample of 100 vignettes in this study reached a D-efficiency coefficient of 89.8, with an average prediction standard error of 0.44.

After sampling the vignettes, we assigned these 100 vignettes to 10 different sets (versions of the questionnaire) that were then randomly assigned to the respondents. We used SAS Enterprise software (SAS Institute Inc., Cary, 2011) to sample the vignettes and assign them to sets. The 10 versions of the questionnaire contained the same materials except for the varying vignette sets. No vignette was repeated in two different versions of the questionnaire and only one level of each factor was presented in a single vignette. The distribution of factor levels by vignette sets is presented in Table S2. The vignettes were presented in random order. The data was collected through the online survey platform Qualtrics (2005).

3.3 | Procedure

The questionnaire started with an informed consent form. APA ethical guidelines were followed in data collection, analysis, and reporting. Only participants who agreed to participate were given access to the main part of the questionnaire. This part started with items measuring socio-demographic variables, followed by the measure of the importance of different membership groups. Participants were then asked to evaluate ten vignettes. This is an example of a vignette from one of the questionnaires: "Svetlana: 25 years old, Russian, Muslim. She was born in Russia and speaks Russian fluently. Doesn't have higher education. She is a skilled professional." After each vignette, participants were asked three questions, one assessing perceived similarity to the person described in the vignette, and two assessing

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[2] $D-\text{efficiency} = 100 \times \dfrac{1}{N_D |(X'X)^{-1}|^{1/p}}$, where X is a vector of the vignette variables, $X'X$ represents the matrix, and $|X'X|$ is the determinant of this matrix. N_D is the number of sampled vignettes (usually identified by the researcher in advance), and p is the number of regression coefficients (including the intercepts and any interactions specified) that need to be identified. D-efficiency coefficient is used to compare the efficiency of various designs to select the one with the highest power.

TABLE 4 Dimensions of social categorization and categories used in the study

Dimensions of categorization (Factors)	Categories (Levels)
Ethnic group	(1) Russian, (2) Tatar, (3) Ukrainian, (4) Bashkir, (5) Armenian, (6) Azerbaijani
Religion	(1) Christian, (2) Muslim, (3) Not religious
Gender	(1) Male, (2) Female
Age	(1) 25 years old, (2) 45 years old, (3) 65 years old
Education	(1) No higher education, (2) Has higher education, (3) Has a Ph.D.[a]
Proficiency in the Russian language	(1) Almost does not speak Russian, (2) Speaks Russian, but not well, (3) Speaks Russian fluently
Job skill level	(1) Low-skilled worker (2) Skilled professional, (3) Highly skilled specialist
Immigration status	(1) Was born in Russia, (2) Legally immigrated to Russia, (3) Illegally immigrated to Russia

[a]According to OECD, 54% of Russian population from 25 to 64 years old have a university degree, so having a university degree might not contribute much to the perceived social status in Russia, but having a Ph.D. does. Adopted from Grigoryan (2019).

attitude towards the person. Additionally, the questionnaire included measures of perceived similarity, contact, and perceived conflict between the ethnic groups. At the end of the questionnaire, we provided a more detailed description of the study, together with the contact details of the researcher. In the current study, we only use the measures of identity importance and attitude towards the vignette persons; other measures are out of the scope of the current study and are reported elsewhere (Grigoryan, 2017, 2019).

3.4 | Measures

3.4.1 | Attitude

Two items were used to measure attitude towards the vignette person: one is a modified question from Bogardus' social distance scale (Bogardus, 1933; Parrillo & Donoghue, 2005): "Would you like this person to be your neighbor?" and the other is a general attitudinal question: "Do you like this person?" Both items had an 11-point response scale, from 0 (not at all) to 10 (very much) and correlated at $r = .85$, $p < .001$, with the Spearman-Brown reliability coefficient of 0.92.

3.4.2 | Identity importance

In accordance with the conceptualization of identity importance we adopted, the measurement was developed to fulfill the following criteria:

group memberships should be evaluated (a) in terms of their importance to the individual's sense of self; (b) in terms of their salience; (c) in comparison to each other, i.e., in a hierarchical order. The instruction read:

> Which of the following characteristics are the most important for your perception of yourself? [importance to the sense of self] Try to describe yourself to yourself. Which of the following would you mention first? [salience] Which ones seem to be not important at all? Please rank the following characteristics, assigning each a number from 1 to 10, where 1 is the most important, and 10 the least important (type in the numbers). Each number can be assigned only once [hierarchy].

We then provided the list of eight categorization dimensions used in the vignettes (e.g., "My gender", "My ethnicity"). Additionally, we offered two open-ended "other" categories, in case the respondent wanted to add characteristics that were not mentioned in the list. We obtained over 200 responses to these open-ended categories. The analysis of these responses can be found in Supporting Information.

3.4.3 | Socio-demographic variables

We asked about ethnicity, religion, age, gender, education, occupation, knowledge of Russian language, and immigration status of the respondents in order to identify whether or not they shared a group membership with the vignette persons on each of those dimensions.

Gender

"Please specify your gender", with response options "Male" and "Female".

Age

"Please specify your age", open-ended question.

Occupation

"What is your occupation", open-ended question.

Ethnicity

"Please specify your ethnic group", with six response options corresponding to the groups that we sampled: Russian, Tatar, Ukrainian, Bashkir, Armenian, Azerbaijani.

Education

"Please specify your level of education", with response options from 1—"Incomplete secondary education" to 6—"Doctor of Sciences".

Religion

"Please specify your religious affiliation", with response options "I do not associate with any religion", "Christian", "Muslim", and "Other religion".

Citizenship

"Are you a citizen of Russia", with response options "Yes" and "No (please specify your citizenship)".

Language proficiency

"Is Russian your mother tongue?" with response options "Yes" and "No". If the respondent answered "No", they were redirected to another question: "How would you evaluate your proficiency in Russian language?" with response options "I'm fluent in Russian", "I have a relatively good knowledge of Russian", and "I have a quite poor knowledge of Russian".

Before proceeding to data analysis, we created a set of variables that indicated whether the participant and the vignette person shared a group membership on each of the dimensions. The details of the coding scheme are provided in Table S3. We operationalize intergroup bias as the strength of the relationship between participant-target in- (vs. out-)group membership on each dimension and attitude towards the target.

All study materials, including data and syntax, are available on the Open Science Framework platform: https://osf.io/dfqpa/.

4 | RESULTS

To analyze factorial survey data, the hierarchical structure of the data should be taken into account (Duelmer, 2007; Hox, 2002). The data is cross-classified, meaning the observations are nested within both respondents and vignettes. The intra-class correlations for the individuals and the vignettes as the second-level unit of analysis were 0.45 and 0.08, respectively. Therefore, differences between respondents accounted for 45% of the variance of the dependent variable and differences between the vignettes for 8% of the variance. As practically all of the variance at the vignette level is explained by vignette dimensions (inclusion of vignette dimensions in the model dropped the variance on the vignette level to 0.007%), we only used participants as the second-level units in the analysis (a similar strategy is employed in Havekes et al., 2013, and Schlueter et al., 2018).

We first identify the dominant dimension of categorization by looking at the effects of shared group membership on each dimension in predicting the attitude when controlling for the main effects of vignette dimensions and respondents' group memberships. The dimension that creates the strongest intergroup bias will be treated as the dominant one when testing the patterns of crossed categorization. We then proceed to test these patterns. Finally, we test cross-level interactions between the importance of a categorization dimension as reported by the respondent and the (in-)group membership of the vignette person on the respective dimension. A significant positive interaction would provide supporting evidence for the proposed hypothesis, that is, the intergroup bias is stronger when a dimension is deemed important.

4.1 | Identifying the dominant category

To identify which dimension of categorization produced most bias, we first include the vignette dimensions and the respondent characteristics as predictors of attitudes towards the vignette person (Model 1, Table 5), and then add the variables reflecting whether or not the respondent and the vignette person shared a group membership on each of the dimensions (Model 2). As the model includes a large number of predictors, we adjust the α level by the sample size using the formula proposed by Good (1982) to reduce Type-I error. The adjusted *p*-value of <.007 is used as a cutoff value to estimate the statistical significance of the effects. To estimate sizes of the effects, we calculate pseudo R^2 and report the percentage of variance explained by each of the predictors.

The vignette dimensions and the respondent characteristics explained approximately 17.8% of the within-respondent variance in attitudes and 5.7% of the between-respondent variance. The strongest predictors of the attitude were the dimensions reflecting the socio-economic status of the vignette person: respondents preferred those with higher Russian language proficiency (1.2% var. explained), higher job skill level (1.1% var. explained), no immigration background (0.9% var. explained), and higher education level (0.7% var. explained). Among the respondents' characteristics, Russian citizenship had the strongest effect: citizens evaluated the vignette persons more negatively than non-citizens did (2.7% between-participants var. explained). Finally, the inclusion of the shared group membership on each dimension explained an additional 5.2% of the within-respondent variance in attitudes.

The direction of the effects for shared group membership was consistent with the SIT predictions: On all dimensions, participants evaluated the in-group members more positively than the out-group members, although the effects were not always significant. The strongest predictor was religion (3.3% var. explained) and the second strongest was ethnicity (1.6% var. explained). Thereby we treat religion as the dominant categorization dimension in the following analyses.

4.2 | Patterns of crossed categorization

4.2.1 | Additive pattern

As we proposed in the introduction, a positive linear relationship between the number of shared group memberships and the attitude would provide supporting evidence for the additive pattern of crossed categorization in multiple categorization settings. To test this prediction, we calculated an index that is a sum of all shared group memberships between the participant and the target (each shared group membership has a score of 1). We will further refer to this index as N_{shared}. The index varied from 0 (no shared group memberships) to 8 (all group memberships are shared). Figure 1 presents the

TABLE 5 Linear mixed-effects models predicting attitude towards the vignette person

	Model 1			Model 2			% variance explained[a]
	b	SE	p	b	SE	p	
Intercept	6.92	1.13	<.001	5.55	1.16	<.001	
Vignette dimensions							
Ethnicity: Azerbaijani	−0.33	0.13	.013	−0.07	0.13	.581	0.09
Ethnicity: Tatar	−0.10	0.13	.464	0.11	0.13	.424	
Ethnicity: Bashkir	0.03	0.13	.841	0.21	0.13	.107	
Ethnicity: Ukrainian	−0.17	0.13	.204	0.10	0.13	.447	
Ethnicity: Armenian	−0.25	0.13	.060	−0.04	0.13	.764	
Ethnicity: Russian	Reference						
Religion: Not religious	−0.34	0.08	<.001	−0.12	0.07	.084	0.03
Religion: Muslim	−0.15	0.07	.029	−0.02	0.07	.791	
Religion: Christian	Reference						
Gender: Male	−0.20	0.06	.001	−0.18	0.06	.002	0.18
Gender: Female	Reference						
Age: 25 years old	−0.10	0.07	.165	−0.35	0.10	<.001	0.24
Age: 45 years old	−0.11	0.07	.125	−0.13	0.07	.072	
Age: 65 years old	Reference						
Education: No higher education	−0.81	0.08	<.001	−0.67	0.12	<.001	0.67
Education: Higher education	0.15	0.07	.029	−0.15	0.07	.026	
Education: Ph.D.	Reference						
Language: Almost doesn't speak Russian	−0.96	0.09	<.001	−0.79	0.22	<.001	1.17
Language: Speaks Russian, but not well	−0.34	0.07	<.001	−0.14	0.21	.502	
Language: Speaks Russian fluently	Reference						
Job skill level: Low-skilled worker	−1.08	0.08	<.001	−0.84	0.12	<.001	1.10
Job skill level: Skilled professional	−0.19	0.08	.016	−0.19	0.08	.015	
Job skill level: Highly skilled specialist	Reference						
Immigration status: Immigrated illegally	−0.61	0.10	<.001	−0.49	0.15	.001	0.89
Immigration status: Immigrated legally	−0.07	0.10	.441	0.04	0.14	.788	
Immigration status: Born in Russia	Reference						
Respondent characteristics							
Ethnicity: Azerbaijani	0.11	0.52	.828	0.05	0.52	.930	1.75
Ethnicity: Tatar	0.46	0.43	.282	0.45	0.43	.291	
Ethnicity: Bashkir	0.007	0.44	.988	−0.08	0.44	.847	
Ethnicity: Ukrainian	0.89	0.45	.008	0.89	0.45	.048	
Ethnicity: Armenian	−0.51	0.31	.105	−0.61	0.31	.054	
Ethnicity: Russian	Reference						
Religion: Christian	−0.06	0.27	.832	−0.04	0.27	.885	0.39
Religion: Muslim	−0.80	0.37	.031	−0.82	0.37	.028	
Religion: Other	−0.28	0.51	.584	−0.02	0.51	.966	
Religion: Not religious	Reference						
Gender: Male	−0.40	0.20	.045	−0.39	0.20	.053	0.59
Gender: Female	Reference						
Age	0.01	0.01	.150	0.04.1	0.01	.142	0.21
Education level	0.02	0.18	.925	−0.01	0.18	.957	−0.21

(Continues)

TABLE 5 (Continued)

	Model 1			Model 2			
	b	*SE*	*p*	*b*	*SE*	*p*	% variance explained[a]
Language proficiency	0.35	0.21	.104	0.36	0.21	.096	0.41
Job skill level: Low	−0.67	0.35	.055	−0.58	0.35	.098	0.40
Job skill level: High	*Reference*						
Citizenship: Russian	−1.46	0.40	<.001	−1.5	0.41	<.001	2.74
Citizenship: Non-Russian	*Reference*						
Shared group membership							
Ethnicity				0.74	0.09	<.001	1.63
Religion				0.78	0.06	<.001	3.31
Gender				0.03	0.06	.617	−0.02
Age				0.30	0.09	<.001	0.24
Education level				0.19	0.11	.104	0.03
Language proficiency				0.18	0.21	.379	−0.003
Job skill level				0.30	0.11	.005	0.15
Immigration status				0.13	0.12	.299	0.002
Variance components							
Residual variance (within-participant)	4.11	0.09	<.001	3.90	0.08	<.001	
Intercept variance (between-participants)	3.85	0.27	<.001	3.85	0.27	<.001	
Explained variance							
Within-participant	17.8%[b]			5.2%			
Between-participants	5.7%[b]			0%			

[a]% variance explained is calculated as $\frac{\sigma n - \sigma f}{\sigma n}$, where σn is the variance of the model without the predictor and σf is the variance of the full model including all predictors. The percentage of variance explained by each predictor is calculated based on residual variance for vignette dimensions and shared group membership, and based on intercept variance for respondent characteristics (as respondent characteristics did not explain any variance on within-participant level, and vignette characteristics and shared group membership did not explain any variance on between-participant level).

[b]Model 1 is compared to the empty model (residual variance = 4.998, *SE* = 0.10, *p* < .001; intercept variance = 4.084, *SE* = 0.29, *p* < .001).

relationship between the number of shared group memberships and attitude. It indicates that this relationship is strictly linear: With each additional shared group membership, the attitude becomes more positive.

We further tested the strength and statistical significance of this relationship in a mixed model. The inclusion of N_{shared} as the only predictor of the attitude showed a significant positive effect (*b* = 0.55, *SE* = 0.02, 95% CI [0.51, 0.59], *p* < 0.001, 14.4% var. explained[3]). The effect of N_{shared} remained significant (*b* = 0.37, *SE* = 0.03, 95% CI [0.31, 0.44], *p* < .001) when controlling for vignette dimensions and respondent characteristics. The unique variance explained by N_{shared} after including the control variables was 3.1%. These results provide strong support for the additive pattern of crossed categorization and reject the equivalence pattern.
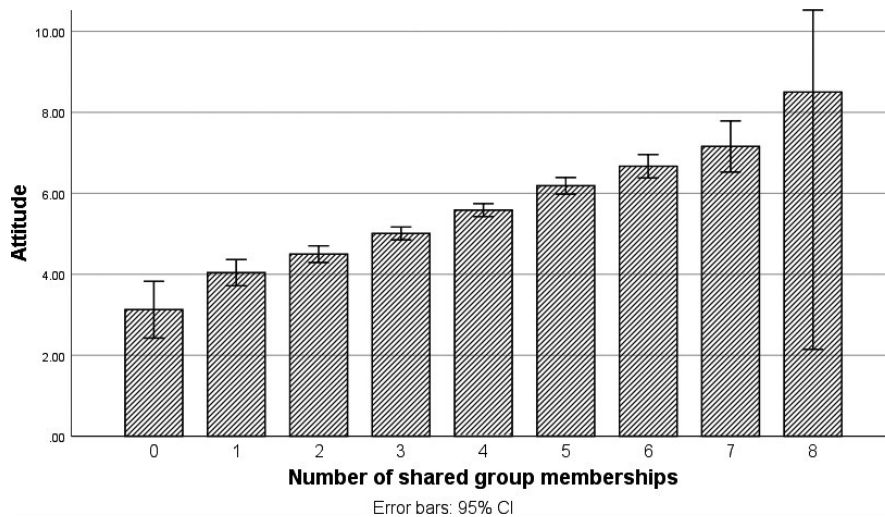
To test the additive pattern against the non-algebraic processing suggested by Urada et al. (2007), we additionally tested whether N_{shared} explains more variance in attitudes than a model with a dichotomous

[3]In this section of the manuscript we only refer to a reduction in within-participant variance, as the vignette characteristics explained only within-participant, but not between-participants variance.

predictor that differentiates between in-grouplike and out-grouplike others. We created a dummy variable that differentiated between cases where the participant and the target shared more than half versus less than half of all group memberships. This dummy variable also significantly predicted attitudes (*b* = 1.47, *SE* = 0.07, 95% CI [1.32, 1.61], *p* < .001); however, it explained only 9% of variance in attitudes versus 14% explained by N_{shared}. Thus, the additive pattern outperforms this non-algebraic model of impression formation.

4.2.2 | Dominance, hierarchical acceptance, hierarchical rejection

All these patterns of crossed categorization have one thing in common: Their predictions are based on unequal importance of categorization dimensions. The prediction derived from the dominance pattern is that once the sample is divided into in- and out-group members on the dominant dimension, N_{shared} should have no effect on the attitude in any of the subsamples. Hierarchical acceptance pattern predicts that there is a positive relationship between N_{shared} and the attitude in the subsample of in-group members on the dominant

FIGURE 1 The linear relationship between the number of shared group memberships with the target, and attitude towards the target. Error bars: 95% CI

dimension, but not in the subsample of out-group members on the dominant dimension. Finally, hierarchical rejection predicts no relationship in the subsample of in-groups and a positive relationship in the subsample of out-groups.

To test these predictions, we divided the sample into in- and out-group members on the dimension of religion, which was the dominant categorization dimension in the current sample. This resulted in two subsamples with N_{in} = 1,604 and N_{out} = 3,432. Counter to the expectation, the effect of N_{shared} was significant in both subgroups. The effects were about the same strength in the two subgroups (among religious in-groups: b = 0.54, SE = 0.04, 95% CI [0.47, 0.62], p < .001; among religious out-groups: b = 0.54, SE = 0.02, 95% CI [0.49, 0.59], p < .001), with 15.6% of variance explained in the subsample of religious in-groups and 13.8% of variance explained in the subsample of religious out-groups. Thus, we found no support for dominance, hierarchical acceptance, or hierarchical rejection patterns.

We further tested whether a variation of the category dominance pattern would hold. Instead of classifying the targets based only on the dimension that created the strongest bias (religion), we classified them based on the two most influential dimensions: religion and ethnicity. Would the information about the two most important group memberships be enough to eliminate the effect of other membership groups on the attitude? The effect of N_{shared} was significant and of similar size in all four subgroups (double in-groups: b = 0.55, SE = 0.14, 95% CI [0.26, 0.83], p < .001; double out-groups: b = 0.53, SE = 0.03, 95% CI [0.47, 0.59], p < .001). Therefore, we found no supporting evidence for this modified version of the dominance pattern.

4.2.3 | Conjunction similarity and conjunction dissimilarity

Conjunction patterns predict that (not) sharing group membership on one dimension can determine the attitude towards the target. *Conjunction similarity* predicts that targets with no shared group memberships will be evaluated more negatively than targets with

any number of shared group memberships and that there will be no relationship between N_{shared} and the attitude in the second subgroup. In contrast, *conjunction dissimilarity* predicts more positive evaluations for the targets that have shared group memberships on all dimensions compared to the rest, and no relationship between N_{shared} and the attitude in the group that shares some number of group memberships, but not all.

The dataset included only two observations when the participant and the target shared all eight group memberships. This made it impossible to test the conjunction dissimilarity pattern. The number of observations where the participant and the target did not share any group memberships was 48, so we could test the conjunction similarity pattern. In line with the expectations of this pattern, targets that did not share any group memberships with the participant were evaluated more negatively than the rest (b = 1.88, SE = 0.33, 95% CI [1.22, 2.54], p < .001). However, the link between N_{shared} and the attitude in the rest of the sample remained strong (b = 0.56, SE = 0.02, 95% CI [0.52, 0.60], p < .001). Therefore, the conjunction similarity pattern was not supported. Although we could not formally test the conjunction dissimilarity pattern, the variation in attitudes across the groups that share from 0 to 7 group memberships (Figure 1) suggests that this pattern could not be supported as well.

We also tested whether a variation of the conjunction pattern, where more than just one group membership is shared or not shared, might hold. We split the sample into two subgroups, where the participant and the target shared either less than half (1–4) or more than half (5–8) of all group memberships and tested whether the number of shared group memberships within this subsamples still made a difference. Once again, it did. The effect of N_{shared} was similar in both subsamples: among those that shared less than half (b = 0.55, SE = 0.03, 95% CI [0.48, 0.62], p < .001) and more than half (b = 0.52, SE = 0.10, 95% CI [0.32, 0.73], p < .001) of all group memberships.

To conclude, we found strong support for the additive pattern of crossed categorization in multiple categorization settings and no support for any of the other patterns or their modifications.

4.3 | Predicting category dominance from identity importance

We hypothesized that the importance of a given categorization dimension to the perceiver's self-concept predicts the strength of intergroup bias on that dimension; specifically, we expected the intergroup bias to be stronger when a dimension is deemed more important. Participants ranked their group memberships by importance. The participants on average ranked their education ($M = 3.46$, $SD = 2.13$) and occupation ($M = 3.59$, $SD = 2.37$) as the most important group memberships. The least important ones were age ($M = 4.71$, $SD = 2.2$) and religion ($M = 5.35$, $SD = 2.59$).

We tested the hypothesis by evaluating the moderating effect of identity importance on the relationship between (in-)group membership and the attitude for each categorization dimension. We used Model 2 from Table 5 as a baseline model and added identity importance and the interaction terms. As this is a test of cross-level interactions, we added random slopes for the relationship between group membership and the attitude, thus allowing the slopes to vary between respondents. Allowing random slopes resulted in a Hessian matrix being negative. The examination of the variance components revealed that the problem was caused by zero variance of the slope for the shared group membership on the dimension of gender. After we had removed the random slope assumption for this variable, the model converged without errors. The results are presented in Table 6. For simplicity, we present only those variables that are relevant for the hypothesis; see Table 5 for the effects of the other variables.

Inclusion of the random slopes and the moderators reduced unexplained variance by 24.4% on the within-respondent level and by 29.9% on the between-respondents level. Although the main effects of shared group memberships dropped below the significance level, only one of the interaction terms was significant, given the cutoff value of $p < .007$ that we adopted. The importance of religious identity moderated the link between shared group membership on the dimension of religion and attitude. The more important religious identity was for the respondent, the larger was the difference in evaluations of the religious in- and out-group members. Figure 2 illustrates this interaction.

As Figure 2 indicates, participants who ranked religion higher in importance, in general, evaluated vignette persons less favorably compared to those who ranked it lower. However, the difference in evaluations of the in-group members between these groups was negligible. The interaction is mainly driven by more negative evaluations of the religious out-groups by high-identifiers.

5 | DISCUSSION

The motivation behind this study was to contribute to multiple and crossed categorization research by focusing on its ecological validity. To achieve this goal, we conducted a factorial survey experiment that allowed crossing eight dimensions of social categorization. We selected categories that were relevant for the given social context based on expert interviews and recruited participants from all social groups represented in the vignettes, including several ethnic and religious minorities. Conducting the study online allowed us to get a relatively large sample, which makes the study better powered than the majority of crossed categorization studies conducted in laboratory settings with smaller samples.

5.1 | The relative importance of categorization dimensions in predicting attitudes

Although we found general support for the additive pattern of crossed categorization, there was considerable variation in the relative importance of various dimensions in predicting attitudes. Importantly, we observed a clear split in the mechanisms through which different group memberships affected attitudes. Among the group memberships that had a direct effect on attitudes, irrespective of perceiver's own group membership, socio-economic groups were the most important ones. A number of recent studies show that social class identities occupy an important place in the structure of the self-concept (Easterbrook, Kuppens, & Manstead, 2020) and are used to stereotype others (Kuppens, Spears, Manstead, Spruyt, & Easterbrook, 2018). With increasing economic inequality, social class memberships become ever-more salient and important markers for differentiation, serving as indirect evidence of others' merit (Heiserman & Simpson, 2017).

Despite socio-economic dimensions of social categorization having a strong direct impact on attitudes, we observed hardly any intergroup bias on these dimensions. That is, the preference for higher-status others was universal and did not depend on where the perceiver stood in this hierarchy. The group memberships that most strongly affected attitudes via the mechanism of preference for the in-group were the ones associated with culture: religion and ethnicity. Intergroup bias is often implicitly assumed to be the general rule of group-based impression formation that applies to any dimension of social categorization. Our results, however, suggest that this mechanism might be limited to a certain type of groups. How are religion and ethnicity different from socio-economic group memberships? First, these groups are essentialized. They are perceived to have nearly impermeable group boundaries, to be highly entitative, and to have some "essential" qualities that all members of the group share (Haslam, Rothschild, & Ernst, 2000). Recent meta-analytical evidence shows that people are more prejudiced towards groups that are perceived as highly entitative, especially if entitativity is linked to essentialism (Agadullina & Lovakov, 2018). The evolutionary approach to intergroup bias offers a mechanism (Brewer & Caporael, 2006). Bias results from in-group cooperation being less costly than cooperation with out-groups; groups that are well-regulated by common norms, rules, and customs make cooperation easier and are more prone to give preferential treatment to in-group members. Hence, group memberships that provide this sense of structure and shared norms (religion and ethnicity in this

TABLE 6 Predicting the strength of intergroup bias on each categorization dimension from identity importance

|	b	SE	95% CI Lower	Upper	p
Intercept	7.42	1.70	4.07	10.76	<.001
Shared group membership					
Ethnicity	0.57	0.22	0.13	1.02	.011
Religion	0.23	0.14	−0.04	0.50	.098
Gender	0.11	0.13	−0.15	0.38	.404
Age	0.09	0.15	−0.20	0.38	.545
Education level	0.15	0.21	−0.27	0.57	.492
Language proficiency	0.13	0.26	−0.39	0.65	.630
Job skill level	−0.002	0.21	−0.41	0.41	.989
Immigration status	−0.06	0.20	−0.45	0.32	.747
Identity importance					
Ethnicity	−0.06	0.06	−0.18	0.05	.285
Religion	−0.10	0.05	−0.20	−0.007	.036
Gender	−0.03	0.05	−0.13	0.07	.527
Age	0.01	0.05	−0.09	0.12	.833
Education level	−0.03	0.06	−0.14	0.09	.629
Language	−0.07	0.06	−0.19	0.04	.184
Occupation	−0.06	0.05	−0.17	0.04	.261
Country of origin	−0.04	0.05	−0.15	0.06	.446
Interactions					
Ethnic in-group × Ethnicity important	0.03	0.04	−0.06	0.11	.511
Religious in-group × Religion important	0.14	0.03	0.08	0.20	<.001
Gender in-group × Gender important	−0.02	0.02	−0.07	0.03	.386
Age in-group × Age important	0.05	0.03	−0.002	0.11	.059
Educational in-group × Education important	0.01	0.03	−0.05	0.08	.622
Language in-group × Language important	0.007	0.03	−0.05	0.07	.812
Occupation in-group × Occupation important	0.06	0.02	0.0003	0.12	.049
National in-group × Country important	0.06	0.03	−0.001	0.12	.056

case) are the ones that affect attitudes via the mechanism of intergroup bias.

The split we observed in the mechanisms through which information about others' membership groups is used to form judgments about them reflects a potentially useful typology of social groups. This typology can be linked to the two fundamental dimensions of human perception: warmth and competence (Fiske, Cuddy, & Glick, 2007). Some groups provide information about others' status and membership in these groups is used to assess competence (socio-economic dimensions in this study). Other groups provide information about the possibility and cost of cooperation, which

translates into a perception of trust (cultural dimensions in this study).

5.2 | Patterns of crossed categorization

Our results provide strong evidence for the additive pattern of crossed categorization. The number of shared group memberships between the participant and the target had a strong effect on the attitude. This effect remained significant after controlling for respondents' characteristics and the vignette dimensions. Previous studies
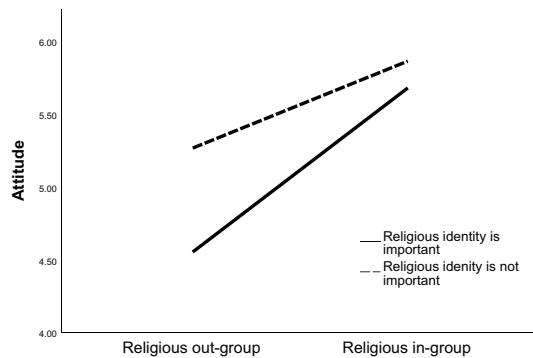
FIGURE 2 The effect of shared group membership on the dimension of religion on attitude as a function of the importance of religious identity. The "Religious identity is important" group includes the 1st quantile of responses; these participants ranked religion as the 1st, 2nd, or 3rd most important group membership. The "Religious identity is not important" group includes all others

suggested that when the number or the complexity of dimensions increases, people are most likely to abandon category-based processing (Crisp & Hewstone, 2007). Urada et al. (2007) proposed that with the increasing number of categorization dimensions, people switch to non-algebraic strategies of information processing, that is, the targets are perceived as either in-grouplike or out-grouplike without further differentiation. However, none of the earlier studies investigated patterns of multiple crossed categorization with a fixed number of dimensions and a systematic variation of in- and out-group memberships on each dimension. Our findings challenge the view that people are not able to use algebraic strategies of information processing with high numbers of categories to consider.

We found no support for any other pattern of categorization. Dimensions indeed differed in the strength of bias that they produced, with religion and ethnicity being the strongest predictors of attitudes. However, when splitting the sample of observations into in- and out-group members on the dominant dimension of religion, we still found a strong additive pattern within each of the two subsamples, contradicting predictions of dominance and hierarchical ordering patterns. The same was true for conjunction patterns: There were significant differences in evaluations of targets with mixed group memberships that could be explained by the number of shared group memberships. The variations of these classical patterns, for example, considering more than one important dimension as the dominant one, also did not receive empirical support.

5.3 | The moderating role of identity importance

We hypothesized that intergroup bias will be stronger when a categorization dimension is deemed important. From all the dimensions studied, the interaction between identity importance and (in-) group membership in predicting the attitude was significant only for religion. People who placed religion high in the ranking of importance of social groups for their self-concept evaluated religious out-groups more negatively compared to those who gave it a lower

rank, but they did not differ much in their evaluations of the religious in-groups. This highlights the importance of differentiating between in-group favoritism and out-group hostility, showing that importance of the category for the self might lead to negative attitudes towards out-groups and have no effect on attitudes towards the in-group.

Why did identity importance have an effect only in the case of religion and only on attitudes towards the out-groups? Silberman (2005) describes religions as collective meaning systems that, once constructed, "tend to be viewed within a given group as basic undisputable truths" (p. 649). Hogg, Adelman, and Blagg (2010) provide evidence showing that religion is particularly efficient in uncertainty reduction, as religious groups are highly entitative and address the nature of existence, which other social groups do not do. If religious identity is central to a person's self-concept, then religious out-groups are especially threatening, because they bring ambiguity into the coherence and correctness of the foundations of a person's worldview.

Considering that religion was the dominant category in this context, there is an alternative explanation for this effect. It is plausible that identity importance is predictive of the strength of bias only for the dominant category. For example, Urada and Miller (2000) demonstrated that positive affect increased favorability of mixed targets only if this affect was related to the dominant dimension of categorization. One can assume that when real-life social groups are used, those that are dominant in crossed categorization settings are probably the ones that are most relevant in the given social context. Higher relevance may imply that there is more discourse around these social groups in society and that there might be more variation among individuals in the ways these groups are perceived. More studies are needed to test whether the moderating role of identity importance is contingent upon the dominance of the dimension or the nature of the dimension, or is simply a matter of statistical power.

5.4 | Limitations and future directions

There are some limitations to this study that might serve as starting points for future research. First, the sample of the current study is a convenient online sample, which does not allow making generalizations about the whole population of the country. Additionally, subsamples differed in size, which could have affected the strength and significance of the effects. We minimized this possibility by controlling for respondents' group memberships on all relevant dimensions. However, future studies would greatly benefit from the use of quota or stratified probability samples.

Second, this study was limited to only one predictor of category dominance, namely identity importance. Further exploration of determinants of category dominance will be highly valuable for understanding the real-life implications of impression formation in multiple categorization settings. On the individual level, perceived threat, conflict, or the amount and quality of intergroup contact can be considered. Societies also vary significantly in what categorization

dimensions are relevant and important. Future studies should not only focus on individual-level predictors of category dominance but societal-level predictors as well, which will require more cross-cultural studies in this area of research.

CONFLICT OF INTEREST

The author declares that there are no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

ETHICAL STATEMENT

APA ethical guidelines were followed in data collection, analysis, and reporting.

TRANSPARENCY STATEMENT

All study materials, including data and syntax, are available on the Open Science Framework platform: https://osf.io/dfqpa/.

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