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The Exposure Index: A Measure of Intergroup Contact

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This article introduces the exposure index as a measure of intergroup contact and in-group isolation. The Index is calculated from the proportions of 2 or more groups appearing in enduring social units, such as teams and workgroups, or in more transitory units such as lunch-table and classroom-seating clusters. Observed values of the Index are interpreted in relation to empirical sampling distributions of Index values calculated under the assumption of random mixing across group boundaries. The Index is applied to lunch-table clusters in the cafeteria of a private girls' school, and shows, as predicted, less Black–White contact among upper-school students (grades 6–12) than among lower-school students (grades K–5). Asian–White and Asian–Black contact was not different from chance. The exposure index may be useful for tracking contact between groups of many kinds, including groups defined in terms of age, gender, class, or combinations of these identifications.

The psychology of intergroup relations has been a major topic in social psychology since Gordon Allport wrote the classic, *The Nature of Prejudice* (1954). Perhaps the central expression of interest in this topic has been the "contact hypothesis" that Allport did so much to advance: the idea that intergroup contact can, under the right conditions, lead to improved relations between groups. Research continues on the contact hypothesis (Desforges, Lord, Pugh, Sia, Scarberry, & Ratcliff, 1997; Forbes, 1997; Hamberger & Hewstone, 1997), even as the hypothesis is put to work in interventions such as the diversity workshops recently popular on U.S. campuses

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(McCauley, Wright, & Harris, 2000). Surprisingly, however, research has not focused much attention on assessing the level of intergroup contact; rather the emphasis has been on understanding attitudes and beliefs (stereotypes) that are hypothesized to be causes or effects of group contact (Fiske, 1998). This study takes a step toward redressing the balance by applying a sociological measure, the exposure index, as a measure of everyday intergroup contact.

EARLY ATTEMPTS TO ASSESS INTERGROUP CONTACT

There have been numerous studies of intergroup relations that employed some form of self-report measure. Perhaps the best known of these is Bogardus's (1925) social-distance scale, which asks whether the respondent would accept a member of a particular ethnic group as citizen, co-worker, neighbor, chum, or kin by marriage. Also widely used for many years is Moreno's (1934) sociometric measure, which asks the respondent to list in order the individuals the respondent would choose to live, work, study, or spend leisure time with. More recent studies of ethnic group relations have tended to use questionnaire measures, especially ratings, of beliefs about and attitude toward ethnic out-groups (e.g., Blaney, Stephan, Rosenfield, Aronson, & Sikes, 1977; Miller, Brewer, & Edwards, 1985; Singleton & Asher, 1979; see Brewer & Brown, 1998, for a recent review).

Attempts to assess intergroup relations by observing everyday behavior are relatively few. The history of such work goes back to the desegregation of U.S. public transportation and public schools, which led to studies that reported on the progress of desegregation in terms of proximity, contact, or interaction of Black Americans with White Americans. Davis, Seibert, and Breed (1966) reported the percentage of bus passengers in New Orleans who violated the previous segregation rule that Black Americans should sit farther back in the bus than Whites should. Silverman and Shaw (1973) examined the percentage of students in segregated versus integrated groups of students observed emerging from the exits of recently desegregated junior and senior high schools. Willis, Reeves, and Buchanan (1976; Willis, Carlson, & Reeves, 1979) measured interracial adjacencies in cafeteria queues in public grade schools; that is, the number of times a White child stood behind a White child versus the number of times a White child stood behind a Black child. Most recently, Johnson and Johnson (1981, 1982) observed fourth-grade children in free play and counted interethnic interactions.

A notable attempt to formalize an adjacency measure of contact was introduced by Campbell, Kruskal, and Wallace (1966). The problem these investigators set themselves was to provide a measure of adjacency that would work with observations of classroom seating (rows with groups demarcated by one or more empty chairs in a row). Their solution was a complicated formula for the expected value of the number of interracial adjacencies, taking as given the total number of each race observed in a classroom and the row-group sizes observed, assuming that individuals are assigned randomly to the observed groups. Even more complicated was their formula for the sampling variance of the number of observed adjacencies; indeed the formula given in the text of the Campbell et al. paper is incorrect, although the formula derived in the Appendix is given correctly.

Campbell et al. (1966) applied their measure to show that there was significant racial segregation in the classroom seating choices of students in nominally desegregated public schools. They suggested that the reliability of their measure, including the reliability of the observational definitions of race, should be investigated in future research using this measure. However, this measure has seldom been used in subsequent research; J. Schofield's two studies of cafeteria groups in an integrated school (Schofield & Sagar, 1977; J. Schofield, 1979) are the only applications we have found. Why has the adjacency measure not been more popular?

The measure has at least two limitations. The first, already noted, is the complexity of the measure. The long formulas for calculating the expected value and the sampling variance of the number of interracial adjacencies probably inhibited use of the measure in the 1970s, although cheap and accessible computing power should have dissolved this inhibition. A more serious kind of complexity is that there is no intuitive interpretation of the observed number of interracial adjacencies; this statistic has meaning only in relation to its expected value and sampling variance. For instance, J. Schofield (1979) found that the adjacency z score for eighth-grade females at cafeteria tables was –1.77. This is statistically significant segregation (by one-tailed test), but does not tell us much about the experience of the average student in the cafeteria.

A second limitation of the adjacency index is that it suffers from ambiguity when applied to social units that are not queues or classroom side-by-side seating choices. J. Schofield (1979; Schofield & Sagar, 1977) recognized this ambiguity in calculating the adjacency index twice, once for adjacency defined as sitting side by side at a cafeteria table and once for adjacency defined as sitting directly across a cafeteria table. Sitting across a table, with the eye contact that this implies, does seem to be psychologically at least as intimate as sitting side by side; unfortunately, the adjacency index does not produce the same results for adjacency defined as sitting opposite as for adjacency defined as sitting next to. This ambiguity increases to indeterminacy when units are not spatially defined; it is not possible to apply the adjacency index to assess the integration and segregation of social units such as clubs, teams, or roommates.

Since school desegregation began, then, there has been an awareness of the need to measure the level of integration and segregation represented in the interactions of individuals in everyday social units. As J. W. Schofield (1995) notes, there have been many studies of intergroup attitudes, especially the attitudes of U.S. Blacks and Whites toward one another, but relatively few studies of actual behavior of Whites and Blacks in interaction. The danger, of course, is that attitudes are not always closely linked to behavior; for instance, J. W. Schofield (1989) reports on an integrated school in which negative racial stereotyping increased even as everyday interracial behavior in the school became more positive.

Although intergroup attitudes and stereotypes will continue to be of interest, it seems fair to say, following J. W. Schofield (1995), that everyday intergroup behavior deserves more attention than it has received. Similarly, Fiske has observed: "Documenting discriminatory behavior has not been social psychology's strong suit. Like the attitude–behavior debacle that almost destroyed the foundations of persuasion research, a debacle threatens stereotyping research if it does not soon address behavior" (1998, p. 374).

Measuring intergroup behavior can provide another means of assessing the state of intergroup relations and will permit triangulation in which the combination of verbal and behavioral measures can tell us more about intergroup relations than either type of measure alone. In addition, the practical implications of intergroup interaction make such behavior worth studying in its own right. This study focuses on the foundation of intergroup interaction, that is, intergroup exposure. We advance a measure of intergroup exposure that is based on unit membership rather than physical adjacency, is applicable to social units of any size, and offers an intuitive interpretation in terms of the experience of the average member of the social unit.

CENSUS-TRACT EXPOSURE INDEXES

The measure of interest originated in research in demography and sociology, disciplines with a long history of grappling with the issues of measuring residential segregation. In this research, the spatial units are usually census tracts in a Standard Metropolitan Statistical Area (SMSA), and a number of different indexes have been developed to summarize residential integration and segregation across a whole metropolitan area. One of these, the "exposure index" is designed "to measure the experience of segregation as felt by the average minority or majority member" (Massey & Denton, 1988, p.287).

The exposure index takes two forms: the "interaction index" and the "isolation index." The exposure of a minority to the majority, or "interaction index" is the minority-weighted average of majority proportion in each tract:

$$\text{minPmaj} = [(\#\text{ minority in tract})/(\#\text{ minority in SMSA})]\\ [(\#\text{ majority in tract})/(\text{total }\#\text{ in tract})]$$

This index sums over census tracts the proportion of majority in each tract, with each tract's majority proportion weighted by the proportion of all SMSA minority who live in that tract. The result is the proportion of majority seen by the average minority member looking around in his or her census tract, and this average minority experience of the local majority proportion is signaled as minPmaj.

The second form of the exposure measure, the "isolation index", is the exposure of minority to one another, that is, the minority-weighted average of minority proportion in each tract:

minPmin = [(# minority in tract)/(# minority in SMSA)]
[(# minority in tract)/(total # in tract)]

The index sums over census tracts the proportion of minority in each tract, with each tract's minority proportion weighted by the proportion of all SMSA minority who live in the tract. The result is the proportion of minority seen by the average minority member looking around in his or her census tract, and this average minority experience of the local minority proportion is signaled as minPmin.

The minority interaction index and the minority isolation index thus have psychologically appealing interpretations. The minority interaction index (minPmaj) is the majority percentage sharing a census tract unit with the typical minority member. Similarly, the minority isolation index (minPmin) is the minority percentage sharing a census tract with the typical minority member. The same considerations lead to analogous indexes for the majority group: a majority integration index (majPmin) and a majority isolation index (majPmaj) (see later in this article for examples of both majority and minority indexes in applying exposure indexes to small groups).

These indexes may be compared with the values they would take with random mixing of majority and minority across census tracts. Assuming random mixing, the expected value of the minority interaction index (minPmaj) and the expected value of the majority isolation index (majPmaj) is simply the overall majority proportion across all tracts: (# majority in SMSA)/(total # in SMSA). Similarly, the expected value of the minority isolation index (minPmin) and the expected value of the majority interaction index (majPmin) is the overall minority proportion across all tracts: (# minority in SMSA)/(total # in SMSA).

The minority interaction index and the minority isolation index (and the majority interaction and isolation indexes) must sum to 1.0 if there are only two groups—minority and majority—under consideration. The exposure index can also be used with three or more groups, however. If there is more than one minority, then, for any one minority, the sum of that minority's interaction indexes with all other groups *plus* minority interaction with minority (isolation index) must sum to 1.0 (see Massey & Denton, 1988).

EXPOSURE INDEXES APPLIED TO SMALLER UNITS

Consider a simple example. Suppose there are only three units, and members of these units are either majority or minority. Unit 1 is composed of 2 minority students and 2 majority students, Unit 2 is composed of 1 minority student and 4 majority students, and Unit 3 is composed of 4 majority students. The minority interaction index (minPmaj) would be [2/3][2/4] + [1/3][4/5] + [0/3][4/4] or .60; the majority percentage in the unit of the typical minority student would be 60%. The minority isolation index (minPmin) would be [2/3][2/4] + [1/3][1/5] + [0/3][0/4] or .40; the minority percentage in the unit of the typical minority student would be 40%. Similarly, the majority interaction index (majPmin) would be .18, and the majority isolation index (majPmaj) would be .82.

One is tempted to say that the expected values for the interaction and isolation indexes should simply be the overall proportions of majority and minority across all units; that is, [2 + 4 + 4] / [2 + 4 + 4 + 2 + 1] = 10/13 or .77 for majority exposure expected for both minority and majority individuals (minPmaj and majPmaj), and [2 + 1] / [2 + 4 + 4 + 2 + 1] = 3/13 or .23 for the minority exposure expected for both minority and majority individuals (minPmin and majPmaj).

This temptation must be avoided, however, because the expected values of the exposure indexes depend on the number and size of units when the units are small in relation to the size of census tracts. The nature of this dependency is not susceptible to a general solution. Instead we use a computer simulation or Monte Carlo approach that randomly shuffles the observed numbers of minority and majority individuals into the number and size of units observed. (This is the same logic used by Moreno, 1938, in shuffling names into pairings to obtain expected values for sociometric choice data, and by Campbell, Kruskal, and Wallace, 1966, in shuffling majority and minority individuals into observed row-groups to obtain expected values for their adjacency index.)

Computer shuffling amounts to empirical instantiation of random mixing without regard to minority and majority membership. After 10,000 values of an exposure index have been calculated, the empirical sampling distribution can be used to calculate the two-tailed probability of the one observed value of the index under the null hypothesis of random mixing. Our method is akin to bootstrapping, which is a popular procedure for dealing with distributions of unknown shape (see, e.g., Mooney & Duval, 1993). Indeed the empirical sampling distributions for the exposure indexes in this article are not normal-shaped but substantially skewed.

We replace the original notation, minPmaj and minPmin, with minEmaj and minEmin, to signal that exposure indexes are calculated on small units and evaluated in relation to empirical sampling distributions rather than simple proportions.

For the 3-group example discussed earlier, the mean of the empirical sampling distribution for the interaction index minEmaj is .64, and the mean of the sampling distribution for the isolation index minEmin is .36 (vs. simple proportions of .77 and .23, as aforementioned). Similarly, the mean of the sampling distribution for the interaction index majEmin is .19, and the mean of the sampling distribution for the isolation index majEmaj is .81 (again vs. .23 and .77).

In general, the larger the units are, the closer the mean of the empirical sampling distribution will be to the simple proportions of majority and minority.

The dependence of expected values on number and size of groups can be seen if we change the 3-unit example to a 4-unit example while keeping the number of minority and majority individuals unchanged and the distribution of minority and majority in the first two units unchanged. That is, suppose the four majority individuals in the third unit appeared instead in two units, each with two majority individuals. The observed index values remain unchanged. But now the expected values for minEmaj and minEmin are .58 and .42 (vs. .64 and .36 in the 3-unit example), and the expected values for majEmin and majEmaj are .17 and .83 (vs. .19 and .81 in the 3-unit example). Note that the 4-unit example has smaller units than the 3-unit example, and the expected values for the 4-unit example are further from the simple proportions than was the case for the three-unit example (.58 and .42 further than .64 and .36 from simple proportions of .77 and .23; .17 and .83 further than .19 and .81 from .23 and .77).

Returning now to the original 3-unit example, there is the question of the statistical significance of the differences between observed and expected values of the interaction and isolation indexes. The probability of a particular difference between observed and expected can be read directly off the appropriate empirical sampling distribution. The 3-group example is too small to support serious statistical analysis (all observed–expected differences are $p > .50$ in the example). But the trend of the results in this example is that the minority is exposed to the majority (interaction index) a little less than expected under random mixing (.60 observed vs. .64 expected) and the majority is a little less exposed to the minority (interaction index) than expected under random mixing (.18 observed vs. .19 expected). As noted above, when there are only two types of individuals, the interaction index and the isolation index must sum to 1.0. Thus the isolation indexes corresponding to the interaction indexes just cited must show the obverse pattern: isolation index for minority a little greater than expected (.40 observed, .36 expected) and isolation index for majority a little greater than expected (.82 observed, .81 expected).

In this article, we will present results that include the observed value of an exposure index, the corresponding expected value (mean) from the empirical sampling distribution of that index under the null hypothesis of random mixing of different types of individuals into the units actually observed, and the null-hypothesis two-tailed probability of the difference between observed and expected that is taken directly from the empirical sampling distribution. As noted above, each p value must be taken from the relevant empirical sampling distribution because the sampling distributions are decidedly non-normal, with a tendency for skew that increases as the minority proportion decreases. As with all statistical measures, the sampling distribution of an exposure index depends upon the number of observations, so that the variance of the sampling distribution tends to be higher for minority exposure to majority than for majority exposure to minority.

DEMONSTRATION OF THE GROUP EXPOSURE INDEX: A STUDY OF ETHNIC CONTACT IN A SCHOOL CAFETERIA

For our initial application of the exposure index, we studied social units in the cafeteria of a private school that has both Asian and Black students in addition to White majority students. The presence of two minority groups gave us the opportunity to calculate interaction and isolation indexes for all three groups: Black, Asian, and White. The students take lunch in two seatings, one for the lower school (grades K–5) and the other for the upper school (grades 6–12); these two seatings provided the further opportunity to compare interaction and isolation indexes for younger and older students.

Previous studies provided evidence that interracial interaction tends to decrease with increasing age. Silverman and Shaw (1973) counted Black–White interactions on school grounds and found that these were sparse, stable over one semester of observation, and less frequent for high school students than for junior high students. J. Schofield (1979), using the adjacency measure devised by Campbell, et al., (1966), found that Black–White face-to-face adjacencies in cafeteria seating declined from February to June for two classes of 8th-grade students (although adjacencies had increased over months during the previous year for one of these classes, which had participated in a 7th-grade program offering special support for interracial contact). In addition, several studies using sociometric or attitudinal measures (verbal rather than behavioral) have found Black and White school children becoming less positive toward one another between kindergarten and 8th grade (Criswell, 1937), between kindergarten and 4th grade (Bartel, Bartel, & Grill, 1973), between 3rd grade and 6th grade (Singleton & Asher, 1979), and between 4th grade and 12th grade (Shrum, Cheek, & Hunter, 1988).

Our prediction, therefore, was that contact between Blacks and Whites would be lower for grades 6–12 than for grades K–5. Confirmation of this hypothesis will provide initial evidence of the validity of the exposure index as a measure of social distance. We were unable to find any previous studies of interaction between Asians and Whites across different ages, and we did not have any prediction about whether or how contact between Asians and Whites might be different for older students than for younger students.

METHOD

Demographics of the School Observed

Students were observed in a private girls' school in an upper-middle-class suburban neighborhood of southeastern Pennsylvania. The 1998–1999 tuition ranges from $9,000 for kindergarten to $13,800 for the senior year in high school; about 20% of students receive financial aid. Approximately 400 students attended lunch on the day of observation.

Procedure

After receiving permission to observe students from the lower, middle, and high schools, two observers arrived at the cafeteria before the lunch periods began. There were two separate seatings: the first for upper and middle schools (grades 6–12) and the second for the lower school (grades K–5). For each seating, each observer made a seating chart of the tables in the front and back sections of the cafeteria. The two observers first recorded social units in the front section, then moved together to record units in the back section. Within each section, the two observers worked independently, without any coordination in the order in which tables were recorded.

The observers recorded the apparent ethnicity and gender of each student on their standardized seating charts. In most cases, a social unit was defined as an entire table. Sometimes, however, a clear division into smaller units within a table was observed and recorded. Such division was determined by the combination of the absence of conversations between the subsets of students at the table, and orientation of a student's head or torso toward some students and away from others. A student was recorded as belonging to a unit if his or her food was placed within the unit boundary and he or she sat with that unit for at least 5 minutes. (Students did sometimes change seats, and a few individuals may not have been recorded in any unit or may have been recorded in more than one unit.) A student was designated as alone or outside of any unit if she was sitting at least two chairs or 5 feet away from any other student and did not interact with anyone.

Observers judged ethnicity in three categories—Black, Asian, and White—and recorded a single letter (B, A, or W) for each subject at each table. "Black" could include African-American, Caribbean, and African subjects. "Asian" included both East Asian and South Asian. Only one student was judged to be other than Black, White, or Asian; this Native American student was not included in our results.

Sampling Distributions for Exposure Indexes

A program that calculates observed and expected exposure indexes and displays the relevant sampling distributions can be downloaded from the World Wide Web (http://www.brynmawr.edu/Acads/Psych/cmccaule/index.html). Input for the program is a data file with the number of majority and minority in each group and the number of groups observed.

RESULTS

Table 1 shows the distribution of unit sizes recorded for each observer, for grades K–5 and grades 6–12. Observers agreed in reporting a mean unit size about seven, but observers' distributions of unit sizes showed some discrepancies (*SD*s of unit sizes 1.8 vs. 2.0 for K–5). Given some movement of students in the cafeteria during an observation period, some disagreement about unit sizes is to be expected, and this disagreement will contribute to imperfect agreement of indexes calculated for different observers. Reliability will also be decreased by the observer differences in the numbers judged Black, Asian, or White. It is worth noting that Black and Asian students were similarly small minorities in both grades K–5 (11–13 individuals recorded; 5–6% of all students) and grades 6–12 (13–16 individuals; 7–9% of all students).

Table 2 presents exposure indexes for Blacks, Asians, and Whites, for each observer for grades K–5 and grades 6–12. The first entry in each cell is an observed

TABLE 1
Distribution of Unit Sizes and Judged Ethnicity for Two Observers of Lunch Units in Grades K–5 and 6–12

	K–5		*6–12*	
	Observer 1	*Observer 2*	*Observer 1*	*Observer 2*
Unit size				
1	0	0	1	1
2	0	0	3	3
3	1	0	1	1
4	1	4	3	4
5	2	2	1	1
6	7	5	4	3
7	4	2	4	4
8	5	6	1	2
9	6	7	2	2
10	2	2	4	4
11	0	1	0	0
12	0	0	1	2
13	0	0	1	1
14	0	0	1	0
Total units	28	29	27	28
Mean unit size	7.2	7.3	6.8	6.7
SD unit size	1.8	2.0	3.5	3.3
Blacks	11[a]	13[b]	14[c]	16[d]
Asians	12[b]	12[b]	14[c]	13[e]
Whites	178[f]	187[g]	156[h]	158[h]

[a]5%. [b]6%. [c]8%. [d]9%. [e]7%. [f]89%. [g]88%. [h]84%.

TABLE 2
Ethnic Exposure Indexes, Observed and Expected, for Two Observers of Lunch Units in Grades K–5 and 6–12

	Grades K–5				*Grades 6–12*			
	Observer 1		*Observer 2*		*Observer 1*		*Observer 2*	
	O	*E*	*O*	*E*	*O*	*E*	*O*	*E*
Black–Black	.17	.18	.17	.19	.51*	.23	.50*	.21
Black–Asian	.02	.05	.02	.05	.05	.07	.04	.06
Black–White	.81	.77	.81	.77	.44*	.73	.46*	.73
Asian–Black	.02	.05	.02	.05	.05	.07	.05	.07
Asian–Asian	.16	.19	.16	.18	.26	.20	.24	.20
Asian–White	.82	.77	.82	.77	.69	.73	.71	.73
White–Black	.05	.05	.06	.05	.04*	.07	.05*	.09
White–Asian	.06	.05	.05	.05	.06	.07	.07	.07
White–White	.89	.90	.89	.90	.90*	.87	.88*	.84

Note. O = Observed; E = Expected.
*Observed and expected different $p < .05$ (two-tailed).

exposure index. For each ethnic group, the two observed interaction indexes and the observed isolation index (each three rows in Table 2) sum, as expected, to 1.0. The second entry in each cell of Table 2 is the expected value of the index from the empirical sampling distribution described earlier in this article. One White student was observed eating alone; this student was not included in calculation of exposure indexes because it is not clear whether a singleton should be considered a case of maximal ethnic isolation or a case of minimal social motivation or acceptance.

Table 2 shows that the exposure indexes of the two observers are very similar, despite the small differences already noted in the number and sizes of units and the number of each ethnic group reported by the two observers. Across all 18 exposure indexes in Table 2, the discrepancy between observers ranged from –.02 to +.02 with mean discrepancy of .00. The intra-class correlation—ICC(2,1) of Shrout and Fleiss (1979)—expressing the agreement of the two observers across all 18 indexes is .99.

With observer reliability established, the observed indexes can be compared with their expected values. For grades K–5, Table 2 shows that all the exposure indexes are close to their expected values; the difference between observed and expected values is never significantly different from zero. For grades 6–12, however, Black exposure to other Blacks (isolation index) is much higher than expected (bEb observed .51 and .50 vs. .23 and.21 expected), and Black exposure to Whites (interaction index) is much lower than expected by random mixing (bEw observed .44 and .46 vs. .73 and .73 expected). Similarly, White exposure to Blacks is less than what would be expected by chance (wEb observed .04 and .05 vs. .07 and .09 expected) and White exposure to Whites is greater than chance (observed .90 and .88 vs. .87 and .84 expected). The absolute size of observed–expected differences for Whites are much smaller than for Blacks, but the differences are nonetheless highly significant for Whites because their greater numbers produce empirical sampling distributions with much less variability.

Taken together, these results tell us that the older students are showing significant and substantial Black–White segregation, whereas the younger students interact without significant Black–White segregation. In contrast to the results for Blacks, Asian students in grades 6–12 do not show significant underexposure to Whites or significant overexposure to other Asians. Similarly, White students do not show underexposure to Asians. Thus, results for Asians show no significant segregation from either Blacks or Whites, for either younger or older students.

DISCUSSION

This study takes up a quantitative measure of intergroup interaction and in-group isolation, the interaction index used by sociologists and demographers to assess residential segregation in census tracts (Massey & Denton, 1988), and extends it to assess segregation in smaller social units. Results of a demonstration study provide initial evidence of the practicality, reliability, and validity of the new measure.

The interaction index required observers to judge the ethnicity of students in a cafeteria, and our two observers were closely but not perfectly agreed about the numbers and proportions of Black, Asian, and White students in the cafeteria. The observers were also required to judge the boundaries of social units or clusters at the lunch tables, and they were not always agreed about how many units of a given size they reported—probably as a consequence of some students moving between units during an observation period. Despite these differences in the inputs to the exposure index, the values of the indexes calculated from these inputs were very similar for the two observers. Across all exposure indexes, the intra-class correlation expressing between-observer reliability was .99. In other words, the observed values of group interaction and group isolation were not sensitive to observer differences in ethnic identifications or unit sizes. Indeed the very high level of observer agreement, if confirmed in future research, suggests that intergroup exposure might confidently be assessed with data from a single observer.

A limitation of this initial study is that there is no assessment of the variation of exposure indexes calculated for the same individuals in the same cafeteria on different days. The end of the 1998 school year prevented a second day of observations in this study, but the temporal stability of exposure indexes should be investigated in future research.

The results of a number of studies reviewed earlier in this article led us to predict that Black–White exposure would be less for older students than for younger students, despite the fact that this private school strongly encourages integration of both Black and Asian minorities with White majority in all school activities. Our prediction was strongly confirmed; Black–White exposure indexes did not differ from random mixing for grades K–5 but were significantly lower than expected by random mixing for grades 6–12.

We did not have a prediction for Asian–White or Asian–Black contact, and the results indicated no significant segregation of Asians from Whites or Blacks for either younger students or older students. The difference between results for Blacks and Asians in the study is stark, given that these two minorities were closely matched for size in both grades K–5 and grades 6–12. The interpretation of this difference is beyond the scope of this article; it is possible, for instance, that the difference represents the impact of socioeconomic difference correlated with ethnicity, rather than the impact of ethnic differences alone. Information on family background of students at this private school was not available to us.

Nevertheless, confirmation of our prediction about Black–White contact provides a beginning of convergent validation of the exposure index as a measure of social distance. Both verbal self-report and observational data reviewed earlier in the article have shown the same pattern noted in this study: Black–White relations deteriorating as children move from grade school to high school. Further research will be required in order to link exposure indexes to such familiar social psychological constructs as intergroup attitudes and stereotypes. Following Ajzen and Fishbein (1980), we expect that intergroup exposure will be predicted by a combination of individual attitudes and perceived social norms. We emphatically do not see intergroup exposure as a measure of prejudice; in this regard it is useful to remember Schelling's (1978) demonstration that small individual preferences for in-group contact can lead to surprisingly large levels of group segregation.

It is interesting to note that Black–White segregation appears much greater when looked at from the perspective of Black exposure to Whites than when looked at from the perspective of White exposure to Blacks. For Blacks, observed exposure to Blacks was .50 and .51 for the two observers, in contrast to expected exposures of .23 and .21 under random mixing. For Whites, observed exposure to Blacks was .04 and .05 in contrast to expected exposures of .07 and .09. The greater number of Whites means that a relatively small White decrement in exposure to Blacks can imply a relatively large Black decrement in exposure to Whites. This impact of relative numbers on the experience of typical Black and White students may lead the typical Black to see Black–White segregation as much greater than the typical White sees it.

The exposure index is potentially useful for a wide variety of research questions in intergroup relations. When used to track change in intergroup relations over time, the exposure index may provide a warning signal of deteriorating intergroup relations or a quantitative assessment of the effectiveness of interventions such as conflict resolution (Fisher, 1997) and cross-cultural training (Triandis, Brislin, &

Hui; 1988). Indeed, one instigation of the present research was our recognition of the need to evaluate the impact of the diversity workshops that have become so popular on U.S. campuses (McCauley, Wright, & Harris, 2000). Assessing the level of contact between groups is, of course, not the same as assessing the quality of what contact does occur (Hall & Friedman, 1999); but, compared with assessing body language, facial expression, and voice quality, the exposure index has the advantage of being considerably less intrusive and more easily applicable to large groups and to groups—clubs, teams, roommates—that are not easily brought under observation.

The exposure index can be used to assess interaction between any two or more distinguishable groups. Intergroup exposure might be measured, for instance, for groups defined in terms of gender, age, occupation, or socioeconomic status, or for groups defined in terms of combinations of these characteristics, such as Black female exposure to White males. Similarly, the exposure index can be extended to social units other than lunch clusters, including clubs, teams, workgroups, roommates, best friends, and classroom or pedestrian clusters. When studying contact between groups not easily defined by observer judgment, such as higher versus lower socioeconomic status, information about group membership may have to be obtained before or after recording of interaction.

CONCLUSION

The exposure index is a direct measure of intergroup behavior and may be useful for tracking changes in intergroup relations over time. In addition, the exposure index may be useful in showing the impact of peace-education interventions, such as Diversity Workshops, to the extent that these interventions aim to encourage and increase interaction across group boundaries defined by ethnicity, gender, sexual preference, or social class.

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