Ethnic Diversity Matters:

Putting Implicit Associations between Weapons and Ethnicity in Context

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Abstract

Weapons are implicitly associated with Black Americans. We examined the extent to which this implicit stereotype fluctuates as a function of the ethnic diversity of contexts. Across 351 U.S. metropolitan areas, we tested whether three distinct indicators of ethnic diversity predicted implicit associations between the concept of “weapons” (vs. “harmless objects”) and Black Americans vs. White Americans. As predicted, implicit Black-weapon stereotypes were weaker in areas characterized by the presence of multiple ethnic groups (variety) and greater dispersion of ethnic groups at the neighborhood level (integration). Additionally, the negative association between integration and implicit stereotypes was strongest when minority representation was low compared to high. Considering multiple dimensions of ethnic diversity proved useful to document reliable relations between implicit associations and characteristics of local contexts.

Ethnic Diversity Matters:

Putting Implicit Associations between Weapons and Ethnicity in Context

Guns, violence, and criminality are concepts implicitly associated with Black Americans compared to White Americans (Correll, Hudson, Guillermo, & Ma, 2014; Payne, 2006). These cultural associations reflect the notion that Black Americans are appraised as sources of danger and threat (Correll, Park, Judd, & Wittenbrink, 2002; Correll, Urland, & Ito, 2006). Prior research on this topic has focused primarily on understanding the mechanisms underlying such stereotypical assumptions (Correll et al., 2002; Correll, Wittenbrink, Crawford, & Sadler, 2015; Gonsalkorale, Sherman, Allen, Klauer, & Amodio; Greenwald, Oakes, & Hoffman, 2003; Payne, 2001, 2005) and identifying the circumstances under which their effects are exacerbated or mitigated (Correll, Park, Judd, Wittenbrink, Sadler, & Keese, 2007; Payne, Lambert, & Jacoby, 2002; Plant, Peruche, & Butz, 2005; Sim, Correll, & Sadler, 2013). The latter has examined proximal factors that affect the extent of bias expressed, such as individual-level variables (training or expertise; Sim et al., 2013) or characteristics of the immediate context (disrepair of the background scene; Correll, Wittenbrink, Park, Judd, & Goyle, 2011). Here, we sought to uncover contextual factors—at the level of the metropolitan area in which individuals are immersed—that account for stronger or weaker implicit Black-weapon associations. More precisely, our aim was to examine the extent to which such implicit stereotypes fluctuate as a function of ethnic diversity.

Contextual Variations in Implicit Associations

In line with socio-structural perspectives on implicit biases (Payne, Vuletich, & Lundberg, 2017; Yogeeswaran, Devos, & Nash, 2017), several research findings point to meaningful variations in implicit associations across contexts. For example, country-levels of

implicit gender stereotypes about science and math are linked to gender gaps in science and math performances (Nosek et al., 2009). In the same vein, country-levels of implicit prejudice toward overweight people are positively correlated with obesity rates (Marini et al., 2013). Mean-levels of implicit ethnic prejudices (pro-White or anti-Black attitudes) and stereotypes (Black-weapon associations) displayed by White residents are positively correlated with the disproportionate use of lethal force towards Blacks across U.S. geographical areas (Hehman, Flake, & Calanchini, 2017). Directly relevant to the aim of the present research, U.S. states and counties with larger proportions of Black to White residents are characterized by stronger implicit ingroup favoritism among both White and Black respondents (Rae, Newheiser, & Olson, 2015). These findings are similar to correlations showing that as the presence of Blacks in an area (zip code) increases, individual police officers evidence faster Black-weapon associations on the First Person Shooter Task (FPST; Correll et al., 2007). One important limitation of these pioneer demonstrations and analogous findings (Leitner, Heman, Ayduk, & Mendoza-Denton, 2016; Zerhouni, Rougier, & Muller, 2016) is the reliance on aggregated data. Averaging responses over a large number of participants based on their insertion in a specific context (e.g., country, state, county, or city) precludes exploration of effects contexts may have on implicit associations at the individual level. Instead of favoring one level of analysis over another, the present work combined context-level and individual-level analyses (see also MacInnis, Page-Gould, & Hodson, 2017).

Mixed Effects of Context Ethnic Diversity

Given the paucity of research on the relations between implicit intergroup biases and context diversity, lessons from research relying on more traditional investigative techniques are worth considering. To simplify, two contrasting trends emerge from the relevant literature. On

one hand, research stemming from an intergroup contact perspective has typically shown that ethnic diversity accounts for more tolerant attitudes toward ethnic minorities (for a review see Hewstone, 2015). On the other hand, some evidence is more consistent with the notion that ethnic diversity is associated with a sense of threat and, as such, intensifies prejudices (Dixon, 2006) and erodes social trust (Putnam, 2007). These two perspectives are not mutually exclusive. Context ethnic diversity can simultaneously be the source of opposite effects (Schmid, Al Ramiah, & Hewstone, 2014; Stolle, Soroka, & Johnston, 2008). For example, the presence of ethnic minorities can be associated with both a sense of group threat and opportunities for intergroup contact, respectively exacerbating and reducing prejudice (Dixon, 2006). The picture emerging from this literature suggests that the effects of context ethnic diversity on various aspects of relations between ethnic groups are complex and mixed (see also Cohen-Marks & Faught, 2010; Craig & Richeson, 2006; Craig, Rucker, & Richeson, 2018; Piekut & Valentine, 2016).

Dimensions of Context Ethnic Diversity and Black-Weapon Stereotype

To move research on this topic forward, it might be useful to adopt a multi-faceted perspective on context diversity (Biemann & Kearney, 2010; Budescu & Budescu, 2012; Harrison & Klein, 2007). Capitalizing on prior conceptual and empirical contributions (Iceland, 2004; Koopmans & Schaeffer, 2015; Massey & Denton, 1988; Reardon & Firebaugh, 2002), we distinguish three dimensions of context diversity. As a set, these dimensions have the potential to provide a more comprehensive and sophisticated perspective on the effects of context ethnic diversity.

The most common conceptualization of context diversity is in terms of the relative presence of a specific minority ethnic group in an area. Here, *minority representation* (MR) will

be instantiated as the proportion of the population Black Americans constitute. Defining diversity as minority representation assumes, implicitly or explicitly, a pairwise group comparison (e.g., number of Blacks is compared to everyone else combined). Thus, minority representation ignores variation in the presence of multiple minority ethnic groups across local contexts (White, Kim, & Glick, 2005). Two additional dimensions of diversity capture variation reflecting the multiethnic nature of contexts. *Variety* (V) reflects the presence of multiple ethnic groups in an area. More precisely, it captures the proportional equivalence of different ethnic groups in the context. Even though two contexts may be equivalent in terms of the proportion of Black residents, variety provides additional information about the representation of the remaining ethnic groups in the context. *Integration* (I) encapsulates the relative distribution of ethnic group proportions across smaller environments within an area (e.g., neighborhoods within a metropolitan area). As such, integration distinguishes areas in which ethnic groups are distributed similarly at both the neighborhood and metropolitan area levels (high integration) versus tend to be unevenly represented at the neighborhood (lower) level compared to their distribution at the metropolitan area or more inclusive level (low integration). Two metropolitan areas with the same level of variety can differ in terms of how diverse or homogeneous neighborhoods making up these metropolitan areas tend to be. If the distribution of ethnic groups at the neighborhood level reflects that of the metropolitan area, the metropolitan area is integrated. At the opposite end on the spectrum, there could be a metropolitan area in which ethnic groups are not dispersed across neighborhoods, but instead are highly concentrated. The metropolitan area would be characterized by a form of segregation with residents living in relatively homogenous ethnic enclaves. Thus, the integration-segregation dimension provides meaningful information about diversity beyond variety by tapping the extent to which the

distribution of ethnic groups is even across neighborhoods (integration) or characterized by deviations (under-representation or over-representation in some neighborhoods) from their distribution at the metropolitan area level.

In areas characterized by a relatively high *minority representation*, opportunities for exposure to and, in some cases, contact with Black Americans are more likely. Considering the relatively low base rates of violent and criminal activities, minority representation may help dilute stereotypic associations through exposure to or contact with counter-stereotypical Black Americans. Our first hypothesis (H1) was that implicit Black-weapon stereotypes would be weaker in areas with a relatively high proportion of Black Americans. We should acknowledge that the opposite prediction is also justifiable. As minority representation increases, the contrast between Black and White residents may be more pronounced and, as a result, implicit stereotypical associations may be reinforced. In line with this notion, at the individual level, implicit Black-weapon associations on the FPST were larger among police officers serving areas with higher proportions of Blacks (Correll et al., 2007). In contrast to police officers whose professional activities focus on identifying unlawful or criminal activities, residents are more likely to be exposed to evidence challenging Black-weapon associations given that, for them, the vast majority of daily situations do not involve an element of violence or criminal activity. Based on this assumption, we hypothesized that as the proportion of Black residents increases in a metropolitan area, prevalent implicit intergroup biases, including cultural stereotypes might be less pronounced (cf. Rae et al., 2015).

Variety is expected to account for implicit Black-weapon stereotypes over and above minority representation. Areas characterized by multiple ethnic groups allow more complex cognitive representations of the social environment rather than dichotomous categorical

thinking. Variety in ethnic group representations lays the groundwork for a more differentiated cognitive representation. To the extent that multiple minority ethnic groups constitute even shares of the populace, perception of the context as a diverse multiethnic community may emerge. This rationale is consistent with several lines of research pointing to the fact that a more complex or diverse representation of the social environment is linked to less pronounced intergroup biases (Brauer & Er-rafiy, 2011; Er-rafiy & Brauer, 2012; Hartstone & Augoustinos, 1995; Miller, Brewer, & Arbuckle, 2009; Waldzus, Mummendey, Wenzel, & Weber, 2003; Waldzus, Mummendey, & Wenzel, 2005). For example, individuals residing in ethnically diverse neighborhoods hold more complex and inclusive ingroup representations, which account for less ingroup favoritism and less intergroup social distance (Schmid, Hewstone, & Al Ramiah, 2013). Our second hypothesis (H2) was that implicit Black-weapon stereotypes would be weaker in areas characterized by a relatively even representation of multiple ethnic groups.

Integration may also contribute to implicit associations between weapons and ethnicity. Areas characterized by greater integration ought to facilitate frequent intergroup contact compared to relatively segregated areas. Moreover, areas in which members of different groups live and work together may foster more personal and positive contact experiences that in turn are associated with reduced intergroup biases (Schmid et al., 2014; Wagner, Hewstone, & Machleit, 1989). In addition, multicultural experiences are endemic to local contexts with higher levels of ethnic integration. Residents living in an integrated multiethnic neighborhood are likely to be exposed to cultural symbols and practices of varying ethnic groups. Multiethnic experiences are related to more positive intergroup relations, including less stereotypic expectations (Tadmor, Hong, Chao, Wiruchnipawan, & Wang, 2012). In addition, integration could potentially foster a strong endorsement and internalization of normative principles conflicting with stereotypical

and prejudicial responses. In contrast, segregation could perpetuate local social norms, which in turn may maintain and reinforce stereotypical expectations. Cross-sectional and longitudinal studies highlight the role of social norms to account for context effects of diversity on ethnic prejudice (Christ, Schmid, Lolliot, Swart, Stolle, Tausch, Al Ramiah, Wagner, Vertovec, & Hewstone, 2014). Rather than superficially endorsing the notion that ethnic distinctions and cultural differences ought to be tolerated, integration may promote multiculturalism as a normative principle that is deeply embedded in the local context. Our third hypothesis (H3) was that implicit Black-weapon stereotypes would be weaker in relatively integrated areas.

Research Overview

The aim of the present research was to systematically test the relations between three dimensions of ethnic diversity (minority representation, variety, and integration) and implicit stereotypic associations between weapons and ethnicity. We predicted that each indicator of ethnic diversity would uniquely account for implicit associations, controlling for socio-demographic variables such as ethnicity, age, gender, level of education, and political orientation. The three hypotheses were consistent with an additive model in that we posited that each dimension of context ethnic diversity would account for unique variance in implicit associations (over and above socio-demographic variables). We also examined the possibility that the effect of one diversity dimension might be moderated by another diversity dimension. The exploration of interactive effects allowed us to map on more complex configurations of ethnic diversity. Additionally, we examined if context diversity effects persisted after controlling for contextual factors previously found to relate to the magnitude of the FPST Black-weapon association (e.g., population size, violent crime; Correll et al., 2007). Finally, in light of prior research suggesting that the ethnic identity of respondents influences, at a minimum, the

magnitude of implicit intergroup biases (Nosek et al., 2007), we tested whether the effects of context diversity were moderated by this individual-level factor. At that level, our main goal was to determine whether the three dimensions of context diversity were sources of similar or different effects for White and Black respondents. Although the focus of the present research was on documenting context effects on implicit associations, we report homologous analyses on an explicit measure for comparison purposes.

Method

Participants

From 2004 to the end of 2015, the dataset based on the Weapon IAT available on the Project Implicit website (<https://implicit.harvard.edu>) included complete IAT data for 542,956 participants. Of these, 13,549 (2.5%) were dropped based on having 10% or more critical trial responses faster than 300 ms (Greenwald, Nosek, & Banaji, 2003; Nosek, Greenwald, & Banaji, 2007). Because participant demographic variables were controlled in analyses, only participants who reported race/ethnicity, age, gender, education attainment, and political orientation ($N = 415,447$) were included. Finally, participants must have reported a current zip code ($N = 340,245$), which must lie in a Metropolitan Statistical Area (MSA) with 50 or more participants. The final sample included 296,886 participants across 351 MSAs (of 382 possible MSAs) covering widely distinct U.S. regions. The median number of participants in an MSA was 2,826 (25th percentile 782, 75th percentile 6,561 and maximum 16,501). The number of MSAs included and the minimum number of participants per MSA were sufficient to allow requisite statistical power as guidelines suggest collection from 50 contexts and 20 participants per context for MLM (Hox, 1998).

Participants were 26.810 years old on average, ranging from 7 to 89 years. The sample had more women than men (56.7% female) and was composed of 72.1% Whites, 6.8% Blacks, 4.6% Asians, 4.9% Latino/as, and 11.7% who chose “Other”. Fifty-eight percent (58.3%) of participants who were at least 25 years old obtained a bachelor’s degree or more. Finally, participant political orientation varied but leaned slightly toward the liberal end of the spectrum ($M = 3.790$ on 1 to 6-point scale used 2004-2006; $M = 4.270$ on 1 to 7-point scale used 2006-2015). While very large, this dataset should not be mistaken as being representative of a definable population.

Procedure

Participants completed the IAT, a short questionnaire, and demographic questions. The dataset and a description of all measures are available at <https://osf.io/f4htw/>. The data file and analysis script necessary to reproduce the findings reported in this paper are publicly available at <https://osf.io/k5dvu/>. Only measures of interest to our specific research questions are described here.

Implicit weapon associations. The IAT assessed the direction and strength of the associations between the concepts “weapons” vs. “harmless objects” and two ethnic groups (“Black Americans” vs. “White Americans”). Stimuli are available at <https://www.projectimplicit.net/stimuli.html>. The two critical blocks of trials required categorizing these stimuli based on the appropriate dimension. In one block of trials, the concept “Black Americans” was paired with “weapons” and the concept “White Americans” was paired with “harmless objects.” In another block of trials, the concept “Black Americans” was paired with “harmless objects” and the concept “White Americans” was paired with “weapons.” Participants were asked to sort each stimulus into its correct category as quickly as possible by

pressing the appropriate key. When participants made an error, a red “X” appeared below the stimulus. When this happened, participants were required to choose the correct answer in order to move on to the next trial. Each critical block included a total of 60 trials with a brief message appearing after the first 20 trials to remind participants to go fast. The order of the blocks was randomized across participants.

Explicit weapon associations. Participants were asked to indicate to what extent they associate weapons and harmless objects with Black Americans and White Americans. For each type of object, responses were provided on a 7-point scale with options ranging from “Strongly with Black people” to “Strongly with White people”. The mid-point of the response scale indicated that objects were “Neither Black nor White”. A difference score was created by subtracting the rating of harmless objects from the rating of weapons, thus positive numbers indicate a greater association of weapons than harmless objects with Black versus White Americans and negative numbers indicate the opposite association.

Demographic questionnaire. Participants were asked to provide demographic information including age, gender, ethnicity, education, political orientation, and current zip code. Current zip code was used to determine residency in a specific MSA.

Context diversity indicators. Data from the 2010 U.S. Census Bureau were utilized to compute three indicators of context ethnic diversity for U.S. metropolitan areas. MSAs have populations greater than 100,000 centered in a metropolitan area but including proximal areas that are integrated socially or economically. Minority representation was calculated as the proportion of Black Americans in an MSA. Variety was calculated as an entropy score (Iceland, 2004) per MSA. Higher scores on variety represent more even proportional representation of four major ethnic groups (Asian, Black, Latino, and White Americans). To assess integration, it

was also necessary to compute entropy scores for census tracts making up each MSA. Census tracts are stable divisions of a few thousand residents. Integration was computed as 1 – multigroup Theil’s H or multigroup information theory index (Iceland, 2004). Higher scores indicate that the distribution of ethnic groups at the level of census tracts is similar to that of the MSA.

In the current sample, minority representation of Black Americans across MSAs averaged about 12% ($M = 12.4\%$, $SD = 9.1\%$) ranging from nearly 0% to 53%. To account for non-normality, a natural log transformation was applied to minority representation in all analyses. Variety can range from 0 to 1.396 with four groups. On average, variety was near the midpoint of the scale ($M = 0.673$, $SD = 0.248$) but showed considerable variability across MSAs. Integration can range from 0 to 1 with higher numbers indicating that ethnic groups are distributed similarly at the census tract and MSA levels. On average, integration was moderately high ($M = 0.833$, $SD = 0.084$) and ranged in the upper half of the scale.

Reliable correlations were found among minority representation, variety, and integration, although in disparate directions. Minority representation was positively associated with variety ($r_{349} = .577$, $p < .001$). As the proportion of Black Americans increased, so did the extent to which ethnic groups were evenly distributed. In contrast, minority representation was negatively correlated with integration ($r_{349} = -.592$, $p < .001$). As the proportion of Black Americans increased, so did the extent to which ethnic groups were unevenly represented at the census tract level compared to their distribution at the MSA level (relative segregation). Variety was also negatively associated with integration ($r_{349} = -.423$, $p < .001$). As groups were more evenly distributed at the MSA level, they tended to be less evenly distributed within census tracts. Part of the positive relationship between minority representation and variety is inherent to the

computation of these indexes; this is not the case for relations with integration. Although some bivariate relationships among diversity measures were relatively strong, at most 35% of variation was shared per pair of measures and multicollinearity, as indexed by variance inflation factors, was not an issue. These data confirm that distinct facets of diversity across geographical areas can be empirically operationalized and differentiated (see also Koopmans & Schaeffer, 2015; Massey & Denton, 1988; Reardon & Firebaugh, 2002; Schaeffer, 2013).

Results

Implicit Weapon Associations

IAT data were analyzed following the algorithm recommended by Greenwald et al. (2003). More precisely, the difference between the mean response latency for the two critical blocks of trials, divided by its associated standard deviation, was computed. This quotient was computed separately for the first 20 trials and the last 40 trials; the two values were then averaged. As recommended by Greenwald et al. (2003), statistical analyses were always performed on this index known as the IATD. In the present case, the IATD score reflects the extent to which the concept “weapons” (relative to “harmless objects”) was more strongly associated with Black Americans than with White Americans. On average across participants, the tendency to associate weapons more with Black Americans than with White Americans approached medium size ($M = 0.381$, $SD = 0.379$) and was significant, $t(296,885) = 548.182$, $p < .001$, $R^2 = .503$. Individual scores ranged from positive to negative. The average IATD score across MSAs was also of medium size ($M = 0.381$, $SD = 0.034$) and significant, $t(350) = 207.378$, $p < .001$, $R^2 = .992$. At the MSA level, IATD scores were always positive. At both the individual and context levels, weapons were more strongly linked to Black Americans than to White Americans.

Context Diversity and Implicit Weapon Associations

IATD scores were analyzed using multilevel models with participant as the Level 1 unit and MSA as the Level 2 unit (see Table 1). Although the ICC value was very small ($ICC = .002$), the multilevel analytic approach is maintained because the theoretical questions of interest are multilevel in nature (the effects of context properties on individuals immersed within them; Luke, 2004).

Level 1 fixed effects were group-mean centered and Level 2 fixed effects were grand-mean centered (Enders & Tofighi, 2007). Gender was contrast-coded (+1 if Male, -1 if Female). Participant ethnicity was coded in orthogonal codes: WvB (+1 if White, -1 if Black, 0 if Other) and WBvO (+1 if White or Black, -2 if Other). Finally, political orientation was z-scored separately for the 6-point and 7-point scale versions, then combined. Effect size estimates (R^2) were calculated according to Snijders and Bosker (1999). Given the unusually large sample size, it is important to put findings in their proper perspective by relying not only on significance levels, but also on effect sizes. Highly significant effects of Level 1 predictors (socio-demographic variables) reflect in most cases very small effects. For Level 2 predictors (context-level variables), effects might be larger in the sense that they account for a sizeable proportion of context-level variations, but it is also important to note that variance to be explained is relatively limited at the context-level. Thus, a significant context-level effect associated with a non-negligible proportion of variance may need to be interpreted relative to the contribution of other context-level predictors. Only those findings with at least a small effect size (r^2 greater than or equal to .030) are discussed.

Model 1. The first model included individual-level socio-demographic predictors and context diversity predictors of implicit weapon associations. This model was significantly better

than a model including only the individual-level predictors, $\chi^2(3) = 39.349, p < .001$ which explained less than 1.4% of Level 1 variation. Although each of the demographic variables was significant, the effect sizes were quite small. The largest effect, in which White participants displayed a stronger Black-weapon stereotype than Black participants, was very small, $r^2 = .010$.

Context diversity measures accounted for 6.6% of the Level 2 variation in implicit weapon associations. Controlling for the degree of variety and integration in an area, there was no evidence that fluctuations in minority representation between MSAs predicted implicit weapon associations (no support for H1). As predicted, variety (H2, $r^2 = .046$) and integration (H3, $r^2 = .020^1$) each uniquely contributed to understanding differences in implicit weapon associations between MSAs, over and above minority representation. As ethnic groups were more evenly distributed in the populace of an MSA, the tendency to associate weapons to Black Americans rather than to White Americans decreased. In addition, the more the ethnic group distribution at the census tract level reflected the distribution at the MSA level, the lower the Black-weapon stereotype in an area.

Model 2. Next a model with two-way interactions among context diversity measures proved significantly better than Model 1, $\chi^2(3) = 32.918, p < .001$, explaining 5.2% of the remaining Level 2 variation. There was a significant interaction between minority representation and integration, $r^2 = .043$ (see Figure 1). Simple effects tests revealed that in areas with relatively low minority representation (-1 SD on minority representation), increases in integration were associated with decreases in Black-weapon stereotypes, $B = -.230, t = -5.707, p < .001$, but there was no evidence of an association when minority representation was high (+1 SD on minority representation), $B = .023, t = 0.941, p = .348$. Taken from the other perspective on the interaction, in areas weakly integrated, as the proportion of Black Americans increased,

Black-weapon stereotypes decreased, $B = -.011$, $t = -4.123$, $p < .001$. However, in relatively integrated areas, as the proportion of Black Americans increased, there was an increase in Black-weapon stereotypes, $B = .006$, $t = 2.950$, $p = .003$. Finally, although there were two significant interactions involving variety, their effect sizes were below 0.8%.

Model 3. Analyses were conducted to determine if the main or interactive effects of context diversity indicators were moderated by participant ethnicity. Cross-level interactions between the WvB contrast code and context diversity effects were added and the slope for WvB was allowed to be random. This model was significantly better than Model 2 (adding a random WvB slope), $\chi^2(6) = 36.583$, $p < .001$, and explained 7.9% of the remaining variation. Several 2-way and 3-way interaction effects involving participant ethnicity were significant, but the effect size was quite small in all cases ($.001 < r^2 < .025$).

Controlling for additional context variables. Model 2 was re-estimated to test if the effects of context diversity on implicit weapon associations held over and above potentially relevant differences between MSAs in population density (average number of people per square mile), median household income, and prevalence of violent crime. Population density was available through the 2010 U.S. Census. Median household income was taken from the American Community Survey for 2012 that gives the average value for the prior five years. The prevalence of violent crime was taken from the Uniform Crime Reports published by the Federal Bureau of Investigations. It was calculated as the average violent crime rate (per 100,000 inhabitants) from 2008 to 2012 per MSA. This model was significantly better than Model 2, $\chi^2(3) = 188.570$, $p < .001$, but accounted for only 1.4% additional variance at the context level (individual effects of additional context-level predictors $r^2 < .010$). Importantly, the relationships between implicit weapon associations and the diversity indicators were not

explained away by these additional characteristics of MSAs. The effects were largely the same when controlling for population density, median income, or violent crime, $ps < .003$ for variety, integration, and minority representation by integration interaction.

Context Diversity and Explicit Weapon Associations

The goal of the present research was to test the relations between three dimensions of ethnic diversity and the *implicit* race-weapon associations rather than to compare systematically the effects of context diversity on implicit vs. explicit stereotypes. Yet, carrying out similar analyses on a self-report measure that paralleled the IAT might be informative. These analyses followed similar multilevel analyses to those described for the implicit measure ($ICC = .009$). Thus, they will be described more succinctly (see Table 2 for details).

Explicit stereotypes were measured as the extent to which weapons versus harmless objects were more associated with Black Americans than White Americans. Including effects for minority representation, variety, and integration provided a significantly better fit to the data than a model with demographic variables alone, $\chi^2(3) = 106.775, p < .001$ (Model 1). The set of individual difference predictors accounted for 3.1% of the Level 1 variation in explicit associations. On average, weapons (relative to harmless objects) were more strongly associated with Black people than with White people (as reflected in the intercept test. The effects of demographic variables were significant, however, each effect was quite small, $r^2 < .013$.

The set of context diversity measures accounted for 24.3% of the variation in explicit associations between MSAs. Unlike in the implicit findings, there was a significant effect of minority representation, $r^2 = .058$, but the effect was opposite of the hypothesis: as the proportion of Black Americans increased, explicit Black-weapon stereotypes also increased. The effects of variety, $r^2 = .062$, and integration, $r^2 = .089$, were significant and in the same direction

as those reported for implicit weapon associations. As variety and integration increased, explicit Black-weapon stereotypes decreased.

A model that allowed two-way interactions among the context diversity measures provided a better fit to the data, $\chi^2(3) = 17.925, p < .001$, and explained an additional 4.5% of variance at Level 2 (Model 2). A significant interaction between minority representation and integration, $r^2 = .039$, revealed that integration was more strongly associated with *weaker* explicit Black-weapon stereotypes when minority representation was low, $B = -1.333, t = -6.044, p < .001$, than when minority representation was high, $B = -.280, t = -2.001, p = .046$. Minority representation was associated with stronger explicit Black-weapon stereotypes when areas were relatively integrated, $B = .077, t = 6.698, p < .001$, but not when areas were relatively segregated, $B = .004, t = 0.263, p = .793$. The second significant interaction between variety and integration was of very small size, $r^2 = .018$.

A model that included interactions between each main and interactive effect of context diversity indicator and participant ethnicity provided a better fit to the data, $\chi^2(6) = 20.988, p < .001$, and explained an additional 4.4% of variance at Level 2 (Model 3). Although there were two significant interactions between participant ethnicity and context diversity, the effect sizes were very small, $r^2 < .019$.

As was the case for implicit associations, we examined the extent to which additional context level variables explained variance in explicit associations. Model 2 was re-estimated to test if the effects of context diversity on explicit weapon associations held over and above MSA population density, median household income, and prevalence of violent crime. This model was significantly better than Model 2, $\chi^2(3) = 648.769, p < .001$, it explained less than 0.1% of the remaining variation between MSAs. None of the additional contextual variables uniquely

predicted explicit weapon associations. More importantly, the relationships between explicit weapon associations and the diversity indicators were not explained away by these additional characteristics of MSAs. The effects were the same when controlling for population density, median income, or violent crime (all $ps < .038$).

Discussion

The findings reported point to the merit of relying on a multi-faceted perspective on context ethnic diversity. Going beyond a simplistic and unidimensional operationalization of this construct provides a more systematic and fine-grained understanding of the relations between context ethnic diversity and implicit associations between weapons and ethnicity. Despite not being able to provide direct evidence for the role of specific underlying mechanisms, the conceptual and analytic model that we developed along with the empirical findings represent important steps towards a more solid and systematic theoretical framework and as such advance the scientific literature.

If our hypotheses regarding the effects of variety (H2) and integration (H3) are supported, evidence for the role of minority representation is more tenuous (H1). For this more simplistic measure, an effect in the expected direction emerged only in areas weakly integrated. A first implication of this finding is that even if the relative size of an ethnic minority group has an impact on how salient it is in mental representations of the environment and contributes to making counter-stereotypic exemplars more accessible, these mechanisms may not be sufficient to undermine implicit stereotypic associations about violence and criminality. Particularly noteworthy is the fact that integration is associated with weaker implicit Black-weapon stereotypes only when the proportion of Black Americans is relatively low. When Black Americans represent a more significant segment of the local population, integration is no longer

a reliable source of variation. The pattern suggests that mechanisms that should help reduce implicit Black-weapon stereotypes might be counteracted by one or multiple mechanisms when a large proportion of Black Americans is dispersed across neighborhoods. As predicted, weaker implicit Black-weapon stereotypes are observed in areas characterized by the presence of multiple ethnic groups (H2) and a dispersion of these ethnic groups that is relatively isomorphic at neighborhood and metropolitan levels (H3). Among the possible mechanisms through which context ethnic diversity operates, the effect of variety might be associated with a tendency to construe the environment in a more complex manner. The presence of multiple ethnic groups, each representing a sizable portion of the local population, may undermine the tendency to contrast Black Americans to White Americans. The presence of other ethnic minorities may lead to more nuanced distinctions and, as a result, dilute stereotypic assumptions about Black Americans. Integration might be working through at least two distinct mechanisms. Intergroup contact is likely to be more frequent, more positive, and less superficial in areas characterized by a high level of integration compared to ethnic enclaves. In line with prior research (Christ et al., 2014; MacInnis et al., 2017), contact may operate at the context level, meaning that individuals immersed in an integrated environment may benefit from the prevalence of positive intergroup contact even if they do not themselves engage in cross-group interactions. From this perspective, context effects may operate through normative influences (Crandall, Eshleman, & O'Brien, 2002). Integrated multiethnic communities may promote a strong endorsement and internalization of egalitarianism and/or multiculturalism (Guimond, de la Sablonnière, & Nugier, 2014). Stereotypic responses would conflict with these principles. To the extent that social norms are deeply embedded in local contexts, they may produce implicit associations that are more aligned with them (Uhlmann, Poehlman, & Nosek, 2012). In contrast, ethnic diversity in

relatively segregated environments may give room for normative pressures that would perpetuate stereotypic assumptions about violence and criminality. The expression of prejudices and stereotypes might not be normative, and thus these responses may not be publicly expressed, they may nonetheless be learned passively through repeated experiences (Rudman, 2004). These forces may strengthen implicit Black-weapon stereotypes.

Although not our primary focus, several points can be made based on a comparison between implicit and explicit stereotypes. Unlike the implicit findings which find no relationship, there is a significant association between minority representation and explicit Black-weapon stereotypes that is opposite of predictions. Explicit Black-weapon stereotypes are stronger in areas with a larger percentage of Blacks in the population. The remaining findings, however, align across implicit and explicit stereotypes. There is evidence for the idea that variety and integration are associated with weaker Black-weapon stereotypes and the effect of integration is more pronounced when the percentage of Black inhabitants is relatively low but diminishes as the percentage of Black inhabitants increases. Thus, associations of context diversity and stereotypes are largely consistent across implicit and explicit domains.

Among the limitations of the present research, it is worth mentioning the non-representativeness of the sample. Although the sample was relatively diverse and allowed us to control for the effects of important socio-demographic variables, the non-representativeness of a sample constrains the interpretations of the findings and limits their generalizability. Non-representative samples may bias estimates of population averages, slopes, and standard errors, although slopes are typically less disturbed by selection issues. Multilevel models address potential bias in estimates through inclusion of population information as predictors at the context-level. For example, in the present work, the population information per context for the

key variable of ethnicity was included in the form of minority representation (and in different facets, variety and integration). Despite respondents not being representative of a given population, reliable and meaningful contextual fluctuations are picked up in the analyses. This is consistent with a core assumption of the present work: immersion in a particular socio-historical context might be a source of fluctuations in implicit Black-weapon stereotypes. Thus, issues of representativeness and self-selection might not be as crucial as one might be inclined to assume. In addition, it is worth noting that the findings are based on a dataset that includes the vast majority of metropolitan areas. In that sense, the coverage is extensive and inclusive. The findings pertain to the relations between ethnic diversity and implicit Black-weapon stereotypes in relatively urban and densely populated areas (given the focus on metropolitan areas as defined by the U.S. Census) and as such do not shed light on how these dynamics play out in more rural areas. The present research significantly increases our understanding of the relations between context ethnic diversity and associations between weapons and ethnicity. Considering simultaneously the unique contributions of three distinct facets of ethnic diversity allow us to map on a wide range of ethnic diversity configurations and to document context effects on implicit associations. At the same time, much remains to be learned in particular regarding the mechanisms underlying these effects. A challenge for future research is also to account for the fact that dimensions of context ethnic diversity are sources of distinct effects depending on the implicit intergroup bias considered. In the present case, variety and integration are most clearly associated with weaker implicit Black-weapon stereotypes. The analyses reported by Rae et al. (2015) are most consistent with the notion that minority representation is associated with stronger implicit ingroup favoritism. As this body of work expands, it might be possible to account for disparate findings. For now, suffice to note that implicit assessments are suited to

reveal the interconnections between socio-structural factors and beliefs or attitudes about ethnic groups.

Declaration of Conflicting Interests

The authors declare that there is no conflict of interest.

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Footnotes

¹Although the effect size of integration is below the 3% threshold in Model 1, the direction of the effect is discussed because on Model 2 it is above threshold ($r^2 = .032$) and interacts with another context diversity measure, minority representation.

Table 1

Implicit Weapon Associations as a Function of Context Diversity Dimensions.

	Model 1			Model 2			Model 3		
	<i>B</i>	<i>t</i>	<i>p</i>	<i>B</i>	<i>t</i>	<i>p</i>	<i>B</i>	<i>t</i>	<i>p</i>
<u>Level 1</u>									
Intercept	.384	282.877	<.001	.388	241.322	<.001	.388	241.692	<.001
Age	.001	16.100	<.001	.001	16.100	<.001	.001	16.178	<.001
Gender	.007	9.799	<.001	.007	9.799	<.001	.007	9.736	<.001
Education	.003	7.055	<.001	.003	7.055	<.001	.003	7.101	<.001
Political	-.012	-17.283	<.001	-.012	-17.283	<.001	-.012	-17.361	<.001
WvB	.076	53.809	<.001	.076	53.809	<.001	.074	31.235	<.001
WBvO	-.013	-18.545	<.001	-.013	-18.545	<.001	-.013	-16.903	<.001
<u>Level 2</u>									
MR	-.001	-0.773	.440	-.002	-1.338	.182	-.002	-1.329	.185
V	-.034	-5.432	<.001	-.044	-7.054	<.001	-.044	-7.012	<.001
I	-.060	-3.203	.002	-.104	-4.408	<.001	-.103	-4.402	<.001
MR x V				.002	0.205	.838	.001	0.184	.855
MR x I				.105	5.352	<.001	.104	5.282	<.001
V x I				-.184	-2.136	.034	-.182	-2.112	.036
<u>Cross-Level</u>									
WvB x MR							-.001	-0.204	.838
WvB x V							-.034	-4.138	<.001
WvB x I							-.122	-3.691	<.001
WvB x MR x V							.020	2.104	.037
WvB x MR x I							.093	3.861	<.001
WvB x V x I							-.174	-1.997	.050
Level 1 r^2	.014								
Level 2 r^2	.066			.052			.079		

Note. MR = Minority Representation, V = Variety, I = Integration. Level 1 fixed effects were group-mean centered and Level 2 fixed effects were grand-mean centered. Level 2 r^2 values for Models 2 and 3 are additional variation explained by current than previous model (e.g., Model 2 v. Model 1). Gender was contrast-coded (+1 if Male, -1 if Female). Participant ethnicity was coded in orthogonal codes: WvB (+1 if White, -1 if Black, 0 if Other) and WBvO (+1 if White or Black, -2 if Other). Political orientation was z-scored with higher values reflecting a more liberal orientation.

Table 2

Explicit Weapon Associations as a Function of Context Diversity Dimensions.

	Model 1			Model 2			Model 3		
	<i>B</i>	<i>t</i>	<i>p</i>	<i>B</i>	<i>t</i>	<i>p</i>	<i>B</i>	<i>t</i>	<i>p</i>
<u>Level 1</u>									
Intercept	.481	65.455	<.001	.491	55.067	<.001	.491	54.972	<.001
Age	-.012	-42.837	<.001	-.012	-42.837	<.001	-.012	-42.623	<.001
Gender	-.025	-9.237	<.001	-.025	-9.237	<.001	-.025	-9.270	<.001
Education	-.027	-15.612	<.001	-.027	-15.612	<.001	-.027	-15.529	<.001
Political	-.173	-62.696	<.001	-.173	-62.696	<.001	-.173	-62.694	<.001
WvB	.160	29.337	<.001	.160	29.337	<.001	.147	14.113	<.001
WBvO	-.043	-15.854	<.001	-.043	-15.854	<.001	-.039	-13.689	<.001
<u>Level 2</u>									
MR	.045	5.049	<.001	.041	4.160	<.001	.041	4.146	<.001
V	-.189	-5.320	<.001	-.225	-6.313	<.001	-.224	-6.276	<.001
I	-.672	-6.300	<.001	-.807	-6.229	<.001	-.805	-6.208	<.001
MR x V				.017	0.405	.686	.017	0.419	.675
MR x I				.438	4.000	<.001	.436	3.976	<.001
V x I				-1.400	-2.726	.007	-1.382	-2.687	.008
<u>Cross-Level</u>									
WvB x MR							.009	0.722	.470
WvB x V							-.124	-3.265	.001
WvB x I							-.315	-2.130	.034
WvB x MR x V							.075	1.652	.100
WvB x MR x I							.123	1.072	.285
WvB x V x I							-.047	-0.101	.919
Level 1 r^2	.031			.045			.044		
Level 2 r^2	.243								

Note. MR = Minority Representation, V = Variety, I = Integration. Level 1 fixed effects were group-mean centered and Level 2 fixed effects were grand-mean centered. Level 2 r^2 values for Models 2 and 3 are additional variation explained by current than previous model (e.g., Model 2 v. Model 1). Gender was contrast-coded (+1 if Male, -1 if Female). Participant ethnicity was coded in orthogonal codes: WvB (+1 if White, -1 if Black, 0 if Other) and WBvO (+1 if White or Black, -2 if Other). Political orientation was z-scored with higher values reflecting a more liberal orientation.

Figure 1. Implicit Black-weapon stereotype as a function of Minority Representation (MR) and Integration (I) across Metropolitan Statistical Areas.