Title: Adults and children blatantly dehumanize outgroups

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Abstract: Dehumanization is observed in adults across cultures and is thought to motivate the worst forms of human violence. The age of first expression and the degree of socialization required to foster dehumanization remains largely untested. This research demonstrates that several different representations of humanness, including a novel one, readily elicit blatant dehumanization in adults (N = 482) and children (5-12 years of age; N = 150). We also find that dehumanizing responses in both age groups are associated with stronger perception of outgroup inferiority and a willingness to punish outgroup transgressions. These findings rule out the need for exposure to cultural norms throughout adolescents and adulthood before observing significant outgroup dehumanization.

Keywords: dehumanization, intergroup bias, moral concern, enculturation

Dehumanization is a psychological process through which others are stripped of humanness. Perceiving others as subhuman is posited to allow for moral exclusion. Heinous acts of cruelty and violence become acceptable (Bandura, 2016; Smith, 2020). Dehumanization is linked to acceptance of punishment, torture and capital punishment of outgroups (Bandura, Underwood, & Fromson, 1975; Jardina & Piston, 2016; Kteily, Bruneau, Waytz, & Cotterill, 2015; Markowitz & Slovic, 2020; Viki, Osgood, & Phillips, 2013). In extreme cases, dehumanizing portrayals, for example, of Jewish people as vermin during the Holocaust, Tutsis as cockroaches in the Rwanda genocide, and victims as rats during the Tokyo firebombing are thought to have encouraged mass killings. Dehumanization of enemies is used to encourage soldiers to apply lethal force (Smith, 2020). Understanding the mechanism that makes individuals predisposed to dehumanization and the psychology that allows for its development are critical to implementing strategies to prevent future intergroup aggression.

The *Early Emergence hypothesis (EEH)* posits that the tendency to deny humanity to another individual or group emerges as result of a maturational pathway during early childhood and develops little during formal schooling. This potential early maturation would support the universality across humans which has been suggested by a range of findings. Small-scale societies from across the world refer to their own group in language and myth as “principle” or “real” people (McCallum, 2001; Sumner, 1906). Cross-cultural experimental surveys have revealed blatant dehumanization of threatening outgroups in every ethnic and demographic group surveyed (Kteily & Bruneau, 2017). What is also prevalent across cultures is the association of dehumanization with the perceived inferiority of outgroups (Kteily et al., 2015; Trounson, Critchley, & Pfeifer, 2015) and moral disengagement. The tendency of those surveyed to dehumanize predicts their withdrawal of prosociality and the acceptance of harm toward other

groups even when prejudice is controlled (Kteily & Bruneau, 2017; Kteily et al., 2015; Kteily, Hodson, & Bruneau, 2016).

This early emergence of dehumanization is suggested to result in the maturation of the cognitive process that allows for viewing another person or group of people as lacking some combination of human perceptions, feelings, desires and beliefs (Hare, 2017; Hare & Woods, 2020). The link between the Theory of Mind capacity and dehumanization is suggested by the central role of mentalizing in promoting prosociality and inhibit antisocial behaviors to others (Hare, 2017). Neurobiological evidence demonstrates mental states of threatening outgroup members are not recognized (Bedny, Pascual-Leone, & Saxe, 2009; Cikara, Bruneau, & Saxe, 2011; Cikara, Eberhardt, & Fiske, 2011; Harris & Fiske, 2006; Levy et al., 2016; Richins, Barreto, Karl, & Lawrence, 2019; Viki et al., 2013). Blatant dehumanization shows neural specificity that distinguishes it from negative or prejudice responses to others (Bruneau, Jacoby, Kteily, & Saxe, 2018). The left inferior parietal cortex (IPC) and left inferior frontal cortex (IFC) selectively respond during blatant dehumanization – areas involved in reducing mentalization and processing of social status (Bruneau et al., 2018; Cikara, Eberhardt, et al., 2011; Cloutier, Ambady, Meagher, & Gabrieli, 2012; Farrow et al., 2011; Jack, Dawson, & Norr, 2013). Consistent with the EEH, initial evidence suggests dehumanization of outgroups already occurs in early childhood with the appearance of full-blown Theory-of-Mind abilities (McLoughlin, Tipper, & Over, 2018).

The *Social Artifact hypothesis* (SAH) offers an alternative to the EEH. It suggests dehumanization results from enculturation. Through a lifetime of social learning and norm enforcement, individuals learn to use non-human entities, especially animals, as metaphors to emphasize negative traits of other groups (Dhont, Hodson, Loughnan, & Amiot, 2019; Goff,

Eberhardt, Williams, & Jackson, 2008). While animal analogies are widely used to degrade outgroups, the belief that humans are morally superior expresses itself late in development and is thought to be largely socially acquired (Wilks, Caviola, Kahane, & Bloom, 2020). Even the most insulting animalistic slurs that engender disgust of other groups are only ever meant and understood metaphorically (Over, 2020; Smith, 2020).

SAH points to a gap in evidence used to suggest EEH. It remains unknown what degree of enculturation or training is required to observed dehumanization. Cross-cultural questionnaires sample adults and have largely relied on a single measure of dehumanization known as the Ascent of Man. This measure relies on the common misconception that evolution in a linear progression toward human perfection (see Figure 1; Kteily & Bruneau, 2017). Similarly, children have only ranked humanness using the Face Continuum scale that requires a degree of training (see Figure 1; McLoughlin et al, 2018). Another line of studies investigated dehumanization using implicit and explicit trait attribution, and find that people attribute more human-related qualities and secondary emotions to ingroup rather than outgroup targets (Haslam & Loughman, 2014). Because the trait attribution tasks require advanced language comprehension abilities, only literate children were tested (Chas, Betancor, Delgado, & Rodríguez-Pérez, 2018; Costello & Hodson, 2014; Martin, Bennett, & Murray, 2008; van Noorden, Haselager, Cillessen, & Bukowski, 2014). Moreover, recent research reveals age difference in associating emotion terms with humanness. As compared to literate children, adults derive more clues about humanity from emotions which have cultural difference in expression (Rodríguez-Pérez, Betancor-Rodríguez, Ariño-Mateo, Demoulin, & Leyens, 2014; Rodríguez, Villar, Rodríguez-Pérez, & Rodríguez, 2016). Traits that are thought to represent humanness also vary across cultures (Bain, Vaes, Kashima, Haslam, & Guan, 2012). These findings suggest that

the understanding of the association between traits and humanness is heavily influenced by social learning. Together, the existing observations may only represent different participants' idiosyncratic understanding and response to these specific representations of humanness. Children may not spontaneously dehumanize without enculturation or explicit training by adults.

To test the two hypotheses, what is needed now is an assessment of dehumanizing tendencies in children who have developed full-blown theory-of-mind (i.e. five years or older) using multiple measures that vary in familiarity and intuitiveness. If dehumanization emerges early (EEH) with the maturation of Theory-of-Mind network, then a variety of stimuli that provide a scale of humanness, regardless of familiarity, should illicit stronger dehumanizing responses toward outgroup than ingroups. Children should be more likely to view the outgroup as inferior while being less likely to act prosocially and more accepting of harm toward them. This tendency will not change during middle childhood when children are exposed to formal schooling. If dehumanization is largely a social artifact shaped by enculturation and familiarity with materials (SAH), then each scale should illicit very different responses in children, and their responses will largely be unassociated with the perception of group hierarchy, prosociality or acceptance of harm. In pace with socialization, the dehumanizing tendency will develop with age.

General Method

We used the Ascent of Man, Face Continuum, and Human Silhouette scales (see Figure 1) to evaluate the tendency of school-age children to dehumanize outgroups. Each scale asked participants to indicate how human a group is by using a scale from “the least human-like” to “fully human”. The Ascent of Man scale presents cartoons of human ancestors that are

increasingly human-like and is validated for use with adults (Kteily et al., 2015). For use with children, we adapted the scale by reducing it to four items and using more differentiated species (i.e. those with more taxonomic distance between them). The Face Continuum scale was previously developed for use with children and presents four face morphs from a non-human-like doll face to a completely human face (McLoughlin et al., 2018). We also created the Human Silhouette scale that depicts the silhouettes of a human in a four-item scale with each item showing a more complete cartoon silhouette of a human. We designed this scale to show the “progress” toward being fully human without requiring children to need knowledge about evolution that might be necessary to fully understand the Ascent of Man scale. Prior to the examination of children, a validation study in adults was conducted to verify that the Face Continuum scale and the Human Silhouette scale can capture dehumanizing responses as the Ascent of Man scale does.

Power Analysis

To obtain 80% power to detect a small effect ($d = 0.25$) with an $\alpha = .05$ in the comparison between ingroup and outgroup ratings of humanness on each scale using two-tailed Wilcoxon signed rank tests, G*Power specifies a sample size of 134. A priori power analysis for logistic regressions specified a sample size of 110 to obtain 80% power to detect a medium effect (odds ratio = 3.47; see (Chen, Cohen, & Chen, 2010) in the comparison of dehumanization across scales. To obtain 80% power to detect a medium effect (odds ratio = 3.47) of a continuous covariate (SDO, outgroup prosociality, and demographic variables for models in Study 1; SDO-c, scale of humanness, social acceptance, outgroup sharing, outgroup punishment, and demographic variables for models in Study 2) using logistic regressions, G*Power specifies a

sample size of 55. Our final data included a sample size of 482 in adults and a sample size of 150 in children. The subsample size involved in analyses with continuous covariates is greater than or equal to 58. Therefore, we are sufficiently powered.

Ethics Statement

All research and consent procedures were approved by the campus institutional review boards at Duke University (IRB Protocol Number: 2018-0035). For Study 2, all Zoo Atlanta granted consent and an opt-out parental permission form was provided to all children's parents. All studies reported in this paper comply with all relevant ethical regulations.

Study 1

We first validate that the three measures of humanness can elicit similar responses in adults toward a group that is perceived as threatening in the US and was one of the most strongly dehumanized group in previous research (Kteily et al., 2015). We systematically examine the dehumanizing responses by observing the association with the endorsement of group-based hierarchy and biased prosociality which were seen in previous investigations of dehumanization (Kteily et al., 2015; Kteily et al., 2016).

Participants

482 participants (mean age = 36.39, SD = 11.17; 267 males, 215 females) completed an online survey (see Appendix 1 for demographics of the participants and details of the survey). They were recruited using Amazon's Mechanical Turk (MTurk: www.mturk.com) and completed the survey as part of a larger study (see supplemental materials). All participants were from the

United States and received \$1 for completing the survey regardless of their responses. Another 26 participants did not complete the assessment based on predetermined demographic exclusion criteria (i.e. they self-identified as belonging to the identity we used as outgroup. We assigned “Muslims” as the outgroup because previous work with online samples shows U.S. participants most heavily dehumanize this group relative to other racial and ethnic groups in this context; Kteily et al, 2015).

Survey

Participants reported their racial or ethnic group and then responded to the survey which included the following measures:

Humanness scales: allowed participants to rate their own ethnic group and Muslims using the Ascent of Man, Face Continuum, and Human Silhouette. We code the responses on each scale from 4 = the least human-like to 1 = fully human, so that higher scores represent lower perceived humanness.

Social Dominance Orientation (SDO, Cronbach’s $\alpha = 0.95$): SDO was measured using the standardized 16-item SDO 7 Scale (Ho et al., 2015). Participants rated their agreement with each of the items following a 7-point Likert scale (from 1 = strongly disagree to 7 = strongly agree).

Outgroup Prosociality: allowed participants to choose how to distribute a \$0.5 donation between an ingroup and outgroup cause. The ingroup cause was a relief fund for victims of the Santa Fe High School shooting. The outgroup cause was a relief fund for Afghanistan victims of war.

Participants were allowed to choose from six different amounts to donate to the Afghanistan fund (from \$0 to \$0.5, interval = \$0.1). Whatever remained was distributed to the relief fund for the ingroup.

See Supplementary materials for measures of intergroup divide and demographic variables such as *sex*, *age*, and *political preference* etc.

Analysis

Data were exported from Qualtrics in tabular form. Data were evaluated and one single response for each participant was ensured using IP addresses and Mturk ID. R4.0.0 was used to analyze the data. All three humanness measures were treated as ordinal. Cronbach's α coefficients of ingroup and outgroup ratings were calculated respectively across the three humanness measures to test for internal consistency. SDO, outgroup prosociality, and age were entered as continuous variables. Sex was treated as binary. Wilcoxon signed rank tests were performed to demonstrate blatant dehumanization by comparing the perceived humanness of the ingroup and the outgroup. The effect size r 's were calculated as $Z/\sqrt{N}$ and values were interpreted as small (0.1), medium (0.3), and large (0.5) (Fritz, Morris, & Richler, 2012). We calculated ordinal logistic regressions with cumulative link mixed models to 1) compare dehumanization across the three humanness measures, with Ascent of Man scale defined as the reference (See full results in Supplementary Table 3); 2) test for a relationship between dehumanization and SDO as well as outgroup prosociality (See full results in Supplementary Table 4–5); and 3) identify predictors of dehumanization among demographic variables (See full results in Supplementary Table 10). All tests were two-tailed, and p values were adjusted using Holm-Bonferroni method.

Results and discussion

Figure 2 presents participant responses on the three scales of humanness. Cronbach's α suggested acceptable internal consistency of the three scales on measuring outgroup humanness

(Cronbach's $\alpha = .71$). Lower Cronbach's α (.43) was obtained across ingroup humanness measures due to low variance of ratings on each scale (71.78% of the participants rated the ingroup as "fully human" on all three scales. See details of the distribution in Supplementary Table 1).

Dehumanization of the outgroup is observed on each scale, with the outgroup more likely rated as less human-like than the ingroup (Ascent of Man: $Z = 5.24$, effect size $r = .24$, $p < .001$; Face Continuum: $Z = 7.00$, effect size $r = .32$, $p < .001$; and Human Silhouette: $Z = 5.16$, effect size $r = .24$, $p < .001$). No significant differences across the three humanness measures were detected when comparing ratings of different groups, with the Face Continuum and Human Silhouette eliciting similar levels of dehumanization as the Ascent of Man scale (see odds ratio of the comparison of humanness ratings on each scale in Figure 3).

With ratings on the different scales being consistent with each other, we combined them into a single measure of dehumanization by treating responses to the three scales as different observations of the same variable. Using this combined measure, we find that participants who were more likely to dehumanize the outgroup scored higher on SDO (odds ratio = 1.02, 95% CI = [1.01, 1.04]; $Z = 3.70$, $p < .001$). Outgroup dehumanization is also associated with less willingness to donate to the outgroup (odds ratio = 0.73, 95% CI = [0.61, 0.86]; $Z = -3.66$, $p < .001$). Together, the results validate the three humanness measures by showing that they elicit similar dehumanizing responses in adults and replicating the link between dehumanization, endorsement of social hierarchy and withdrawal of prosociality.

Study 2

In Study 2, we examine dehumanization in children aged five years and older because they have developed full-blown theory-of-mind ability and are able to perceive or deny a full human mind of other individuals. We designed a situation in which participants compete against a hypothetical peer group. We assessed responses toward the hypothetical outgroup using the three humanness measures. To verify that participants understood the scales of humanness, a pre-test was conducted. Similar to the observation of adults, we also tested the association of dehumanization with SDO and empathic responses in children.

Participants

We tested 150 children (5-12 years old, mean age = 7.72, SD = 1.64; 78 boys, 72 girls). Participants were tested in groups of similarly aged children (the age difference within a group was always less than two years) at a week-long summer camp at Zoo Atlanta. The children were from families of middle-class economic backgrounds and a relatively heterogenous racial composition, but individual data was not collected on these variables to avoid possible association of socioeconomic status or racial groups with dehumanizing representations. Each child participated in the camp activities with the same group for 1-3 days immediately before the experiment, so they were familiar with their group members. Each group was also assigned with the name of a charismatic animal present at the zoo (i.e., the lions, flamingos, etc.), which facilitated the sense of group identity. They came to the experiment in groups of 9-11 children and remained with familiar members of their groups during the experiment - a knowledge competition against a hypothetical peer group.

Procedure

After entering the experimental room, children were directed to sit around a table. They could see each other and the experimenter but could not see the responses other children made during the experiment. They were asked not to speak with each other and to carefully follow the experimenter's instruction. Children who were not able to follow the rules were allowed to finish the experiment, but their groups data was discarded (N=7).

Children first participated in a comprehension pre-test (See Appendix 2 for the procedure) that required they correctly order the different items of each of the three scales according to the degree of humanness they illustrated (See Figure 1 for the correct order of each). 139 (92.67% of the sample) correctly ranked the scale items.

Children were next introduced by the experimenter to a hypothetical outgroup. The experimenter told the children they would be competing against another group of campers from a different zoo in a memory competition. The experimenter referred to this outgroup by their group's animal name - the "Slug group". The campers were also told that the counselors at the other camp thought the Slug group was "impolite, selfish and sloppy" (See Appendix 2 for the standardized script). The experimenter then introduced the children to some animal facts and led them in the memory competition that quizzed them about these same facts.

The children independently filled a physical paper-pencil survey by circling the answers they agreed with the most (see Appendix 2 for the procedure and wordings). The experimenter guided the children through the questions making sure all participants could complete them regardless of their reading level. In doing so, experimenters never indicated how a child should respond. The questionnaire included a measure of:

Humanness: Participants rated the humanness of their own group and the Slug group using the Ascent of Man, Face Continuum, and Human Silhouette scales. This only required

looking at the pictures of the scales and circling the item on the scale they believed best fit the group they were evaluating. Identical to Study 1, we code the responses on each scale from 4 = the least human-like to 1 = fully human.

Social Dominance Orientation-children (SDO-c, Cronbach's $\alpha = .66$): Participants responded to four age appropriate questions using a 5-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). These questions were adapted from the SDO scale (Ho et al., 2015) and were designed to measure the endorsement of ingroup superiority over the Slug group.

Social Acceptance: The experimenter described a hypothetical scenario in which a member of the Slug group joined the participants' group. The children were asked to indicate their feelings about this person joining their group using a 7-point Likert scale (from 1 = very happy to 7 = very sad).

Outgroup Punishment: This measure was added for the 2019 data collection season and used with a subsample of 58 participants (mean age = 8.22, SD = 1.58; 30 girls, 28 boys). The experimenter described a hypothetical scenario in which a member of the Slug group betrayed a non-Slug group member and tore apart the victim's painting. Participants were instructed to decide how many hours the misbehaving person should be made to wait before she could visit the zoo animals again. Children chose the number of hours from a list of choices (from 0h to 5h) provided.

Outgroup Sharing: This measure was added in the latter half of the 2018 data collection season and carried over into 2019. A subsample of 87 participants (mean age = 7.89, SD = 1.52, 43 girls, 44 boys) responded to it. Each participant was allowed to choose five of their favorite stickers from a large collection. They were then asked how many they were willing to share with

the Slug group. They did this by giving them back to the experimenter and marking on their paper how many they would share.

Children then marked their age and gender on the survey and their responses were collected. To protect the privacy of the children, no video recordings were made of the testing sessions.

Analysis

Only test data from children who correctly ranked the scale items in the comprehension pretest were included in the analysis (N=11 failed this pre-test). R4.0.0 was used to analyze the data. Humanness measures were treated as ordinal. Internal consistency of the three scales was measured using Cronbach's α . SDO-c, social acceptance, outgroup punishment, outgroup sharing, and age were entered as continuous variables. Gender was treated as binary. Wilcoxon signed rank tests were performed to demonstrate blatant dehumanization in children by comparing the perceived humanness of the ingroup and the outgroup. Ordinal logistic regressions were calculated using cumulative link mixed models to 1) compare dehumanization across the three humanness measures, with Ascent of Man scale defined as the reference (See full results in Supplementary Table 13); 2) test the relation between dehumanization and SDO-c as well as behavioral outcomes, including social acceptance, outgroup sharing and punishment (See full results in Supplementary Table 14–S17); and 3) identify predictors of dehumanization among age and gender (See full results in Supplementary Table 19). All tests were two-tailed, and p values were adjusted using Holm-Bonferroni method.

Results and discussion

Figure 4 depicts the response of the children to each of the humanness scales. Cronbach's α coefficients suggested relatively high internal consistency of the three scales on measuring humanness of the outgroup ($\alpha = .83$) and acceptable internal consistency on measuring ingroup humanness ($\alpha = .69$, see details of the distribution in Supplementary Table 11).

Dehumanization is observed on each scale, with the outgroup being more likely to be rated as less human-like than the ingroup (Ascent of Man: $Z = 8.52$, effect size $r = .70$, $p < .001$; Face Continuum: $Z = 8.80$, effect size $r = .72$, $p < .001$; and Human Silhouette: $Z = 8.87$, effect size $r = .72$, $p < .001$). Children were more likely to dehumanize the outgroup on Human Silhouette than the Ascent of Man scale (odds ratio = 3.25, 95% CI = [1.28, 8.22]; $Z = 2.48$, $p = .04$). We did not see significant difference between ratings on Ascent of Man and Face Continuum (see odds ratio of the comparison of humanness ratings on each scale in Figure 5).

Identical to Study 1, since responses to the three scales are consistent (based on Cronbach's α), we combined them and created a single measure of dehumanization. Using this combined measure, results show that children who are more likely to dehumanize the outgroup scored higher on SDO-c (odds ratio = 1.24, 95% CI = [1.12, 1.38]; $Z = 3.99$, $p < .001$). The dehumanization tendency is also associated with more willingness to punish the outgroup member (odds ratio = 2.95, 95% CI = [1.90, 4.57]; $Z = 4.83$, $p < .001$), but only a trend for children to show reduced willingness to share stickers with the outgroup (odds ratio = 0.73, 95% CI = [0.54, 0.97]; $Z = -2.14$, $p = .06$). Ordinal logistic regressions reveal that neither age nor gender predicted levels of dehumanization.

General discussion

Results support the Early Emergence hypothesis. Children show higher levels of dehumanization of outgroup than ingroup in response to all three representations of humanness. This pattern does not change with age in middle childhood. Responses in adults and children were both associated with participants' social dominance orientation – replicating the previously established pattern in adults (Kteily et al., 2015). In both age groups, higher outgroup dehumanization was associated with stronger agreement with statements of group dominance and inequality. Similar to the previously demonstrated link between acceptance of punishment and outgroup dehumanization in adults (Bandura et al., 1975; Jardina & Piston, 2016), children who dehumanized more also recommended more severe punishment for a misbehaving member of the Slug group. The link between dehumanization and prosociality was also investigated. In adults, similar to previous findings (Kteily et al., 2015), smaller allocations of support toward an outgroup charity was associated with dehumanization of the outgroup. However, in children, only a non-significant trend was observed between outgroup dehumanization and less sharing of stickers with the Slug group. As well, we did not see a link between dehumanization and decreased social acceptance. This suggests that dehumanization and disliking (i.e. the basis for prejudice) might already be distinguishable early in development (Dore, Hoffman, Lillard, & Trawalter, 2014).

There was only limited support for the Social Artifact hypothesis. As predicted by the SAH, children did show a significant difference in the degree they dehumanized between the scales. Children dehumanize more in response to the Human Silhouette scale than the Ascent of Man scale. This might be because this simplified scale was more intuitive that might illicit a stronger response once exposed to the erroneous belief it represents human progress. This might be viewed as support for the idea that adolescent or adult levels of exposure are needed to fully shape dehumanizing responses. However, the consistent responses across childhood suggest that

dehumanization emerges before the prosociality toward outgroups become sensitive to social norms (House et al., 2013). The overall similarity in the pattern of results between adults and children in response to all three scales, despite this one difference, also suggests that dehumanization does not require a lifetime of intense exposure to cultural norms or education to be blatantly expressed. Instead, individual differences in the expression of dehumanization may be largely due to socialization during infancy and early childhood.

We introduced a number of new instruments and results that provide initial support for the validity of our new measures. Our results with adults replicate the pattern seen in previous investigations of dehumanization using similar samples and questionnaires. With the three humanness measures, we again observe the link between dehumanization, perception of social hierarchy, and prosociality. Our pre-tests with the children helped demonstrate that the majority of participants can intuitively understand all three scales with little, if any, explicit training. The similarity of children's responses to the adult patterns also suggests these scales can measure dehumanization at younger ages.

The main limitations of our tests derive from the methodological differences inherent in comparing adults to preliterate children. Group psychology can be manipulated in adults simply by mentioning the identity of a familiar outgroup. Questionnaires can also be completed anonymously. With children, we felt the most age appropriate method was to use a manipulation of group membership guided by an experimenter. The high level of outgroup dehumanization in children might be attributable to this method of manipulation and lack of anonymity. For the most meaningful quantitative comparisons across ages, future studies will need to develop more comparable methods.

Our findings have important implications for cognitive models and efforts to encourage intergroup tolerance. The early appearance of dehumanization and concurrent moral disengagement are coherent with the hypothesis that dehumanization occurs through a specialized cognitive process that dampens theory-of-mind and denies a fully human mind to others (Hare, 2017; Hare & Woods, 2020). Future work can test this prediction further by examining the link between theory-of-mind and dehumanization during early development. Measures of metaphorical reasoning can also be used to directly test its role. In addition, increases in self-control during adolescent development may also help explain individual differences in blatant dehumanization (i.e. increases in self-control are likely linked to reduced dehumanization; Hare, 2017). It will also be critical to test if positive intergroup contact reduces or prevents dehumanization in adults and children (Bohman & Miklikowska, 2020; Hodson, Crisp, Meleady, & Earle, 2018; Vezzali, Hewstone, Capozza, Trifiletti, & Bernardo, 2017). Our results seem to suggest early socialization by parents and exposure to a diverse range of people in infancy and early childhood will have the greatest impact on reducing dehumanizing tendencies. Essential to any of this future work will be the use of as diverse and representative as possible. Previous research has revealed the prevalence of dehumanization across Western and Middle Eastern countries (Kteily & Bruneau, 2017), but few investigations have been conducted with either East Asian or non-WEIRD societies. Advanced statistical tools can be leveraged to allow for powerful quantitative comparisons across cultures and regions (Muthukrishna et al., 2020). This type of research promises to reveal ways to further promote concern and cooperation among human groups of all identities.

References

- Bain, P., Vaes, J., Kashima, Y., Haslam, N., & Guan, Y. (2012). Folk conceptions of humanness: Beliefs about distinctive and core human characteristics in Australia, Italy, and China. *Journal of cross-cultural psychology*, 43(1), 53-58.
- Bandura, A. (2016). *Moral disengagement: How people do harm and live with themselves*: Worth Publishers.
- Bandura, A., Underwood, B., & Fromson, M. E. (1975). Disinhibition of aggression through diffusion of responsibility and dehumanization of victims. *Journal of Research in Personality*, 9(4), 253-269.
- Bedny, M., Pascual-Leone, A., & Saxe, R. R. (2009). Growing up blind does not change the neural bases of Theory of Mind. *Proceedings of the National Academy of Sciences*, 106(27), 11312-11317.
- Bohman, A., & Miklikowska, M. (2020). Does classroom diversity improve intergroup relations? Short- and long-term effects of classroom diversity for cross-ethnic friendships and anti-immigrant attitudes in adolescence. *Group Processes & Intergroup Relations*. doi:<https://doi.org/10.1177/1368430220941592>
- Bruneau, E., Jacoby, N., Kteily, N., & Saxe, R. (2018). Denying humanity: The distinct neural correlates of blatant dehumanization. *Journal of Experimental Psychology: General*, 147(7), 1078-1093.
- Chas, A., Betancor, V., Delgado, N., & Rodríguez-Pérez, A. (2018). Children consider their own group to be more human than other social groups: Evidence from indirect and direct measures. *Social Psychology*, 49(3), 125.

426 Chen, H., Cohen, P., & Chen, S. (2010). How big is a big odds ratio? Interpreting the magnitudes
 427 of odds ratios in epidemiological studies. *Communications in Statistics—simulation and*
 428 *Computation*®, 39(4), 860-864.

429 Cikara, M., Bruneau, E. G., & Saxe, R. R. (2011). Us and them: Intergroup failures of empathy.
 430 *Current Directions in Psychological Science*, 20(3), 149-153.

431 Cikara, M., Eberhardt, J. L., & Fiske, S. T. (2011). From agents to objects: Sexist attitudes and
 432 neural responses to sexualized targets. *Journal of cognitive neuroscience*, 23(3), 540-551.

433 Cloutier, J., Ambady, N., Meagher, T., & Gabrieli, J. (2012). The neural substrates of person
 434 perception: Spontaneous use of financial and moral status knowledge. *Neuropsychologia*,
 435 50(9), 2371-2376.

436 Costello, K., & Hodson, G. (2014). Explaining dehumanization among children: The interspecies
 437 model of prejudice. *British Journal of Social Psychology*, 53(1), 175–197.

438 Dhont, K., Hodson, G., Loughnan, S., & Amiot, C. E. (2019). Rethinking human-animal
 439 relations: The critical role of social psychology. *Group Process & Intergroup Relations*,
 440 22(6), 769-784.

441 Dore, R. A., Hoffman, K. M., Lillard, A. S., & Trawalter, S. (2014). Children's racial bias in
 442 perceptions of others' pain. *British Journal of Developmental Psychology*, 32(2), 218-
 443 231.

444 Farrow, T. F., Jones, S. C., Kaylor-Hughes, C. J., Wilkinson, I. D., Woodruff, P. W., Hunter, M.
 445 D., & Spence, S. A. (2011). Higher or lower? The functional anatomy of perceived
 446 allocentric social hierarchies. *Neuroimage*, 57(4), 1552-1560.

447 Fritz, C. O., Morris, P. E., & Richler, J. J. (2012). Effect size estimates: current use, calculations,
 448 and interpretation. *Journal of Experimental Psychology: General*, 141(1), 2-18.

449 Goff, P. A., Eberhardt, J. L., Williams, M. J., & Jackson, M. C. (2008). Not yet human: implicit
 450 knowledge, historical dehumanization, and contemporary consequences. *Journal of*
 451 *Personality and Social Psychology*, 94(2), 292-306.

452 Harris, L. T., & Fiske, S. T. (2006). Dehumanizing the lowest of the low: Neuroimaging
 453 responses to extreme out-groups. *Psychological science*, 17(10), 847-853.

454 Haslam, N., & Loughman, S. (2014). Dehumanization and infrahumanization. *Annu Rev*
 455 *Psychol*, 65, 399-423. doi:10.1146/annurev-psych-010213-115045

456 Ho, A. K., Sidanius, J., Kteily, N., Sheehy-Skeffington, J., Pratto, F., Henkel, K. E., . . . Stewart,
 457 A. L. (2015). The nature of social dominance orientation: Theorizing and measuring
 458 preferences for intergroup inequality using the new SDO₇ scale. *Journal of Personality*
 459 *and Social Psychology*, 109(6), 1003-1028.

460 Hodson, G., Crisp, R. J., Meleady, R., & Earle, M. (2018). Intergroup contact as an agent of
 461 cognitive liberalization. *Perspectives on Psychological Science*, 13(5), 523-548.

462 House, B. R., Silk, J. B., Henrich, J., Barrett, H. C., Scelza, B. A., Boyette, A. H., . . . Laurence,
 463 S. (2013). Ontogeny of prosocial behavior across diverse societies. *Proceedings of the*
 464 *National Academy of Sciences*, 110(36), 14586-14591.

465 Jack, A. I., Dawson, A. J., & Norr, M. E. (2013). Seeing human: distinct and overlapping neural
 466 signatures associated with two forms of dehumanization. *Neuroimage*, 79, 313-328.
 467 doi:10.1016/j.neuroimage.2013.04.109

468 Jardina, A., & Piston, S. (2016). *Dehumanization of black people motivates white support for*
 469 *punitive criminal justice policies*. Paper presented at the Annual Meeting of the American
 470 Political Science Association, Philadelphia, PA.

471 Kteily, N., & Bruneau, E. (2017). Darker demons of our nature: The need to (re) focus attention
 472 on blatant forms of dehumanization. *Current Directions in Psychological Science*, 26(6),
 473 487-494.

474 Kteily, N., Bruneau, E., Waytz, A., & Cotterill, S. (2015). The ascent of man: Theoretical and
 475 empirical evidence for blatant dehumanization. *J Pers Soc Psychol*, 109(5), 901-931.
 476 doi:10.1037/pspp0000048

477 Kteily, N., Hodson, G., & Bruneau, E. (2016). They see us as less than human:
 478 Metadehumanization predicts intergroup conflict via reciprocal dehumanization. *Journal*
 479 *of Personality and Social Psychology*, 110(3), 343.

480 Levy, J., Goldstein, A., Inlus, M., Masalha, S., Zagoory-Sharon, O., & Feldman, R. (2016).
 481 Adolescents growing up amidst intractable conflict attenuate brain response to pain of
 482 outgroup. *Proceedings of the National Academy of Sciences*, 113(48), 13696-13701.

483 Markowitz, D. M., & Slovic, P. (2020). Social, psychological, and demographic characteristics
 484 of dehumanization toward immigrants. *Proceedings of the National Academy of Sciences*,
 485 117(17), 9260-9269.

486 Martin, J., Bennett, M., & Murray, W. S. (2008). A developmental study of the
 487 infrahumanization hypothesis. *British Journal of Developmental Psychology*, 26(2), 153-
 488 162.

489 McCallum, C. (2001). *Gender and sociality in Amazonia: how real people are made*. Oxford:
 490 Berg.

491 McLoughlin, N., Tipper, S. P., & Over, H. (2018). Young children perceive less humanness in
 492 outgroup faces. *Developmental science*, 21(2), e12539.

493 Muthukrishna, M., Bell, A. V., Henrich, J., Curtin, C. M., Gedranovich, A., McInerney, J., &
 494 Thue, B. (2020). Beyond western, educated, industrial, rich, and democratic (WEIRD)
 495 psychology: measuring and mapping scales of cultural and psychological distance.
 496 *Psychological science*, 31(6), 678-701.

497 Over, H. (2020). Seven challenges for the dehumanization hypothesis. *Perspectives on*
 498 *Psychological Science*. doi:<https://doi.org/10.1177/1745691620902133>

499 Richins, M. T., Barreto, M., Karl, A., & Lawrence, N. (2019). Empathic responses are reduced to
 500 competitive but not non-competitive outgroups. *Social neuroscience*, 14(3), 345-358.

501 Rodríguez-Pérez, A., Betancor-Rodríguez, V., Ariño-Mateo, E., Demoulin, S., & Leyens, J.-P.
 502 (2014). Normative data for 148 Spanish emotional words in terms of attributions of
 503 humanity.[Datos normativos de 148 términos afectivos en dimensiones relacionadas con
 504 la atribución de humanidad]. *Anales de Psicología/Annals of Psychology*, 30(3), 1137-
 505 1145.

506 Rodríguez, V. B., Villar, A. C., Rodríguez-Pérez, A., & Rodríguez, N. D. (2016).
 507 Infrahumanization in children: An evaluation of 70 terms relating to humanity.
 508 *Psicothema*, 28(1), 53-58.

509 Smith, D. L. (2020). *On inhumanity: Dehumanization and how to resist it*: Oxford University
 510 Press.

511 Sumner, W. G. (1906). *Folkways: A study of the sociological importance of usages, manners,*
 512 *customs, mores, and morals*. Boston: Ginn.

513 Trounson, J. S., Critchley, C., & Pfeifer, J. E. (2015). Australian attitudes toward asylum
 514 seekers: Roles of dehumanization and social dominance theory. *Social Behavior and*
 515 *Personality: an international journal*, 43(10), 1641-1655.

516 van Noorden, T. H., Haselager, G. J., Cillessen, A. H., & Bukowski, W. M. (2014).
 517 Dehumanization in children: The link with moral disengagement in bullying and
 518 victimization. *Aggressive behavior*, 40(4), 320-328.

519 Vezzali, L., Hewstone, M., Capozza, D., Trifiletti, E., & Bernardo, G. A. D. (2017). Improving
 520 intergroup relations with extended contact among young children: Mediation by
 521 intergroup empathy and moderation by direct intergroup contact. *Journal of Community
 522 & Applied Social Psychology*, 27(1), 35-49.

523 Viki, G. T., Osgood, D., & Phillips, S. (2013). Dehumanization and self-reported proclivity to
 524 torture prisoners of war. *Journal of Experimental Social Psychology*, 49(3), 325-328.

525 Wilks, M., Caviola, L., Kahane, G., & Bloom, P. (2020). Children prioritize humans over
 526 animals less than adults do. doi: <https://doi.org/10.1177/0956797620960398>

Author contributions

Both authors contributed to the study design. W.Z. performed testing, data collection, data analysis and interpretation under the supervision of B.H. Both authors wrote the manuscript and approved the final version of the manuscript for submission.

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540 **Figures**

Figure 1. The three measures of humanness. **a)** Ascent of Man, **b)** the Face Continuum and **c)** the Human Silhouette. Ratings on each measure were coded following the 4-point scale from 1= fully human to 4 = the least human-like (as illustrated in Panel **d**).

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550 **Figure 2.** Perceived humanness of the ingroup and the outgroup across three measures in adults
 551 (Study 1). The ratings were coded following the 4-point scale from 1= fully human to 4 = the
 552 least human-like. As such, higher ratings represent lower perceived humanness. Each histogram
 553 demonstrates the number of participants who made the rating.

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Figure 3. Dehumanization on each measure of humanness in adults (Study 1). Dehumanization is defined that the outgroup as compared to the ingroup is more likely (odds ratio > 1) to be rated less human-like. Ascent = Ascent of Man. Face = The Face Continuum. Silhouette = The Human Silhouette. Error bars represent 95% confidence intervals. Odds ratios and confidence intervals are calculated from the results reported in Supplementary Table 3.

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Figure 4. Perceived humanness of the ingroup and the outgroup across three measures in children (Study 2). The ratings were coded following the 4-point scale from 1= fully human to 4 = the least human-like. As such, higher ratings represent lower perceived humanness. Each histogram demonstrates the number of participants who made the rating.

Figure 5. Dehumanization on each measure of humanness in children (Study 2).

Dehumanization is defined that the outgroup as compared to the ingroup is more likely (odds ratio > 1 on the horizontal axis) to be rated less human-like. Ascent = Ascent of Man. Face = The Face Continuum. Silhouette = The Human Silhouette. Error bars represent 95% confidence intervals. Odds ratios and confidence intervals are calculated from the results reported in Supplementary Table 13.