RUNNING HEAD: Autistic traits and group homogeneity

Self-categorization and autism: Exploring the relationship between autistic traits and group
homogeneity

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Conflict of Interest Statement

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Abstract

The Integrated Self-Categorization model of Autism (ISCA: Skorich & Haslam, under review; Bertschy et al., 2019) argues that the theory of mind differences seen in autism arise from Enhanced Perceptual Functioning/Weak Central Coherence, via a dysfunctional self-categorization mechanism. The ISCA model also makes the novel prediction that phenomena that arise from self-categorization should also be affected in autistic people. In this paper, we report three studies exploring this prediction in the context of one such phenomenon: group homogeneity. We first measure participants' autistic traits, then ask them to make homogeneity judgments of their ingroup alone or their outgroup alone (in Study 1, and in the Alone conditions of Studies 2a and 2b); or of their ingroup in comparison to their outgroup or their outgroup in comparison to their ingroup (in the Compare conditions of Studies 2a and 2b). As predicted, we find that: the degree of autistic traits negatively predicts ratings of group homogeneity; this relationship is mediated by social identification/self-categorization; and typical comparison-related homogeneity effects are strengthened at higher relative to lower levels of autistic traits. These studies provide convergent evidence for the ISCA model and suggest important avenues for well-being and social skills interventions for autistic people.

Keywords: autism; outgroup homogeneity; self-categorization; weak central coherence; enhanced perceptual functioning

Public Significance Statement

This research advances the idea that autism is characterized by differences in the way social relations are processed cognitively. Specifically, this research suggests that people with more autistic traits are more likely than people with fewer autistic traits to process other people as individuals, rather than as members of the groups to which they belong. These findings provide novel avenues for intervention, particularly to tackle the much higher rates of mental ill health in autistic people

Self-categorization and autism: Exploring the relationship between autistic traits and group homogeneity

The Integrated Self-Categorization model of Autism (ISCA; Skorich et al., 2016; 2017; Bertschy, Skorich & Haslam, 2019) posits that the Theory of Mind differences seen in Autism Spectrum Disorder (hereafter referred to as autism) are a result of enhanced perceptual functioning (Mottron, Dawson, Soulières, Hubert & Burack, 2006) and weak central coherence (Frith & Happe, 1994; Happe & Frith, 2006), via a dysfunctional self-categorization mechanism. The presence of a self-categorization difference in autism logically entails the novel prediction that all those phenomena that arise from self-categorization should also be affected in autistic people, and in people with more autistic traits. In the current paper, we present three studies exploring the relationship between autistic traits and one such self-categorization-based phenomenon: perceived group homogeneity. If the ISCA model is correct that self-categorization operates differently in autistic people, then perceptions of group homogeneity should vary in systematic ways as a function of the degree of autistic traits.

The Integrated Self-Categorization model of Autism

Skorich and colleagues (Skorich & Haslam, under review; Skorich et al., 2016; 2017; Bertschy et al., 2019) have argued, in their ISCA model (see Figure 1), that the Enhanced Perceptual Functioning and Weak Central Coherence features of autism – where Weak Central Coherence refers to a tendency among autistic people to process stimulus frames more at the local level relative to non-autistic people, and Enhanced Perceptual Functioning encapsulates this same tendency, overlaid with a flexibility relative to non-autistic in processing exclusively at either the local or the global level – can be integrated with the Theory of Mind difficulties via a self-categorization mechanism (see also Table 1 for definitions of key concepts). Specifically, these researchers suggest that self-categorization is

dysfunctional in autism, where self-categorization is defined as the process of using a cognitive organizing principle to make sense of social stimulus arrays (of persons, groups, situations etc.) which include the self (McGarty, Mavor & Skorich, 2015; Turner, Oakes, Haslam & McGarty, 1994). Self-categorization can be further distinguished from similar concepts such as self-awareness and mentalization in that it describes a more basic process of segmenting the world into classes of stimuli that are self-related and non-self-related, prior to, but necessary for, the meta-representational processes implicated in these higher order processes. The ISCA model posits that decreased self-categorization is a feature of autism because it relies on centrally coherent processing, which is known to be ‘weak’ in the disorder (Frith & Happe, 1994; Happe & Frith, 2006) and also to be more flexibly engaged among autistic people (Mottron et al., 2006). Given that self-categorization is necessary for the Theory of Mind processes of shared attention (Shteynberg, 2015), and mental state inference (Ames, 2004), any disruption in self-categorization should lead to disruption in Theory of Mind. Skorich et al. (2016) have shown that, indeed, autistic traits positively predict the degree of local vs. global self-categorization in which a person engages, which in turn predicts their pattern of mental state inferences. Similarly, Skorich et al. (2017) have shown that autistic traits negatively predict the degree of self-categorization, which in turn positively predicts the degree of attention a person will share with an ingroup member. Together, these studies provide evidence for a relationship between Enhanced Perceptual Functioning/Weak Central Coherence and Theory of Mind dysfunction via self-categorization, and for the ISCA model.

As well as linking Enhanced Perceptual Functioning/Weak Central Coherence and Theory of Mind dysfunction in autism, the ISCA model also makes a number of novel predictions. Given that self-categorization is posited to function differently in the condition, it follows that any social psychological phenomena that rely on self-categorization for their

proper functioning should also be affected. Self-categorization is known to be one of the key drivers of a range of phenomena including ingroup favoritism (Tajfel et al., 1971), group polarization (Wetherell & Turner, 1987), illusory correlation (McGarty, Haslam, Turner & Oakes, 1993), and impression formation (Skorich & Mavor, 2013). Accordingly, the ISCA model predicts that the degree of autistic traits will modify the typical pattern of each of these effects.

This novel prediction has recently been tested in the context of ingroup favoritism. Bertschy and colleagues (2019) measured the autistic traits of a general population sample using the AQ-Short (Hoekstra et al., 2011; a short-form of the Autism-Spectrum Quotient, AQ; Baron-Cohen, Wheelwright, Skinner, Martin & Clubley, 2001), and then asked participants to complete an online version of the minimal group paradigm. In this paradigm, participants are allocated to the made-up Klee group ostensibly on the basis of their preference for Klee (vs. Kandinsky) paintings. Participants are then asked to allocate points to a member of the Klee group (their ingroup) and to a member of the Kandinsky group (the outgroup), via a series of matrices. The matrices are constructed in such a way that participants can choose to allocate points in favor of their ingroup, the outgroup, or in a more equitable manner. Bertschy and colleagues (2019) found that participants favored their ingroup, but that this effect was attenuated the higher their autistic traits. This pattern provided convergent support for the ISCA model and suggests that other self-categorization-based phenomena might also play out differently in autistic people (see also Cooper, Smith & Russell, 2018, for recent evidence of self-categorization-based gender identity differences in autistic people).

Group Homogeneity

One such self-categorization phenomenon is group homogeneity (Quattrone & Jones, 1980). In the traditional group homogeneity paradigm (Linville, Fischer & Salovey, 1989),

participants are presented with either a group to which they belong (an ingroup) or a group to which they do not belong (an outgroup), and are then asked to rate how homogeneous that group is. In the most common finding, people tend to perceive outgroups as more homogeneous than ingroups. Haslam, Oakes, Turner and McGarty (1995) show that this effect emerges because people typically judge their ingroups without reference to any other groups, which leads them to perceive differences between group members, and therefore to perceive less homogeneity within the group. Outgroups, on the other hand, tend to be judged in comparison to the ingroup, such that differences between the groups and similarities within each group are emphasized, thus leading to increased perceptions of outgroup homogeneity. In their paradigm demonstrating these effects, some participants were asked to make the group judgment without reference to the other group (in an Alone condition), while others were asked to make the group judgment in direct comparison with the other group (in a Compare condition), and they find that, indeed, relative outgroup homogeneity only emerges in the Alone conditions. Researchers have also found that ingroups are perceived to be just as homogeneous as, or even more homogeneous than, outgroups, when they are explicitly judged in comparison to those outgroups (Haslam et al., 1989; Kelly, 1995; Simon, 1992; Simon & Brown, 1987; Simon & Pettigrew, 1990). These various patterns of group homogeneity all flow from self-categorization, because categorizing oneself into groups alongside, or in comparison to, others leads to the emergence of typical categorization-based assimilation and contrast effects, which affect perceptions of group variability.

The Current Research

Given that perceptions of group homogeneity arise from self-categorization, it is plausible, as the ISCA model predicts, that patterns of group homogeneity will vary as a function of the degree of autistic traits. We present three studies here that test this novel prediction. Across all three studies, we first measure participants' autistic traits using the AQ-

Short (Hoekstra et al., 2011). We then present participants with a typical group homogeneity paradigm, modelled on Linville et al. (1989; Study 1) and Haslam et al. (1995; Studies 2a and 2b). We also measure people's social identification with their ingroup as a proxy measure of their self-categorization (McGarty 1999), in order to test the ISCA model's key claim that autism is characterized by decreased self-categorization, which in turn predicts perceptions of group homogeneity.

A number of predictions can be made across all three studies. First, if the ISCA model is correct, group homogeneity effects such as those described above should be moderated by AQ. This moderation should manifest in a specific pattern, which can be derived from the Weak Central Coherence (Frith & Happe, 1994) and Enhanced Perceptual Functioning accounts (Motttron et al., 2006), on which the ISCA model is partially founded. Both the Weak Central Coherence and Enhanced Perceptual Functioning accounts suggest that autism is characterised by a tendency towards local processing. The Enhanced Perceptual Functioning account goes beyond this, however, and suggests that this tendency is overlaid on a more flexible processing style, in which the level of processing (local/global) is relatively optional for autistic people, rather than generally mandatory (at the global level) as it is for non-autistic people. This has been found, for example, in the context of Navon figure tasks, in which autistic people show (1) an overall tendency to identify the local letter targets more easily than the global letter targets compared to non-autistic people, when asked to search for the targets at both levels; alongside (2) a greater or equal ability to find the target letters at the global level without interference from the local level compared to non-autistic people, when explicitly asked to search for the targets at the global level (Plaisted, Swettenham & Rees, 1999).

In the context of group homogeneity, a tendency for local processing, as consistent with both the Weak Central Coherence and Enhanced Perceptual Functioning accounts (and thus

for local self-categorization; Skorich et al., 2016) would likely manifest as a negative relationship between AQ and group homogeneity overall. The greater processing flexibility seen in those with more autistic traits, as consistent with the Enhanced Perceptual Functioning account, would likely manifest as a *strengthening* of the typical patterns of group homogeneity among people with more autistic traits; specifically greater outgroup homogeneity when the groups are being judged alone, and greater ingroup homogeneity when the groups are being judged in comparison to one another. This pattern is likely to emerge because at higher levels of autistic traits there is likely to be less interference from the hierarchically subordinate or superordinate ways of processing the stimuli; that is, when asked to judge a group alone, people with more autistic traits are likely to focus attention only on the individual members of the group, with little interference from the group-level, leading to *decreased* perceptions of homogeneity, and when asked to judge the groups in comparison to one another, people with more autistic traits are likely to focus only on the two groups, with little interference from the individual-level, leading to *increased* perceptions of homogeneity.

Finally, if the ISCA model is correct, AQ should negatively predict the degree of social identification with the group, as social identification is a proxy for self-categorization (McGarty, 1999). Additionally, if, as the ISCA model suggests, any relationship between AQ and group homogeneity is due to differences in self-categorization, then that relationship should be mediated by social identification.

As well as providing theoretical support for the ISCA model, a number of important applied implications would follow if these general hypotheses were to be supported. First, they would suggest that people with more autistic traits (and, by extension, those with autism) process their social groups in terms of the individuals that make up those groups, rather than as relatively homogeneous and relatively undifferentiated entities as those with fewer autistic

traits do. This difference in processing – specifically in the *level* of processing – would likely go some way to explaining some of the social difficulties in autism, in that the Theory of Mind processes underlying adaptive social functioning depend on perceivers and targets operating at the same level of self-categorization as one another. That is, when attempting to infer the behaviour of a target person, it is crucial that the perceiver categorizes that target person in terms of the same category, at the same level of abstraction, as that person *self*-categorizes (Skorich et al., 2016); in the absence of such a match, any inferences made will almost certainly be inaccurate. If autistic people and non-autistic people process the groups to which they belong in relatively heterogeneous and relatively homogeneous ways, respectively, then there will very often be a mismatch between the categorization scheme used by an autistic person when inferring the thoughts and feelings of a target, and the target's own self-categorization scheme – which will result in inaccurate mental state inferences, and the flow-on difficulties in social functioning that characterize autism.

Similarly, a general tendency among autistic people towards perceiving groups as heterogeneous rather than homogeneous would result in decreased feelings of social connectedness and belonging compared to non-autistic people. Social connectedness and feelings of belonging have been implicated very strongly in a wide range of mental health issues, including depression, anxiety, psychosis, and suicidality (Haslam et al., 2019). Decreased social connectedness and feelings of belonging could, therefore, explain the much higher rates of mental ill health in the autistic population (Hollocks, Lerh, Magiati, Meiser-Stedman & Brugha, 2018), and interventions that focus on fostering greater group-based, *homogeneous* self-categorization would provide some promise in improving the mental health of autistic people. Overall, then, exploring differences in perceptions of group homogeneity as a function of autistic traits has the potential not only to deepen our understanding of autism, but also to lead to real-world change in the lives of autistic people.

Ethics Statement

The three studies presented here were approved by the University of Queensland School of Psychology research ethics sub-committee, in accordance with the National Statement on Ethical Conduct in Human Research (NHMRC, 2018).

Study 1

Study 1 was modelled on that of Linville and colleagues (1989). We first asked American participants to complete the AQ, then to make judgments of the variability of Americans (the ingroup) or Australians (the outgroup), and then to rate their degree of identification with their national group. Our predictions for this study logically follow from the ISCA model and the literature on group homogeneity, as described above. We thus hypothesize that:

H1: AQ will negatively predict perceptions of group homogeneity overall.

H2: At higher levels of AQ, participants will judge the outgroup to be more homogeneous than the ingroup, and to a greater degree than at lower levels of AQ.

H3: The negative relationship between AQ and perceptions of group homogeneity (as described in H1) will be mediated by social identification. Specifically:

H3a: AQ will negatively predict social identification.

H3b: Social identification will positively predict perceptions of group homogeneity.

H3c: There will be an indirect effect from AQ to perceptions of group homogeneity via social identification.

Method

Participants

An a priori power analysis was conducted to determine the smallest sample size necessary for Study 1. Based on the size of the smallest outgroup homogeneity effect found

in Haslam et al.'s (1995) experiments, $R^2 = .099$, a desired power of at least .80 (Cohen, 1988; 1992), and assuming 3 predictors (two independent variables and an interaction term) in the omnibus analysis, a sample size of at least 91 was deemed necessary. Two-hundred and thirty-nine participants were recruited via the online crowdsourcing tool *Crowdflower*. Of these, 125 were male, 113 were female, and one participant indicated their gender as 'other'. The mean age was 34.02 years with a range from 19 to 70. All participants were resident in the United States.

Design

Target group (ingroup vs. outgroup) was manipulated between-participants. AQ was included as a continuous predictor. Perceived homogeneity was included as the focal DV.

Procedure

Phase 1: AQ. Participants first completed the AQ-Short (Hoekstra et al., 2011). This measure consists of 28 items, to which participants respond on a 4-point scale from Strongly Disagree (1) to Strongly Agree (4). Thirteen items are worded such that an 'agree' or 'strongly agree' response indicates more autistic traits (e.g., "I prefer to do things the same way over and over again"). Fifteen items are worded such that a 'disagree' or 'strongly disagree' response indicates more autistic traits (e.g., "I find social situations easy").

Phase 2: Katz-Braly Checklist. After completion of the AQ-Short, participants were presented with the 84 items from the Katz-Braly checklist (Katz & Braly, 1933), which includes both positive and negative traits, such as 'intelligent', 'brilliant', 'lazy', and 'arrogant'. The order of presentation of the traits did not differ across participants. From this list, participants were asked to choose the five traits that best described Americans (the ingroup) or Australians (the outgroup). Random allocation to target group condition was achieved by asking participants to choose traits that described either Americans or Australians.

Phase 3: Perceived Homogeneity. Participants were then asked to indicate the extent to which each of the five traits they chose in Phase 2 described Americans (the ingroup) or Australians (the outgroup) well, depending on target group condition. Each of the five chosen traits was presented next to a scale from 0 (Does not describe [Americans/Australians] well) to 100 (Describes [Americans/Australians] well), and participants were asked to position a slider along each of the scales to indicate their response for the associated trait.

Phase 4: Percentage Estimates. Next, participants were asked to estimate the percentage of Americans or Australians, depending on target group condition, who fall into each level of each of the five traits they chose in Phase 2. The levels of the trait were ‘not at all’, ‘slightly’, ‘somewhat’, ‘quite’, ‘moderately’, ‘very’, and ‘extremely’. Participants were asked to write a percentage into a box below each level for each trait. Participants were not able to continue to the next phase unless their percentage estimates summed to 100. Note that we do not present the percentage estimates findings, because no meaningful effects emerged on them in either Study 1 or Study 2, in which they were included. For the percentage estimates results, see the supporting materials.

Phase 5: Social Identification. In this phase, participants were asked to indicate the degree to which they identified with their ingroup, Americans. They were presented with fourteen items from Leach et al.’s (2008) social identification scale, and the single item (“I identify with my national group”) from Postmes, Jans and Haslam’s (2013) single-item social identification scale. Participants were asked to indicate their agreement with each of the items on a 7-point scale from (1) Strongly Disagree to (7) Strongly Agree. Example items from the Leach et al. (2008) scale include “I feel a bond with my national group” and “I am glad to be a member of my national group”.

Phase 6: Demographics. Finally, participants were asked to indicate: (1) their country of residence from a drop-down list of all countries; (2) their gender, either ‘male’, ‘female’ or

‘other’; (3) their year of birth; and (4) whether English was their first language. After answering these questions, participants were debriefed, and paid US\$0.50 for the 15 minutes taken on average to complete the study.

Results

Data for Study 1 are available on the Open Science Framework:

https://osf.io/nmtda/?view_only=8689ddac927448fcb0b4661f77f52896.

Calculation of Measures

AQ. The 15 reverse-coded items were reversed and then averaged with the 13 remaining items, such that a higher score on this measure indicates more autistic traits (Cronbach’s $\alpha = .82$).

Perceived Homogeneity. The ratings for each of the five chosen traits was averaged to create an overall perceived homogeneity score. A higher score on this measure indicates greater perceived homogeneity.

Social Identification. The 15 social identification items were averaged to create an overall measure of social identification. A higher score indicates greater identification (Cronbach’s $\alpha = .95$).

Preliminary Analyses

Table 2 presents the means, standard deviations and inter-correlations for all the continuous variables included in Study 1. AQ is significantly negatively correlated with perceived homogeneity and with social identification. Social identification is also significantly positively correlated with perceived homogeneity.

Perceived Homogeneity

In order to assess the impact of AQ on perceived homogeneity, an ANCOVA was conducted in which target group, AQ, and the target group x AQ interaction were included. This revealed no main effect of target group, $F(1, 235) = 0.32, p = .570, \eta^2 < .01$, and no

interaction, $F(1, 235) = 0.54, p = .465, \eta^2 < .01$. A main effect of AQ did, however, emerge, $F(1, 235) = 11.09, p = .001, \eta^2 = .04$, such that a higher AQ score was predictive of lower perceived homogeneity, $b = -.66$.

Mediation Analysis

A mediation analysis was conducted to determine whether the relationship between AQ and perceived homogeneity was mediated by social identification. Model 4 of Hayes' (2017) PROCESS macro for SPSS was used with 10,000 bootstrapped samples. AQ was entered as the IV, perceived homogeneity as the DV, and social identification as the mediator. There was a significant negative relationship between AQ and perceived homogeneity, $\beta = -.214, p = .001$, a significant negative relationship between AQ and social identification, $\beta = -.174, p = .007$, and a significant positive relationship between social identification and perceived homogeneity controlling for AQ, $\beta = .224, p < .001$. Inspection of the 95% bootstrapped confidence interval revealed a significant indirect effect, $\beta = -.039, \text{BootSE} = .0197, 95\% \text{ BootCI} [-.0816, -.0051]$, indicating mediation (see Figure 2).

Discussion

The results of this first study provided support for H1 and H3; that is, AQ negatively predicted group homogeneity overall, and the relationship between AQ and perceived homogeneity was mediated by social categorization. H2 was not supported, as there was no interaction of AQ and target group on perceived homogeneity. The absence of an interaction likely occurred because no difference in perceptions of the homogeneity of the ingroup and outgroup emerged, which meant that there was no typical outgroup homogeneity effect for AQ to moderate. Nonetheless, results of Study 1 provide partial support for the ISCA model, and specifically for the importance of social identification – as a proxy for self-categorization – in the relationship between autistic traits and perceived homogeneity.

Studies 2a and 2b

Studies 2a and 2b build on Study 1 by including Haslam and colleagues' (1995) manipulation of comparison. In these studies, participants were asked to make judgments either without reference to another group — in the Alone conditions — or in direct comparison with another group — in the Compare conditions. As outlined in the Method section below, this was done differently in Study 2a and Study 2b, such that the only difference between the studies was the way in which the same theoretical construct — Comparison — was operationalized. The Australian outgroup was also replaced with a Canadian outgroup, as it was possible that the absence of an overall outgroup homogeneity effect in Study 1 was due to the outgroup not being psychologically meaningful enough to American participants. This allowed for the inclusion of Canadian participants, for whom 'Canadians' were the ingroup and 'Americans' were the outgroup. We also introduced two attention check questions and a manipulation check question to ensure participants were focused on the task. The percentage estimation task was retained in Study 2a (for results, see supporting materials), but omitted from Study 2b. In all other ways, Studies 2a and 2b were identical to Study 1. Given the similarity between Studies 2a and 2b, we have opted to describe their methodologies in a combined method section, and to analyse them together. Combining the methods and analyses in this way (1) emphasizes the fact that the 'Comparison' construct is of greater theoretical importance than any particular operationalization of it; (2) allows for a more powerful test of our hypotheses as a result of an increased sample size; and (3) enables us to statistically control for any differences between the different operationalizations of the 'Comparison' construct. In the combined analysis, the difference in operationalization did not moderate any other effects, which indicates that it was

appropriate to collapse the two datasets¹ (see Demets, 1987, and Kaufmann, 1989, for discussions of combining data for analysis; for full results of the combined analysis, and for separate Study 2a and 2b results, see supporting materials).

As with Study 1, predictions for Studies 2a and 2b logically follow from the ISCA model and the literature on group homogeneity. We thus hypothesize that:

H1: AQ will negatively predict perceptions of group homogeneity overall.

H2: (a) At higher levels of AQ, in the Alone conditions, participants will judge the outgroup to be more homogeneous than the ingroup, while in the Compare conditions, participants will judge the ingroup to be more homogeneous than the outgroup; and (b) this pattern will emerge to a greater degree than at lower levels of AQ.

H3: The negative relationship between AQ and perceptions of group homogeneity (as described in H1) will be mediated by social identification. Specifically:

H3a: AQ will negatively predict social identification.

H3b: Social identification will positively predict perceptions of group homogeneity.

H3c: There will be an indirect effect from AQ to perceptions of group homogeneity via social identification.

Method

Participants

An a priori power analysis was conducted to determine the smallest sample size necessary for each of Study 2a and Study 2b. Based on the size of the smallest outgroup homogeneity effect found in Haslam et al.'s (1995) experiments, $R^2 = .099$, a desired power of at least .80 (Cohen, 1988; 1992), and assuming 7 predictors (three independent variables

¹ It is important to note, however, that allocation to Study 2a versus Study 2b was not random. As such, results for effects including the “operationalization” variable should be interpreted with this in mind.

and four interaction terms) in omnibus analyses, a sample size of at least 131 was deemed necessary. Given that Studies 2a and 2b were analysed together, we also conducted a power analysis for this combined analysis. Based on an effect size of $R^2 = .099$, a desired power of at least .80, and assuming 15 predictors (four independent variables (see below) and eleven interaction terms) in the omnibus analysis, a sample size of at least 180 was deemed necessary. Participants for Studies 2a and 2b were recruited via the online crowdsourcing tool *Crowdfunder*. Two-hundred and sixteen participants were recruited for Study 2a. Eight of these failed the two attention checks and the manipulation check and were excluded from all subsequent analyses, leaving a final sample of 208 participants. Of these, 95 were male, 112 were female, and one participant indicated their gender as ‘other’. The mean age was 38.14 years with a range from 20 to 78. All participants were resident in the United States (165) or Canada (43).

Two-hundred and eighty-eight participants were recruited for Study 2b. Twenty-three participants failed the two attention checks and the manipulation check and were excluded from all subsequent analyses, leaving a final sample of 265 participants. Of these, 103 were male and 162 were female. The mean age was 39.94 years with a range from 18 to 83. All participants were resident in the United States (201) or Canada (64). It is worth noting that some of the same participants could have completed more than one of the studies reported in this paper. However, this is unlikely as the pool of possible participants on Crowdfunder in the United States numbers approximately 3 million (Kuek et al., 2015).

Combining the samples from Studies 2a and 2b resulted in a final sample of 473 participants.

Design

Both studies employed a 2(target group: ingroup/outgroup) x 2(comparison: alone/compare) between-participants design, with AQ included as a continuous predictor.

Perceived homogeneity was included as the focal DV in both studies. Participants were randomly allocated to target group and comparison conditions.

Procedure

With the exception of changes noted above, Studies 2a and 2b were almost identical to Study 1. In Study 2a, the Alone conditions asked participants to think about either Americans or Canadians, while the Compare conditions asked them to think about “Americans in comparison to Canadians” in the ingroup condition or “Canadians in comparison to Americans” in the outgroup condition (this wording was used in all phases where the target groups were mentioned). In Study 2b, participants in the Alone condition first rated either Americans or Canadians, depending on their target group condition, on the five chosen traits, and then rated the other group on the same traits on the next page. In this way, the first group to be rated was rated without reference to, or psychological availability of, the other group (i.e., it was rated ‘alone’). In the Compare conditions in Study 2b, on the other hand, participants rated both groups simultaneously on each trait one-by-one (e.g., participants rated how well the trait ‘intelligent’ described Americans, and how well the trait ‘intelligent’ described Canadians, and then moved on to rate how well the trait ‘rude’ described Americans, and how well the trait ‘rude’ described Canadians, and so forth). In this way, both groups were psychologically salient when ratings were made for each group on each trait (i.e., they were rated in comparison to each other). The group for which the five traits was chosen (i.e., the group rated first) was deemed to be the target group.

Finally, the attention test questions (“This is a test question. Please select ‘Strongly Disagree’” and “This is a test question. Please select ‘Somewhat Disagree’”) were included among the AQ and social identification items respectively, and a manipulation check asking participants to indicate which group(s) they were asked to rate was also included.

Results

Results reported here combine the Study 2a and 2b datasets. Where relevant, ‘Operationalization’ is therefore included as an additional IV (see supporting materials for separate Study 2a and 2b results). Data for Studies 2a and 2b are available on the Open Science Framework: https://osf.io/nmtda/?view_only=8689ddac927448fcb0b4661f77f52896.

Calculation of Measures

All measures were calculated as described for Study 1. Cronbach’s α for AQ and social identification were .79 and .95, respectively.

Preliminary Analyses

Table 3 presents the means, standard deviations and inter-correlations for the continuous variables included in the combined Study 2a/2b dataset. AQ was significantly negatively correlated with perceived homogeneity, and with social identification. Social identification was also significantly positively correlated with perceived homogeneity.

Perceived Homogeneity

In order to assess the impact of AQ on perceived homogeneity, a 2(target group: ingroup/outgroup) x 2(comparison: alone/compare) x 2(Operationalization: 2a/2b) between-participants ANCOVA with AQ included as a continuous predictor was conducted on the perceived homogeneity measure. This ANCOVA included all possible interactions between IVs, and between the IVs and the covariate. This revealed a main effect of AQ, $F(1, 456) = 25.56, p < .001, \eta^2 = .05$, such that a higher AQ was predictive of lower perceived homogeneity, $b = -0.34$. This also revealed a three-way interaction between comparison, target group, and AQ, $F(1, 456) = 5.27, p = .022, \eta^2 = .01$. No other main effects or interactions were significant (see supporting materials for full results of combined analysis).

Follow-up analyses of the interaction of comparison, target group and AQ revealed an interaction of comparison and target group at high AQ, $b = 12.96, p < .001$, but not at low

AQ, $b = 1.16$, $p = .746$. Further analysis of the interaction at high AQ revealed that there was a significant ingroup homogeneity effect in the Compare condition, $b = 8.15$, $p = .002$, and a significant outgroup homogeneity effect in the Alone condition, $b = -4.81$, $p = .046$ (see Figure 3).

Mediation Analysis

A mediation analysis was conducted on the combined Study 2a and 2b dataset to determine whether the relationship between AQ and perceived homogeneity was mediated by social identification. Model 4 of Hayes' (2017) PROCESS macro for SPSS was used with 10,000 bootstrapped samples. AQ was entered as the IV, perceived homogeneity as the DV, social identification as the mediator. There was a significant negative relationship between AQ and perceived homogeneity, $\beta = -.211$, $p < .001$, a significant negative relationship between AQ and social identification, $\beta = -.289$, $p < .001$, and a significant positive relationship between social identification and perceived homogeneity controlling for AQ, $\beta = .109$, $p = .017$. Inspection of the 95% bootstrapped confidence interval revealed a significant indirect effect, $\beta = -.032$, BootSE = .0155, 95% BootCI [-.0646, -.0036], indicating mediation (see Figure 4).

Discussion

The combined results of Studies 2a and 2b provided support for all four hypotheses. Specifically, AQ negatively predicted perceived homogeneity (H1), and this relationship was mediated by social identification (H3). There was also a three-way interaction between target group, comparison, and AQ, which indicated that people with more autistic traits perceived the outgroup as more homogeneous than the ingroup in the Alone conditions, and perceived the ingroup as more homogeneous than the outgroup in the Compare conditions (H2a). This effect was also attenuated among those with fewer autistic traits, and to such a degree that both the ingroup and outgroup homogeneity effects disappeared entirely at lower levels of

AQ (H2b). The absence of any homogeneity effects at low levels of AQ is somewhat surprising, but is likely a result of additional variance being explained by the AQ when it is included in the model. Nonetheless, these results provide support for the ISCA model, and point to the important role played by decreased social identification, as a proxy for decreased self-categorization, at high levels of autistic traits.

General Discussion

Together, the results of the studies reported above provide some convergent evidence that supports the ISCA model (Skorich & Haslam, under review; Skorich et al., 2016; 2017; Bertschy et al., 2019). In particular, this research shows that typical group homogeneity effects that flow from self-categorization, are moderated by autistic traits. First, autistic traits negatively predict group homogeneity — consistent with the both the Weak Central Coherence (Frith & Happe, 1994) and the Enhanced Perceptual Functioning (Mottron et al., 2006) accounts' contention that autism is characterised by a local processing bias. Moreover, this relationship is mediated by social identification, which itself arises from self-categorization. Second, typical comparison-based homogeneity effects are qualified by autistic traits; they appear to be heightened at high levels of autistic traits, and attenuated at low levels of autistic traits. This latter finding is consistent with the Enhanced Perceptual Functioning perspective's — and consequently the ISCA model's — contention that people with more autistic traits will show greater flexibility in the local/global level at which they process. When asked to process groups in comparison to one another, it is likely that people with more autistic traits process those groups without interference from the individual-level, and thus perceive greater homogeneity of the groups (i.e., fewer individual differences). When asked to process the ingroup alone, on the other hand, it is likely that people with more autistic traits process the individuals within the group without interference from the group-level and thus perceive less homogeneity within the group (i.e., more individual differences).

These context effects are also consistent with findings that the difficulties autistic people show with relational encoding can be attenuated when aspects of the environment are made to facilitate the encoding of that information, for example, through the provision of explicit category labels (Gaigg, Gardiner & Bowler, 2008). In particular, being encouraged to explicitly compare the ingroup and outgroup appears to provide enough environmental structure to allow for encoding of the relations between the individuals, and thus to perceive the groups as relatively homogeneous. The current findings thus point to the flexibility of autistic perception, as well as the importance of understanding the cognitive characteristics that define the disorder as a related set, as the ISCA model attempts to do.

Implications of the Current Findings

The additional evidence in favor of the ISCA model that the current studies provide has a number of important theoretical and applied implications.

Theoretical Implications. First, it strengthens that model's argument for uniting the varied features of autism under a single explanatory framework (see Figure 1). This integrated account itself has implications for further understanding the biological, neurological, genetic, and cognitive basis of autism, in that a novel mechanism — self-categorization — emerges as a promising avenue for exploration in each of these contexts. Nonetheless, it is worth noting that the current research was conducted with a general population sample, exploring the broader autism phenotype (Bishop et al., 2004; Wheelwright, Auyeung, Allison & Baron-Cohen, 2010) rather than autism per se, and needs to be replicated with an autistic sample before more definitive conclusions can be drawn. It is indeed quite possible that the cognitive patterns that differ in the general population as a result of autistic traits are not the same as those that differ between typically developing people and those with a formal diagnosis of autism.

Applied Implications. Second, the evidence that self-categorization is central to autism suggests that interventions that focus on fostering self-categorization and social identification in autistic people could be particularly fruitful. For example, the GROUPS 4 HEALTH program (Haslam, Cruwys, Haslam, Dingle & Chang, 2017; Haslam, Jetten, Cruwys, Dingle & Haslam, 2018; Haslam et al., 2019) — which has shown promise in treating depression, anxiety, and social isolation in neurotypicals by fostering social identification — might be adapted for an autistic population, with a view to alleviating the much higher rates of mental ill health that are evidenced in that population (Hollocks et al., 2018). Cooper, Smith and Russell (2017) have recently found evidence that, indeed, decreased autistic social identification predicts decreased self-esteem and decreased mental well-being in autistic people. It is important to acknowledge, however, that the factors responsible for these higher rates in people with autism may in fact be independent of a decreased tendency for self-categorization. In addition, it may also be the case that a self-categorization-based intervention developed for neurotypicals may not be appropriate for an autistic population, as the cognitive mechanisms each group is able to draw upon may be quite different. Nonetheless, the possibilities offered by the ‘social cure’ perspective on health and well-being (Haslam et al., 2018) certainly hold promise for autistic mental health, given the key driver suggested by this perspective is directly impacted in autism.

The current research also provides an avenue for developing novel interventions for the development of social skills and facilitating social functioning in autistic people. By identifying self-categorization as affected in autism, the current research suggests that programs that currently focus on developing specific social behaviours in autistic children — such as joint attention (Kasari, Freeman & Paparella, 2006), emotion recognition (Beaumont & Sofronoff, 2008), empathy through role play (Bellini & Akullian, 2007) etc — could be strengthened by emphasizing the development of the social cognitive process of self-

categorization that underlies each of these behaviours. Specifically, autistic children could be encouraged to practise their self-categorization skills in a computer-mediated format such as that offered by, for example, Beaumont, Rotolone and Sofronoff's (2018) 'Secret Agent Society' intervention. Autistic children could be presented with a game-like scenario, in which they need to identify the self-categorical relations present in the situation before moving onto the next level, as they must do but with emotion recognition and other social behaviours in Beaumont and colleagues' (2018) program. Whatever the precise format, the current studies, and the ISCA model from which they emerge, suggest that assisting autistic children to engage with self-categorization could help them navigate their social worlds more effectively, thus decreasing the frequency and intensity of their negative and overwhelming social experiences.

Conclusion

The current research tested the novel hypothesis, derived from the ISCA model (Bertschy et al., 2019; Skorich et al., 2016; 2017), that people with more autistic traits would show a different pattern in their perceptions of group homogeneity relative to people with fewer autistic traits, and that this pattern would result from decreased self-categorization. Results across the current studies provided clear support for this hypothesis. Specifically, autistic traits negatively predicted group homogeneity, and this relationship was mediated by social identification, which arises from self-categorization. Additionally, at high levels of autistic traits, typical comparison-based group homogeneity effects were heightened relative to lower levels of autistic traits. These findings suggest that an integrated model of autism, in which the Theory of Mind difficulties are united with the Enhanced Perceptual Functioning/Weak Central Coherence via a self-categorization mechanism, is worth considering in order to further our understanding of the cognitive and social psychological

basis of the condition, and, through that understanding, to improve the lives of autistic people.

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Tables

Table 1. *Definitions of key terms.*

Concept	Definition
Weak Central Coherence	The tendency of autistic people to engage in more local, more piecemeal, less integrated processing than non-autistic people.
Enhanced Perceptual Functioning	The tendency of autistic people to engage in more local processing than non-autistic people, overlaid on a general flexibility, relative to non-autistic people, in processing exclusively at either the local or global level.
Theory of Mind	The ability to represent the mental states (beliefs, desires, intentions, imagination, emotions etc.) of others, and thereby infer and predict their behaviour.
Self-Categorization	The process of using a cognitive organizing principle – a self-category – to make sense of a social stimulus array – of persons, groups, situations etc. – that includes the self.
Social Identification	The degree to which a perceiver feels that a social self-category (i.e., an ingroup) defines them, as well as the degree to which they feel connected to that social self-category.

Table 2. Means, standard deviations, and zero-order correlations for continuous measures for Study 1.

Measure	<i>M</i>	<i>SD</i>	AQ	PH
AQ	11.29	6.68	--	
PH	71.19	17.31	-.21*	--
Social Identification	4.88	1.12	-.17*	-.26**

Note: * $p < .01$, ** $p < .001$.

Table 3. Means, standard deviations, and zero-order correlations for continuous measures included in the combined dataset for Studies 2a and 2b.

Measure	<i>M</i>	<i>SD</i>	AQ	PH
AQ	11.66	4.84	--	
PH	75.95	13.94	-.21**	--
Social Identification	4.91	1.06	-.29**	-.16**

Note: ** $p < .001$

List of Figures

Figure 1. The Integrated Self-Categorization model of Autism (Skorich & Haslam, under review; Skorich et al., 2016; 2017; Bertschy et al., 2019).

EPF: Enhanced Perceptual Functioning; WCC: Weak Central Coherence

Figure 2. The relationship between autistic traits and perceived homogeneity as mediated by social identification. Note: Regression coefficients are standardized β values, and the value in brackets represents the direct effect. $*p < .01$, $**p < .001$.

Figure 3. Perceived homogeneity of ingroup and outgroup as a function of comparison, at low (-1SD) and high (+1SD) levels of autistic traits, across Studies 2a and 2b combined.

Note: Error bars represent standard errors.

Figure 4. The relationship between autistic traits and perceived homogeneity as mediated by social identification, across Studies 2a and 2b combined. Note: Regression coefficients are standardized β values, and the value in brackets represents the direct effect. $*p = .017$, $**p < .001$.

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