Measuring the Measures

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Measuring the Measures: A Meta-Analytic Investigation of the Measures of Outgroup Homogeneity

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We meta-analytically synthesized the intergroup variability literature (177 effect sizes, from 173 independent samples, and 12,078 participants) to test the potential moderating effect of 11 measures of perceived variability. Aggregating across the measures, we detected a small but reliable tendency to perceive more variability among ingroup than outgroup members and such outgroup homogeneity was stronger among non-minimal than minimal groups. Furthermore, analyses that distinguished among the 11 measures revealed systematic discrepancies among the patterns of perception detected by those measures. Those systematic discrepancies further varied across social contexts defined by relative group status, with some measures yielding ingroup homogeneity and others outgroup homogeneity. We discuss the possibility that the measures of variability require different mental activities that interact with contextually induced cognitive and motivational processes to yield disparate intergroup perceptions.

KEYWORDS group perception, group variability, heterogeneity, ingroup homogeneity, intergroup perception, intergroup status, meta-analysis, outgroup homogeneity, relative group status

REFLECTING the stereotype that members of other groups 'are all alike', research on intergroup perception initially identified a tendency for persons to perceive more variability among ingroup members than among outgroup members (e.g. Judd & Park, 1988; Linville, Fischer, & Salovey, 1989; Park & Rothbart, 1982). However, this outgroup homogeneity effect is not always the rule. Sometimes persons perceive less variability among ingroup than outgroup members

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(i.e. ingroup homogeneity; e.g. Simon, 1992; Simon & Brown, 1987; Simon & Mummendey, 1990) and other times they perceive the ingroup and outgroup as equally variable (e.g. Boldry & Kashy, 1999; Linville, et al., 1989). In light of these flip-flopping patterns, research questions have evolved to a focus on socio-structural factors that moderate perceptions of intergroup variability (e.g. Mullen & Hu, 1989; Ostrom & Sedikides, 1992).

In the current research, we follow the evolving path toward the identification of socio-structural moderators, but do so as a backdrop for the exploration of a methodological moderator that has received surprisingly little attention: the measurement of perceived variability. A count of the intergroup relations literature reveals at least 11 measures of perceived variability. While methodological diversity is desirable (e.g. Campbell & Fiske, 1959), such diversity can accrue a cost in that nuances among measures can contribute to variation, even inconsistency, in a research literature. Park and Rothbart (1982), for example, assessed perceived variability between gender groups with a percent estimate measure and detected perceptions of outgroup homogeneity, whereas Linville et al. (1989) employed a probability of differentiation measure and detected equivalent perceptions of variability among gender groups. To assess the possibility of systematic discrepancies among measures, we empirically examined the intergroup variability literature with a meta-analytic technique. As we subsequently explain, we go beyond the basic question of an omnibus difference among measures and explore the more interesting possibility that those differences vary systematically with socio-structural factors.

Measures of perceived variability

The 11 measures of perceived variability are derived from six distinct tasks required of participants. We briefly describe those tasks and their derived measures.

Distribution task

This task requires participants to construct an imagined histogram of the perceived distribution of group members across a trait dimension. Participants, for example, indicate the frequency of 100 randomly selected group members (or the percentage of group members) described by each interval of a Likert-type scale for a given trait (e.g. Judd & Park, 1988; Linville et al., 1989; Park & Judd, 1990). Similarly, the visually oriented dot distribution task requires participants to place dots of varying size along the intervals of a Likert-type scale to indicate the perceived frequency of group members described by a given interval (e.g. Park & Judd, 1990). From those distribution tasks researchers derive measures of *standard deviation* (*SD*; or variance) and *probability of differentiation* (*Pd*; Linville et al., 1989). *SD* (and variance) assesses the average distance (or squared distance) of group members from the mean. *Pd* assesses the probability of distinguishing between two group members. Lower scores on those measures reflect perceptions of lesser variability.

Memory task

For this task, participants review information about group members (e.g. traits, behaviors, faces) and, subsequently, attempt to match the information to the particular member with whom the information was initially associated (e.g. 'who said what?'). Summing the number of within-group errors (i.e. the number of times information associated with one member is incorrectly attributed to another member of the same group) provides an assessment of perceived variability, with more errors reflecting a perception of lesser variability.

The memory task comes in two varieties: recognition and recall. Recognition tasks re-present the previously presented information and participants must match that information to the corresponding group member; such tasks provide a measure of *recognition error* (e.g. Cabecinhas & Amancio, 1999; Howard & Rothbart, 1980; Lorenzi-Cioldi, 1998). Recall tasks do not re-present information and participants must recall the previously presented information and match it to the corresponding group member; such tasks provide a measure of *recall error* (e.g. Ostrom, Carpenter, Sedikides, & Li, 1993; Sedikides, 1997; Stewart & Vassar, 2000).

A sizable literature utilizes a face-recognition task, which is a subset of the recognition task, in which participants identify from an array of faces those faces that were previously presented; such a task provides a measure of *face-recognition error* (Brigham & Barkowitz, 1978; Chance, Goldstein, & McBride, 1975; Feinman & Entwisle, 1976). To the extent that recall and recognition involve different memory processes (e.g. Garcia-Marques & Hamilton, 1996), recall and recognition measures might be better conceptualized as being derived from disparate tasks.

Range task

This task requires participants to identify the two points along a Likert-type scale or semantic-differential scale that best describe the two most extreme group members. The absolute difference between those extreme scores provides the *range measure,* with a smaller range reflecting a perception of lesser variability (e.g. Jones, Wood, & Quattrone, 1981; Simon & Brown, 1987). This task is somewhat similar to the distribution task in that participants ostensibly consider the distribution of group members across a trait dimension. The range task, however, requires participants to consider only the two most extreme members.

Similarity task

This task requires participants to rate on a Likert-type scale the extent to which they perceive group members as being similar (or dissimilar). Anchoring the judgment to a particular attribute (e.g. 'how similar are men in regard to the trait nurturing?') provides a measure of *trait similarity* (e.g. Boldry & Gaertner, 2006; Park & Judd, 1990). Freeing the judgment from a particular attribute (e.g. 'how similar are men?') provides a measure of *global similarity* (Park & Judd, 1990; Park & Rothbart, 1982; Quattrone & Jones, 1980). Higher values of similarity reflect perceptions of lesser variability.

Stereotyping task

This task requires participants to consider the members of a group in regard to stereotypic attributes and counterstereotypic attributes. The *percent estimate measure* requires participants to estimate the percentage of group members who possess stereotypic traits and counterstereotypic traits, and the latter estimate is subtracted from the former (e.g. Pickett & Brewer, 2001; Ryan & Judd, 1992; Ryan, Judd, & Park, 1996). The *mean measure* requires participants to rate on Likert-type scales the degree to which stereotypic traits and counterstereotypic traits describe the group and the latter rating is subtracted from the former (e.g. Park & Judd, 1990; Ryan, Judd, & Park, 1996). These measures assess the extent to which group members are perceived as homogeneously conforming to the group's stereotype, with larger values reflecting perceptions of lesser variability.

Subgroup generation task

This task requires participants to list subgroups that potentially exist within a group (e.g. African-Americans and European-Americans might be subgroups of Americans; e.g. Linville, Fischer, & Yoon, 1996; Park, Ryan, & Judd, 1992). The number of listed subgroups provides the *subgroup generation measure,* with fewer subgroups reflecting a perception of lesser variability.

Measure as mechanism

Despite the number and variety of measures, a modicum of research has empirically compared the measures. Obviously, variation can arise across measures due to issues of reliability and validity. Assessment of relative reliability and validity requires the inclusion of multiple measures in a given study and an appropriate analysis of relative reliability/validity. To date, only one published study meets such a requirement. Park and Judd (1990) employed a structural equation model that explored patterns of association among 6 of the 11 measures. The data consisted of male and female perceptions of gender groups (i.e. men and women). Results suggested that perceived variability comprises two dimensions: dispersion and stereotypicality. Dispersion reflects the extent to which group members are perceived to be dispersed around their group's mean position on a trait dimension and was indexed uniquely by the measures of range, *SD*, and *Pd*. Stereotypicality reflects the extent to which group members are perceived to uniformly fit the group's stereotype and was indexed uniquely by the measures of percent estimate and mean. A measure of global similarity indexed both dimensions.

Park and Judd's (1990) structural model is an important step toward an examination of the multiple measures. Nonetheless, the analysis has its limitations. Time and attention span prohibit the inclusion of numerous measures in a research project and Park and Judd did not include the measures of subgroup generation, recall, recognition, and face recognition. Consequently, it is not clear how those measures align with the included measures. Further, because several measures are derived from common tasks (e.g. standard deviation and probability of differentiation are both derived from a distribution task), it is plausible that characteristics of the task contribute to variation in perception. Such shared variation might be more than a methodological nuisance and might be meaningful conceptually. The mental processes required of participants by a particular task might actively contribute to the perception of intergroup variability.

Although links between mental processes and particular tasks (or measures) are admittedly speculative, hints of such links can be glimpsed in theoretical accounts of the mental activities regulating perceptions of variability. Exemplar-based accounts, for example, suggest that perceived variability fluctuates as a function of the number and diversity of the particular group members (i.e. exemplars) brought to mind at the point of judgment (e.g. Linville, Salovey, & Fischer, 1986; Linville et al., 1989). Abstraction-based accounts, on the other hand, suggest that perceived variability fluctuates both as a function of the particular exemplars that come to mind and stored abstractions about the group as a whole (e.g. Park & Judd, 1990; Park, Judd, & Ryan, 1991). Interestingly, research on those theoretical accounts often employs different tasks (i.e.measures). Research consistent with the exemplar-based account often employs *Pd* or *SD* measures derived from the distribution task, which requires participants to consider individual group members. Research consistent with the abstraction-based account often employs the percent estimate and means measures derived from the stereotyping task, which requires participants to consider group-level information in the form of a stereotype. Consequently, in the current research we examine discrepancies at the level of both measure and task.

However, a less obvious and more insidious limitation of Park and Judd's (1990) work, which is endemic to any single study, is that the associations among measures and their relative patterns occur within a particular constellation of socio-structural factors. In the case of Park and Judd, the obtained data are situated in the dynamics of male-female relations, in which the gender-based groups differ in status (e.g. Eagly, Wood, & Diekman, 2000). To the extent to which such dynamics fluctuate across intergroup relations, so might the obtained pattern of data. Of course, researchers methodically pursue such moderating variables within and across studies. However, the non-obvious difficulty arises when different dependent variables are included across studies. To the extent to which measures of perceived variability are *differentially* sensitive to different moderators, substantial heterogeneity (and apparent inconsistencies) accumulates in a research literature. The issue of differential sensitivity can be conceptualized statistically as an interaction among measure and moderator.

An interaction among measures and socio-structural moderators of perceived intergroup variability suggests that heterogeneous patterns across measures are not simply a function of the differential psychometrics of the measures (i.e. validity and reliability), and, instead, enables the interesting possibility that the measures actively contribute in conjunction with particular socio-structural moderators to perception. In particular, different tasks (and measures) plausibly require different mental activities. For example, some measures, such as similarity, require participants to make judgments about the group as a whole, whereas the range focuses attention on individual group members. Likewise, different socio-structural moderators differentially elicit social processes. Membership in low status groups, for example, activates social identity concerns that motivate positively distinct perceptions of the ingroup relative to the outgroup (Boldry & Gaertner, 2006; Ellemers, Van Rijswijk, Roefs, & Simons, 1997; Tajfel & Turner, 1979) to which tasks/measures that focus attention at the group (vs. individual) level might be acutely sensitive. Stated otherwise, systematic patterns of perceptions might arise when the particular mental activity required by a measure synchs with the particular process elicited by a socio-structural moderator.

Any single study cannot sufficiently address the issue of differential sensitivity due, in part, to the previously discussed limitations of time and attention span and the inherent complexity of a design that manipulates multiple moderators. A meta-analysis, on the other hand, capitalizes on the existing data collected across numerous studies that vary in regard to moderators and included measures. Consequently, a meta-analysis represents a desirable tool for assessing the multiple measures of perceived variability and we employ such a tool in the current research. We have three objectives for the current meta-analysis. First, we meta-analytically assess a possible omnibus difference among the 11 measures of perceived intergroup variability. Second, we meta-analytically assess the potential moderating effects of socio-structural factors identified in previous literature reviews or empirical studies. Third, and most importantly, we meta-analytically assess potential interactions between the measures of perceived variability and the socio-structural moderators to determine whether the measures evidence differential sensitivity to patterns of intergroup perception produced by the potential socio-structural moderators. When exploring the moderating effect of measurement, we examine potential differences at the levels of both measure and task.

Socio-structural moderators of perceived intergroup variability

We consider two socio-structural variables that: (a) occurred with sufficient regularity in the intergroup variability literature and, (b) co-occurred with a sufficient subset of the measures of variability as to make a meta-analysis feasible. Those moderators are relative group status and minimal vs. non-minimal groupings.[1]

Relative group status

Literature reviews (Rubin, Hewstone, Crisp, Voci, & Richards, 2002; Sedikides & Ostrom, 1993; Voci, 2000) consistently identify relative group status as a moderator of perceived group variability. With few exceptions (e.g. Brigham, Maas, Snyder, & Spaulding, 1982; Judd, Ryan, & Park, 1991), the majority of empirical studies indicate that members of high status groups perceive outgroup homogeneity (e.g., Boldry & Kashy, 1999; Lorenzi-Cioldi, 1998; Sedikides, 1997). However, results of those studies are heterogeneous in regard to members of low status groups. Some studies suggest that members of low status groups perceive ingroup homogeneity (e.g. Brown & Smith, 1989; Cabecinhas & Amancio, 1999; Lorenzi-Cioldi, Deaux, & Dafflon, 1998) and others suggest that they perceive equivalent variability among ingroup and outgroup members (Boldry & Kashy, 1999; Hewstone, Islam, & Judd, 1993; Lorenzi-Cioldi, 1998). Such discrepancies could be attributed to the particular measures employed. Among members of low status groups, perceptions of ingroup homogeneity have been detected by recall error (Lorenzi-Cioldi, 1998) and range (Brown & Smith, 1989) and perceptions of equivalent intergroup variability have been detected by recognition error (Cabecinhas & Amancio, 1999) and similarity (Hewstone et al., 1993).

Minimal vs. non-minimal group

Some studies fostered novel groups in the laboratory using a variant of the minimal group paradigm (e.g. Howard & Rothbart, 1980; Lorenzi-Cioldi, 1998; Simon & Brown, 1987). Other studies investigated pre-existing or nonminimal groups, such as those based on gender (e.g. Bardach & Park, 1996; Lorenzi-Cioldi, Eagly, & Stewart, 1995), ethnicity (e.g. Cabecinhas & Amancio, 1999), religion (e.g. Hewstone et al., 1993), and college class (e.g. freshman, sophomore; Boldry & Kashy, 1999; Lorenzi-Cioldi et al., 1998). A meta-analysis (Mullen & Hu, 1989) and literature review (Ostrom & Sedikides, 1992) suggest that perceptions of outgroup homogeneity are stronger among non-minimal than minimal groups. Consistent with the potential for interactions among measures and moderators, the literature review suggested that the range is more reliable among non minimal groups than is *SD* or *Pd*.

Method

Literature searches

We conducted computer searches on PsychInfo from 1887 to January 2002, Sociological Abstracts from 1963 to January 2002, and Digital Dissertations from 1861 to January 2002, using as key words: homogeneity, heterogeneity, variability, intergroup perception, outgroup (and, in all searches, the hyphenated out-group) homogeneity, outgroup heterogeneity, outgroup variability, ingroup (and, in all searches, the hyphenated in-group) homogeneity, ingroup heterogeneity, ingroup variability, and face recognition. Additionally, we searched PsychInfo with the names of researchers active in the area of group variability: B.A. Bettencourt, R.Y. Bourhis, J.C. Brigham, R. Brown, S. Carpenter, J.E. Chance, B. Doosje, N. Ellemers, G.W. Fischer, A.G. Goldstein, A. Guinote, S.A. Haslam, M.A. Hogg, J. Jetten, C.M. Judd, P.W. Linville, F. Lorenzi-Cioldi, D.M. Mackie, R.S. Malpass, P. Oakes, T. Ostrom, B.P. Park, M. Rothbart, C.S. Ryan, I. Sachdev, P. Salovey, C. Sedikides, J. Shepard, B. Simon, R. Spears, S.E. Taylor, A. van Knippenberg, and D.A. Wilder. To avoid the exclusion of recently published studies not yet added to electronic databases we searched psychology journals from 1998 to 2002 that routinely publish research on group variability: *Journal of Personality and Social Psychology, Journal of Applied Social Psychology, Journal of Social Psychology, Journal of Experimental Social Psychology, Personality and Social Psychology Bulletin, Personality and Social Psychology Review, Psychology Review,* and *Psychology Bulletin*. We searched the reference sections of all obtained articles to identify potential studies that our previous searches did not identify. Finally, we posted email requests via the listserves for the Society for Personality and Social Psychology and the Society for Experimental Social Psychology.

Criteria for inclusion

We included studies that contrasted the perceived variability of the ingroup with that of the outgroup using any of the 11 measures of group variability (e.g. range, *Pd, SD* / variance, percent estimate, mean, global-similarity, trait-similarity, recognition error, face-recognition error, recall error, subgroup generation). Because we were interested in perceived variability of the ingroup relative to the outgroup we necessarily excluded studies that: (a) assessed the perceived variability of only the ingroup or only the outgroup (e.g. Kashima & Kashima, 1993; Park & Hastie, 1987), or (b) assessed perception of the ingroup vs. outgroup between-subjects (e.g. Bardach & Park, 1996; Linville et al., 1996).[2] We also excluded computer simulated data (e.g. Fiedler, Kemmelmeier, & Freytag, 1999; Linville, et al., Study 5, 1989). Finally, 50 studies were necessarily excluded because the published reports did not provide sufficient information to compute an effect size and the authors could not provide us with the necessary information (e.g. Lee, 1993; Rothgerber, 1997).

Coding scheme

We coded studies in regard to type of measure, relative group status, and minimal vs. non-minimal group. We coded the relative status of a group either on the basis of a manipulation in the primary study or on the basis of research that attests to perceived status differences among social groups. For example, several studies investigated intergroup perceptions among members of White vs. Black ethnic groups or male vs. female gender groups. Whites are recognized (by Blacks and Whites) as having higher social status than Blacks in the United States (Sidanius, Levin, & Pratto, 1996; Sidanius, Liu, Shaw, & Pratto, 1994; Sidanius, Pratto, & Rabinowitz, 1994) and men are recognized (by men and women) as having higher status than women (e.g. Carli & Eagly, 1999; Eagly et al., 2000). In addition, we coded groups as having 'unknown' status in instances in which the relative status of the groups could not be determined. It is important to note that groups included in this catch-all category of unknown may indeed have a value for relative group status. For example, group members, whose group's status is not manipulated or lacks clear social consensus, may perceive their group to be of higher status. In the absence of an explicit manipulation or clear social consensus, however, such perceived status remains unknown to an external judge. Finally, there were no instances in which the groups were defined explicitly as having equal status.

Two independent raters coded each study. We assessed interrater reliability of the coded moderators with Cohen's kappa. Kappas ranged from .98 to 1.00, indicating strong interrater reliability. We assessed interrater reliability for the calculated effect sizes with Pearson correlations. Correlations ranged from .99 to 1.00, indicating high reliability calculating the effect sizes. The few discrepancies were discussed and resolved prior to analysis.

Calculation of effect sizes

All included effects were derived from within-subjects designs, consequently we calculated effect sizes as the mean perception of the ingroup minus the mean perception of the outgroup divided by the standard deviation of that difference score (Rosenthal, 1994). Because dependent measures were recoded such that higher numbers reflect less variability (i.e. more homogeneous), a positive effect size indicates that the ingroup was perceived to be less variable than the outgroup (i.e. ingroup homogeneity), a negative effect size indicates that the outgroup was perceived to be less variable than the ingroup (i.e. outgroup homogeneity), and an effect size of zero indicates perceptions of equivalent ingroup vs. outgroup variability. We transformed all effect sizes from Glass's g to Cohen's d to correct for the overestimation of population effect sizes typically present in Cohen's g estimates (Hedges, 1981).

Analytic issues

When approaching a meta-analysis, the researcher has a choice between two statistical models: random-effects or fixed-effects (Field, 2001; Hedges & Vevea, 1998; Hunter & Schmidt, 2000). Fixed-effects models can be more powerful when their homogeneity assumption (i.e. all effect sizes estimate a common population effect) is satisfied. However, when the latter assumption is not satisfied, fixed-effect models underestimate standard errors of parameter estimates and inflate the Type I error rate (i.e. underestimate confident intervals). Monte Carlo simulations, for example, suggest that the Type I error rate in heterogeneous fixed-effects models ranges between .43 and .80, which is dramatically higher than the nominal .05 level (Field, 2003). In all of the analyses, we initially tested the homogeneity assumption of the fixed-effects model (which is equivalent to the test of random-effects variance). The homogeneity assumption was violated in all but two instances (as subsequently noted) and we employed the more appropriate random-effects models. To determine whether aggregated effect sizes differed between moderator categories, we used the χ^2 distributed QB statistic.

Thirty of the 173 independent samples (17%) included more than one of the 11 dependent measures. Because those 30 samples contributed more than one effect size, we constructed two data sets to deal with the introduction of non-independence. One data set aggregated across the single or multiple measures of a given sample so that each sample contributed a single effect size. We used the latter data set for analyses that ignored potential discrepancies across measures such as analyses that examined the average ingroup vs. outgroup difference, the average moderating effect of minimal vs. non-minimal group, and the average moderating effect of relative group status. The second data set consisted of effect sizes computed from each dependent measure included in a given sample so that we could compare potential differences among the multiple measures. Consequently, the 30 samples that included more than one measure contributed multiple effect sizes and introduced a small degree of non-independence. We used this data set for analyses that examined the average difference among measures and interactions between the measures and the socio-structural moderators.

Results

Average ingroup vs. outgroup perception

Analysis of the average perception of the variability of the ingroup vs. outgroup was based on 177 effect sizes derived from 173 independent samples of 12,078 participants.[3] Consistent with Mullen and Hu's (1989) meta-analysis, there was a small but reliable outgroup homogeneity effect ($d = -.20$, 95% confidence interval (CI) –.26 / –.13). Averaging across the 11 measures and socio-structural moderators, persons perceived less variability among outgroup than ingroup members.

Discrepancies among measures and tasks

When examining potential discrepancies among the measures of intergroup variability, we conducted analyses at the level of the 11 measures and at the level of the 6 tasks from which the measures were derived. Although those levels are somewhat redundant, they are both informative. The level of the measure is informative because researchers typically interpret results derived from particular measures. The level of the task is informative for two reasons. The task level aggregates across measures derived from a common task and such aggregates are more reliable because they are based on a larger number of effect sizes. Additionally, the mental processes required by a particular task could contribute to perceptions of intergroup variability.

Measures Comparison of the effect sizes for the 11 measures indicated that perceived intergroup variability fluctuated across measures ($QB(10) = 31.38$, $p < .01$). Table 1 displays the estimated effect size and the number of effects upon which the estimate was based for each measure. Reliable outgroup homogeneity was detected by percent estimate ($d = -.31$, 95%CI –.57/–.05), and face recognition ($d = -.37$, 95% CI –.49/–.26). The remaining measures did not detect differences in the perceived variability of the ingroup vs. outgroup.

Tasks As indicated in Table 1, the *range task* consists only of the range measure, the *distribution task* aggregates across *Pd* and *SD* (variance),

Table 1. Intergroup variability as a function of task and measure

Task	Measure	k[a]	*d*	95% CI	*QB*[b]	Power[c]
Range	Range	31	–.14	–.30/.02	–	–
Distribution		10	.12	–.17/.40	.00	.49
	Pd	5	.13	–.26/.52		
	SD/variance	5	.10	–.32/.51		
Stereotyping		13	–.32*	–.56/–.08	.02	.57
	Percent estimate	11	–.31*	–.57/–.05		
	Mean	2	–.38	–1.00/.24		
Similarity		26	.12	–.05/.29	.78	.81
	Global	21	.16	–.03/.34		
	Trait	5	–.04	–.41/.34		
Subgroup	Subgroup	5	–.21	–.61/.19	–	–
Memory		120	–.25*	–.33/–.16	10.30*	1.00
	Face recognition	64	–.37*	–.49/-.26		
	Recall errors	13	–.14	–.38/.10		
	Recognition errors	43	–.11	–.24/.03		

*$p < .05$.
Note: Perceived variability varied across the 11 measures ($QB(10) = 31.38$, $p < .01$) and the 6 tasks ($QB(5) = 20.32$, $p < .01$).
[a]Indicates the number of effect sizes.
[b]*QB* tests for differences across measures within a given task, with *df* equal to 1 less than the number of measures (e.g. $df = 1$ for the distribution task, which consists of *Pd* and *SD*).
[c]Indicates the estimated statistical power of the corresponding *QB* test.
CI = confidence interval.

the *stereotyping task* aggregates across percent estimate and mean, the *similarity task* aggregates across global similarity and trait similarity, the *subgroup task* consists only of the subgroup measure, and the *memory task* aggregates across face recognition, recall errors, and recognition errors. Comparison of the effect sizes for the six tasks indicated that perceived intergroup variability fluctuated across the tasks ($QB(5) = 20.32, p < .01$). Reliable outgroup homogeneity was detected by stereotyping (d = –.32, 95%CI –.56/–.08), and memory (d = –.25, 95%CI –.33/–.16). The remaining tasks did not detect differences in the perceived variability of the ingroup vs. outgroup.

Comparisons among measures within a given task indicated, with one exception, that measures derived from a common task did not differ. For the distribution task, the estimated effect sizes for *Pd* and *SD* (variance) did not differ ($QB(1)$ = .00, *ns*). For the stereotyping task, the estimated effect sizes for percent estimate and mean did not differ ($QB(1)$ = .02, *ns*). For the similarity task, the estimated effect sizes for global and trait similarity did not differ ($QB(1)$ = .78, *ns*). On the other hand, differences were detected among the three measures from the memory task ($QB(2) = 10.30, p < .05$). Among recall errors, recognition errors, and face recognition, only the latter two measures differed, such that the outgroup homogeneity effect for face recognition was stronger than the null effect for recognition errors (d = –.27, 95%CI –.46/–.07).

Minimal vs. non-minimal groups

Consistent with Mullen and Hu's (1989) meta-analysis, the minimal vs. non-minimal distinction moderated perceptions of intergroup variability ($QB(1) = 4.24, p < .05$). Non-minimal groups evidenced a reliable outgroup homogeneity effect (d = –.23, 95%CI –.30/–.16). Minimal groups, however, did not evidence a reliable difference between the perceived variability of the ingroup vs. outgroup (d = –.04, 95%CI –.20/.12).

We subsequently tested whether measure or task interacted with minimal vs. non-minimal distinction. Because the included minimal-group studies did not assess percent estimate, mean, subgroup generation, or face recognition, and the included non-minimal-group studies did not assess trait similarity, those measures could not be included in the analyses. Analyses based on range, *Pd*, *SD* (variance), global similarity, recall errors, and recognition errors indicated that minimal vs. non-minimal distinction did not interact with measure ($QB(5)$ = 1.06, *ns*; estimated power = .99) or task type ($QB(3)$ = 3.66, *ns*; estimated power = .99).

Relative group status

The status distinction (low, high, or unknown) did not moderate perceptions of intergroup variability ($QB(2)$ = 4.08, *ns*). We subsequently tested whether measure or task interacted with relative group status. Because the included low status and high status studies did not assess *SD* (variance), the included low status studies did not assess *Pd*, and the included unknown status studies did not assess mean, those measures could not be included in the analyses. Table 2 displays the estimated effect size and the number of effects upon which the estimate was based as a function of measure and task within levels of status.

Measures Relative group status and measure interacted to affect perceived intergroup variability ($QB(14) = 38.68, p < .01$). We decomposed the interaction to explore whether each measure detected an effect of status on perceived intergroup variability. As indicated in Table 2, the presence and nature of the status effect varied across measure. Subgroup generation and recall errors did not detect status effects. For the sake of comprehensiveness, we review in turn the measures that detected status effects.

Range This measure detected a status effect ($QB(2) = 7.87, p < .05$). Members of high status groups (d = –.19, 95%CI –.37/–.01), and unknown status groups (d = –.32, 95%CI –.51/–.13) perceived outgroup homogeneity, whereas members of low status groups did not evidence a difference in the perceived variability of the ingroup vs. outgroup (d = .07, 95% CI –.13/.26).

Percent estimate This measure detected a status effect ($QB(2) = 10.14, p < .01$). Members of low status groups (d = –.65, 95%CI –1.30/–.01) and

Table 2. Intergroup variability as a function of task, measure, and status

Task	Measure	Status	*QB*[a]	k[b]	*D*	95%CI	Power[c]
Range	Range		7.87*				.86
		High		11	–.19*	–.37/–.01	
		Low		10	.07	–.13/.26	
		Unk		10	–.32*	–.51/–.13	
Distribution[d]			–				–
		High		1	.52	–.36/1.40	
		Low		0	–	–	
		Unk		9	.05	–.13/.23	
	Pd[d]		–				–
		High		1	.52	–.36/1.40	
		Low		0	–	–	
		Unk		4	.05	–.31/.41	
	SD/Variance[d]		–				–
		High		0	–	–	
		Low		0	–	–	
		Unk		5	.08	–.10/.26	
Stereotyping			11.02**				.57
		High		4	.43	–.10/.96	
		Low		4	–.67*	–1.20/–.14	
		Unk		5	–.61*	–1.07/–.16	
	Percent estimate		10.14**				.52
		High		3	.59	–.05/1.24	
		Low		3	–.65*	–1.30/–.01	
		Unk		5	–.61*	–1.10/–.13	
	Mean[d]		–				–
		High		1	–.05	–.44/.33	
		Low		1	–.71*	–1.11/–.32	
		Unk		0	–	–	
Similarity			7.21*				.81
		High		6	.25	–.06/.56	
		Low		9	–.16	–.42/.10	
		Unk		11	.29*	.05/.52	
	Global		6.49*				.73
		High		4	.31	–.11/.72	
		Low		7	–.18	–.49/.14	
		Unk		10	.34*	.07/.60	
	Trait[e]		6.15*				.32
		High		2	.15	–.02/.31	
		Low		2	–.10	–.27/.07	
		Unk		1	–.34	–.83/.15	
Subgroup	Subgroup		1.27				.31
		High		2	–.19	–.91/.53	
		Low		2	.02	–.70/.73	
		Unk		1	–.69	–1.70/.31	
Memory			9.11*				1.00
		High		45	–.32*	–.45/-.19	
		Low		44	–.08	–.22/.05	
		Unk		31	–.36*	–.51/–.21	

(continued)

(continued)

Task	Measure	Status	QB[a]	k[b]	D	95%CI	Power[c]
	Face recognition		7.16*				.99
		High		25	–.33*	–.49/–.17	
		Low		26	–.27*	–.43/–.11	
		Unk		13	–.61	–.83/–.41	
	Recall errors[e]		1.89				.57
		High		2	–.10	–.48/.28	
		Low		2	.13	–.25/.51	
		Unk		9	–.16	–.31/.00	
	Recognition errors		8.92*				.95
		High		18	–.32*	–.54/–.10	
		Low		16	.16	–.07/.40	
		Unk		9	–.15	–.45/.16	

$*p < .05$; $**p < .01$.
Notes: Perceived variability varied as a function of Status × Measure ($QB(14) = 38.68$, $p < .01$), and Status × Task ($QB(8) = 30.48$, $p < .01$).
[a]*QB* provides a 2 *df* test of status for task and measure, respectively.
[b]Indicates the number of effect sizes.
[c]Indicates the estimated statistical power of the corresponding *QB* test.
[d]This level of task (or measure) was necessarily excluded from the interaction with Status when there were no effect sizes in one or more levels of status.
[e]We used a fixed-effects analysis because the random-effects variance did not differ from zero.
CI = confidence interval.

unknown status groups (d = –.61, 95%CI –1.10/–.13) perceived outgroup homogeneity. Members of high status groups evidenced a nonsignificant trend toward ingroup homogeneity (d = .59, 95%CI –.05/1.24).

Global similarity This measure detected a status effect ($QB(2) = 6.49$, $p < .05$). Members of unknown status groups perceived ingroup homogeneity (d = .34, 95%CI .07/.60). Members of high status groups evidenced a nonsignificant trend toward ingroup homogeneity (d = .31, 95%CI –.11/.72). Members of low status groups evidenced a nonsignificant trend toward outgroup homogeneity (d = –.18, 95%CI –.49/.14).

Trait similarity This measure detected a status effect ($QB(2) = 6.15$, $p < .05$). Although the intergroup perceptions (ingroup vs. outgroup) for members of high, low, and unknown status groups differed from one another, none of the effects were individually significant. We suspect that the effects did not achieve statistical significance because they were based on a limited number of samples (i.e. k = 2 for low and high status respectively and k = 1 for unknown status groups). Both unknown status groups (d = –.34, 95% CI –.83/.15) and low status groups (d = –.10, 95%CI –.27/.07) evidenced a trend toward outgroup homogeneity. Members of high status groups evidenced a trend toward ingroup homogeneity (d = .15, 95%CI –.02/.31).

Face recognition. This measure detected a status effect ($QB(2) = 7.16$, $p < .05$). Members of unknown status groups (d = –.61, 95% CI –.83/–.41), high status groups (d = –.33, 95% CI –.49/–.17), and low status groups (d = –.27, 95% CI –.43/–.11) evidenced outgroup homogeneity, which was stronger among unknown status groups than low status groups.

Recognition errors. This measure detected a status effect ($QB(2) = 8.92$, $p < .05$). Members of high status groups perceived outgroup homogeneity (d = –.32, 95%CI –.54/–.10). Members of low status groups evidenced a nonsignificant trend toward ingroup homogeneity (d = .16, 95%CI –.07/.40). Members of unknown status groups evidenced a nonsignificant trend toward outgroup homogeneity (d = –.15, 95% CI –.45/.16).

Tasks Relative group status and task interacted to affect perceived intergroup variability ($QB(8) = 30.48$, $p < .01$). We decomposed the interaction to explore whether each task detected an effect of status on perceived intergroup variability. As indicated in Table 2, a status effect was detected by each task, with the exception of subgroup generation ($QB(2) = 1.27$, *ns*). The nature of the status effect, however, varied across the tasks.

Descriptively similar status effects were detected by range ($QB(2) = 7.87$, $p < .05$) and memory ($QB(2) = 9.11$, $p < .05$). Both tasks indicated that members of high status groups perceived outgroup homogeneity ($d_{range} = –.19$, 95%CI –.37/–.01 and $d_{memory} = –.32$, 95%CI–.45/–.19), as did members of unknown status groups (d_{range} = –.32, 95%CI –.51/–.13 and d_{memory} = –.36, 95%CI–.51/–.21). Members of low status groups did not evidence a reliable difference between the perceived variability of the ingroup vs. outgroup (d_{range} = .07, 95%CI –.13/.26; d_{memory} = –.08, 95%CI –.22/.05).

Descriptively different from the previous effects, descriptively similar status effects were detected by stereotyping ($QB(2) = 11.02$, $p < .01$), and similarity ($QB(2) = 7.21$, $p < .05$). Members of high status groups perceived a nonsignificant trend toward ingroup homogeneity ($d_{stereotyping}$ = .43, 95%CI –.10/.96) and $d_{similarity}$ = .25, 95%CI –.06/.56). Members of low status groups perceived outgroup homogeneity ($d_{stereotyping}$ = –.67, 95%CI –1.20/–.14 and $d_{similarity}$ = –.16, 95%CI –.42/.10), though nonsignificant on the latter measure. The two tasks differed, however, with respect to members of unknown status groups for which stereotyping detected perceptions of outgroup homogeneity (d = –.61, 95%CI –1.07/–.16) and similarity detected perceptions of ingroup homogeneity (d = .29, 95%CI .05/.52).

Comparisons among measures within a given task indicated that measures derived from a common task did not differ. For the stereotyping task, the estimated effect sizes for percent estimate and mean did not differ ($QB(1) = 0.27$, *ns*). For the similarity task, the estimated effect sizes for global and trait similarity did not differ ($QB(2) = 1.82$, *ns*). For the memory task, the estimated effect sizes for face recognition, recall errors, and recognitions errors did not differ ($QB(4) = 6.18$, *ns*). In summary, analyses at the level of task indicated that the tasks of range and memory detected similar perceptions within each level of status which differed from the relatively similar patterns detected within levels of status by the stereotyping and similarity tasks.

Exploring potential confounds of the status × task effect

The Status × Task effect is intriguing because it implies that the tasks (or measures) of perceived variability are differentially sensitive to (evidence different patterns of) the effect of relative group status. The random-effects analysis certainly justifies a broader generalization beyond the contexts defined by the specific characteristics of the included studies. Nonetheless, the validity of the Status × Task effect remains suspect to the extent to which additional study characteristics systematically varied with the effect. Consequently, we coded seven additional characteristics to explore their role as potential confounds. Three characteristics, in addition to group-type (i.e. minimal vs. non-minimal), assess aspects of the social groups: (a) permeable vs. impermeable boundaries (i.e. can members assume membership in the contrasting group?), (b) history of conflict between groups, and (c) relative group size (i.e. is a group a numerical minority or is the ingroup and outgroup composed of an equal number of members?). Four characteristics assess aspects of the procedure: (a) trait valence (i.e. are the traits of the variability measures positively or negatively valenced?), (b) trait typicality (i.e. are the traits typical or relevant to the group's stereotype?), (c) order in which participants rated the ingroup and outgroup, and (d) scale metric (i.e. did participants respond on scales of a shorter vs. longer metric, e.g. 4 vs. 21 points?).

We examined the proportionate distribution of each characteristic across the levels of status and task. Inconsistent with their potential role as confounds, none of the study characteristics were distributed in a manner that tracked the patterns of perceived variability evidenced by the Status × Task effect. Consequently, those characteristics do not constitute threats to the validity of the latter effect. Although, this does not eliminate the role of a yet-to-be identified study characteristic that varies systematically with the pattern of the Task × Status interaction, we attempted to explore conceivable confounds.[4]

We addressed a second potential confound introduced uniquely by the inclusion of effects from minimal group studies. The intergroup variability effect size for minimal groups did not differ from zero (indicating a perception of equivalent ingroup vs. outgroup variability) and those effects were distributed primarily among the tasks of range, similarity, and to a lesser degree, memory. Consequently, introducing effects from minimal group studies into the analysis of Task × Status (and separate analyses of task and status, respectively) could have attenuated estimates of intergroup variability—particularly, for those tasks with higher concentrations of minimal group effects. To examine the extent of this potential confound, we repeated the previous analyses including only effects from non-minimal groups. With two exceptions, all conclusions based on p values and direction of effects remained unchanged.

The first exception is that the previous non-significant status main effect became significant ($QB(2) = 6.44$, $p < .05$) when non-minimal effects were eliminated. Members of high and unknown status groups perceived outgroup homogeneity ($d_{high} = -.24$, 95%CI –.37/–.11; $d_{unkown} = -.35$, 95%CI –.49/–.21) and members of low status groups perceived equivalent ingroup vs. outgroup variability ($d_{low} = -.11$, 95% CI –.24/02). The second exception is that in the context of the still significant Task × Status effect the similarity task no longer evidenced a significant status effect. It is important to mention, however, that this revised analysis of the similarity task is based on a pool of effects from high status groups that dropped from six to one effect size. In which case, it is not clear whether the now nonsignificant effect is due to the removal of minimal group effect sizes or severely reduced statistical power. In any event, it is clear that the obtained patterns of the Task × Status interaction were not driven primarily by effect sizes from minimal groups—the same patterns were evidenced among effects from non-minimal groups.

Discussion

We meta-analytically synthesized the intergroup variability literature to examine whether the multiple measures (and tasks from which the measures are derived) moderate perceptions of variability. Furthermore, we examined the possibility that the patterns evidenced by particular measures (and tasks) vary or interact with socio-structural factors. When ignoring the distinction among the measures (and tasks), the meta-analysis revealed a small but reliable tendency to perceive more variability among ingroup than outgroup members and for such an outgroup homogeneity effect to be stronger in non-minimal than minimal groups. However, the meta-analysis further indicated that the distinction among the measures (and tasks) should not be ignored. Perceptions of intergroup variability systematically varied as a function of measure (task) and those discrepancies further varied as a function of intergroup status.

Summarizing the patterns

In the following sections, we briefly summarize patterns of intergroup perception across the tasks (and measures) and as a function of the socio-structural moderators. We subsequently evaluate speculative accounts as to why tasks (and measures) yield discrepant patterns.

Omnibus patterns across tasks and measures

When averaging across (i.e. ignoring) the socio-structural variables, the stereotyping and memory tasks detected significant perceptions of outgroup homogeneity. The constituent measures of those tasks consistently produced effects in the same direction, but those individual effects were not always significant. The percent estimate measure of the stereotyping task and the face recognition measure of the memory task detected significant outgroup homogeneity. Likewise, the range and subgroup generation tasks/measures detected a nonsignificant trend toward outgroup homogeneity. In contrast, the similarity task (and the global similarity measure) detected a nonsignificant trend toward ingroup homogeneity. Finally, the distribution task (and the constituent measures of *Pd* and *SD*/variance) detected near zero effect sizes (i.e. perceptions of equivalent ingroup vs. outgroup variability).

Minimal vs. non-minimal grouping as moderator When accounting for the moderating effect of minimal vs. non-minimal grouping, the (available) tasks and measures consistently detected the same pattern of perception. Members of non-minimal groups perceived outgroup homogeneity and members of minimal groups perceived equivalent ingroup vs. outgroup variability.

Relative group status as moderator In contrast to the previously described omnibus patterns, we observed a shuffling among the clusters of tasks (and measures) that detected similar perceptions when accounting for the moderating effect of relative group status. Among the omnibus patterns, range, stereotyping, and memory yielded consistent effects (though the effect detected by range was nonsignificant). In the context of relative group status, a different clustering among tasks (and measurers) emerged.

The range and memory tasks evidenced similar patterns of perception which differed from the similar patterns evidenced by the stereotyping and similarity tasks. In particular, the range and memory tasks detected outgroup homogeneity among members of high and unknown status groups and equivalent perceptions of ingroup vs. outgroup variability among members of low status groups. In contrast, stereotyping and similarity detected a trend toward ingroup homogeneity among members of high status groups and outgroup homogeneity among members of low status groups (with the pattern being significant for stereotyping and nonsignificant for similarity). Stereotyping and similarity differed only in regard to the perceptions evidenced by members of unknown status groups, with stereotyping detecting outgroup homogeneity and similarity detecting ingroup homogeneity.

The subgroup generation task/measure, which yielded relatively large confidence intervals, detected neither a status effect nor differential perceptions of ingroup vs. outgroup variability. We could not examine the distribution task (and measures) because of an insufficient number of effect sizes in the literature. Readers might note descriptive differences among measures within a given task. However, analyses at the level of measure frequently involved effect estimates based on a small number of samples. Consequently, we are more comfortable interpreting analyses at the level of task, which aggregated across related measures and benefited from greater reliability.

Accounting for discrepancies

Measurement as mechanism Issues of reliability and validity might be offered as explanations of the discrepancies across tasks (and measures). We suggest, however, that such measurement accounts provide insufficient explanations. The reliability account assumes that all measures tap the same construct, but do so with differing degrees of error. That tasks (and measures) interacted with group status is not fully consistent with a strict reliability account—particularly because the patterns of perception detected by the various tasks (and measures) varied in direction, not just magnitude, across levels of status.

The validity account assumes that the tasks (and measures—or constellations of tasks and measures) tap different constructs. While perceived variability is likely a multidimensional phenomenon (Park & Judd, 1990), a simple validity explanation cannot account sufficiently for the discrepancies among tasks (and measures). Based on a strict validity account we would anticipate that tasks (and measures) tapping a common construct would yield consistent patterns across socio-structural moderators. That the multiple tasks and measures detected similar patterns across the minimal vs. non-minimal variable but different patterns across the relative group status variable is inconsistent with a strict validity account. Of course, we are not suggesting that issues of reliability and validity do not contribute to the observed discrepancies. Instead, we are suggesting that such measurement issues do not provide exhaustive accounts and a more complex explanation is necessary.

Measure as mechanism We do not pretend to have a complete explanation for the observed discrepancies and, instead, offer glimpses of potential explanations. As suggested in the introduction, the tasks (and measures) potentially require or prompt different mental activities. Some tasks, such as range, distribution, and memory, prompt persons to think about individuals. Other tasks (and measures), such as stereotyping and similarity, prompt persons to think abstractly about the group as a whole. Tasks (and measures) differ further in whether they require the possession and utilization of *accurate* information. The memory tasks in particular define variability in terms of a participant's ability to accurately encode and retrieve information—i.e. low variability is indexed in regard to high confusion errors. Of course, the tendency for the tasks (and measures) to detect similar patterns of perception across the minimal vs. non-minimal variable and dissimilar patterns across levels of group status cannot be explained simply in regard to the different mental activities required by the multiple tasks and measures. It is plausible, however, that such differential activities function in conjunction with social processes that are activated by socio-structural variables. Stated otherwise, due to their requisite mental activities, tasks (and measures) potentially vary in sensitivity to different social processes activated by socio-structural moderators.

Relative group status, for example, plausibly activates motivational (Tajfel & Turner, 1979) and cognitive (Fiske, 1993) processes that regulate intergroup perception. Social identity theory (Tajfel & Turner, 1979), for example, suggests that membership in a low status group provides unfavorable intergroup comparisons that threaten the positive distinctiveness of an internalized social identity. In the absence of a mutable status structure, the identity threat motivates efforts toward individual mobility (i.e. seeking membership in higher status group; e.g. Ellemers, van Kippenberg, de Vries, & Wilke, 1988) or a biased social perception that enhances and redefines the ingroup's positive distinctiveness (e.g. Ellemers et al., 1997). As others have argued, perceptions of group variability can be altered in the service of a motivated identity enhancement strategy. For example, exaggerating the perceived variability of the ingroup and outgroup on comparison dimensions that threaten the ingroup might blur intergroup distinctions and soften the threat of the unfavorable comparison (Doojse, Spears, & Koomen, 1995). Likewise, perceiving outgroup homogeneity (i.e. greater variability among ingroup than outgroup members) on dimensions that threaten the ingroup might protect a positive self-identity by allowing greater discrepancy between self and ingroup members (Rubin, Hewstone, & Voci, 2001).

Cognitive processes activated by group status are suggested by perspectives that interpret status effects as reflecting underlying power differences between groups (i.e. higher status groups tend to be higher power groups; e.g. Guinote, Judd, & Brauer, 2002; Sidanius & Pratto, 1999). Cognitive accounts suggest that power affects relative attention to the idiosyncratic characteristics and attributes of ingroup vs. outgroup members. Fiske and colleagues (Fiske, 1993; Fiske & Depret, 1996; Neuberg & Fiske, 1987), suggest that members of the higher power group—whose outcomes are affected slightly, if at all, by the lower power group—have little reason to attend to the lower power outgroup. However, members of the lower power group, whose outcomes are greatly affected by the actions of the higher power group, are apt to attend to the traits and behaviors of outgroup members. Such differential attention provides members of the lower power group with a more diverse perception of the outgroup.[5]

So, how might these motivational and cognitive processes interact with the mental activities prompted by the variability tasks (and measures) to produce discrepant patterns of perception across the measures? Measures that require *accurate* encoding and retrieval of information (such as those of the memory task) might be particularly sensitive to cognitive processes that affect variability judgments. If, for example, members of low power groups (i.e. which typically are low status) are more attentive to information about outgroup (and ingroup) members than are members of high power groups, they would arguably have more accurate intergroup memories and, consequently, evidence fewer ingroup and outgroup errors on memory tasks. The pattern of perception evidenced by the memory measures for members of low and high status groups is certainly consistent with such an explanation (see Table 2). The stereotyping and similarity tasks ostensibly do not require the utilization of *accurate* information, which may account for the discrepancy between the patterns evidenced by those tasks and the patterns of the memory tasks. Perhaps aspects of the stereotyping and similarity tasks (e.g., prompting group-level judgments) enable those tasks to tap into motivated processes that bias variability judgments in an effort to maintain a positive social identity. Unfortunately, the data of the current meta-analysis do not enable us to test conclusively these speculations.

In conclusion, this meta-analytic research indicates that the multiple measures of perceived variability systematically yield different patterns of perception across changing socio-structural factors. These shifting patterns pose a challenge to theory development and stand as a warning that choice of measure contributes to resulting perceptions of intergroup variability. We suspect that characteristics of the measures (or tasks from which the measures are derived) render the measures differentially sensitive to social processes triggered by social contexts. Such a suspicion awaits empirical scrutiny and we suggest that a fruitful avenue for future research is to examine systematically the mental activities initiated by the various measures.

Notes

1. Relative group size (i.e. majority vs. minority) has been identified as a moderator of perceived variability (Mullen & Hu, 1989). Unfortunately, studies that assessed group size included an insufficient array of perceived variability measures for meta-analytic purposes.
2. Two issues preclude inclusion of between-subject ratings of ingroup vs. outgroup. Within-person ratings control for idiosyncratic perceptions across persons (which between-person ratings do not), and necessarily provide the relative perceptions of the ingroup vs. the outgroup. Ignoring the latter issue, it is possible to estimate the relative ingroup vs. outgroup perception from between-person ratings, however, effect sizes from such between-person ratings cannot be combined with effect sizes from within-person ratings unless the two ratings are transformed into a common metric (Morris & DeShon, 2002). Transforming the between-person ratings requires an estimate of the standard deviation of: (a) ingroup ratings, (b) outgroup ratings, and (c) the difference between ingroup and outgroup ratings, and all three estimates must be at the same level (i.e. within cells of the primary study or aggregated across cells of the primary study). Those three estimates were not concurrently available from the primary studies.
3 Four studies required participants to rate multiple groupings (e.g. male vs. female and Blacks vs. Whites; Brigham & Barkowitz, 1978; Cross, Cross, & Daly, 1971; Jalbert & Getting, 1992; McKelvie, 1981). Consequently, each of those studies contributed two effect sizes and introduced minimal non-independence.
4. A detailed description of the distribution of each characteristic is available from the authors upon request.
5. We discuss this as a cognitive process because of our emphasis on the processing of intergroup information (i.e. attention to and retrieval of information). We concur with Fiske and colleagues who suggest that differential encoding of information is motivated by concerns of outcome dependence.

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*Indicates articles included in the meta-analysis.

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