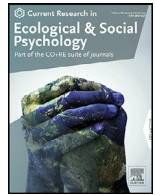




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Cooperative play and globalized social change: Mexican children are less cooperative in 2017 than in 1967

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ABSTRACT

Greenfield's theory of social change and human development is based on the distinction between *Gemeinschaft* (low-income agricultural communities with low levels of formal education and technology) and *Gesellschaft* (wealthier commerce-based societies with high levels of formal education and technology). Cooperation is more adaptive in a *Gemeinschaft* environment; in contrast, competition is more adaptive in a *Gesellschaft* environment. As Mexican ecologies moved in the *Gesellschaft* direction over recent decades, children's cooperative behavior declined, as predicted by the theory. The current quasi-experiment extends this finding from a two-person game, the marble pull, to a new situation, Madsen's cooperation board, a game that requires cooperation among four children. Based on a sample of 57 groups of four children each tested in 2017 and 70 groups of four children each tested in 1967, the Wilcoxon Signed Ranks Test ($p < 0.001$) showed that the decline of cooperation and the rise of competition generalizes across middle-class urban, low-income urban, and rural children in Mexico and that it applies to male, female, and mixed groups. In conclusion, we provide continuing evidence that child behavior is responsive to ecological conditions and shifts over time in order to adapt to them. Given that cooperation is a fundamental human trait that binds social units together, our study also contributes to the conclusion that globalized social change in the *Gesellschaft* direction entails human loss as well as gain.

1. Introduction

Social development varies in different ecologies and ecologies vary over time (Greenfield, 2009). This study contributes to understanding the implications of globalized ecological change for human behavior, more specifically, children's social behavior. As in much of the rest of the world, Mexico has, in recent decades, become wealthier, more urban, with more advanced technology and greater opportunities for formal education. In the course of these ecological shifts, children's cooperative behavior has declined. The goal of the current study was to extend this finding from the two-person game studied by Garcia and colleagues (Garcia et al., 2015) to a new situation, a game that requires cooperation among four children. A second goal was to demonstrate that the decline of cooperation and the rise of competition generalized across different gender combinations (boys' groups, girls' groups, and mixed groups) and across different ecological settings (middle-class urban, low-income urban, and rural). Specifically, the previous studies had not included a

low-income urban group. Nor had any mixed-gender groups been included.

1.1. Greenfield's theory of social change and human development

Both Garcia, Rivera, and Greenfield (Garcia et al., 2015) and the present research use Greenfield's theory of social change and human development as a framework for integrating the effects of social change on children's social behavior. The basic claim of the theory is that human development is not constant across historical time, but changes as a function of changes in the sociodemographic environment (Greenfield, 2009, Greenfield, 2016). The theory formalizes relationships between social change and individual development described in the work of researchers such as Nsamenang (Nsamenang and Lamb, 1994), Whiting (1996), Weisner et al. (1997), Saxe (1999), Edwards (2004), Rogoff et al. (2005), and Gauvain and Munroe (2012).

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A central theoretical claim is that different value systems, learning environments, and behaviors are adapted to different types of ecology. The ecological level of the theory is based on the ideal types of *Gemeinschaft* (community) and *Gesellschaft* (society) Tönnies (1887). Each ideal type is an ensemble of interrelated features. *Gemeinschaft* communities are small-scale, rural, and relatively isolated from the outside world. They are relatively homogenous - in terms of culture, ethnicity, and social class. They have subsistence agricultural economies, simple technology, and have limited material resources (cf. Inglehart and Baker (2000)). The theory posits that collectivistic values are adaptive in this environment; empirical research demonstrates that collectivistic values are, in fact, prevalent in it (e.g., Manago (2014); Zeng and Greenfield (2015)). These values are expressed, both implicitly and explicitly, in the child's learning environment, beginning with family socialization.

One way in which collectivistic values are expressed through maternal socialization is that mothers focus on being helpful to their children and socializing their children to be helpful to others (Greenfield et al., 2003, Madsen and Kagan, 1973, Raeff et al., 2000). Cooperation is also an adaptive component of the learning environment in a *Gemeinschaft* community where family members cooperate to accomplish subsistence tasks such as caring for children, making clothing for the family, and cooking (e. g., Whiting and Whiting (1973); Greenfield (2004)). This kind of learning environment then produces cooperative, helpful children (Whiting and Whiting, 1973, Weisner and Gallimore, 1977, Warneken, 2018, Madsen and Lancy, 1981, Madsen and Yi, 1975).

Gesellschaft societies, in contrast, are large scale, highly urbanized, and connected to the outside world. They are relatively heterogeneous - in terms of culture, ethnicity, and social class. Their economies are based on commerce and money; their technology is complex; and they are relatively wealthy. Individualistic values are adaptive in this environment and are therefore prevalent (e.g., Manago (2014); Zeng and Greenfield (2015)).

Individualistic values are expressed, both implicitly and explicitly, in the child's learning environment by letting the child do tasks on her own (Greenfield et al., 2003) and through the intrinsically competitive structure of standardized tests where achievement is expressed through ranking scores, such as percentiles. Letting children do tasks on their own produces independent children (Greenfield et al., 2003, Zhou et al., 2017), while the structure of formal education leads children to the experience of school as a competitive environment (Johnson et al., 1973).

Because values, learning environments, and behavioral development are, directly or indirectly, adapted to sociodemographic ecologies, Greenfield's theory posits that they are subject to modification under changing ecological conditions. When one or more sociodemographic dimensions moves in the *Gesellschaft* direction - e.g., becoming a more large-scale urban environment, developing a commerce and money-based economy, increasing in wealth, technology, and/or availability of formal education - the theoretically based prediction is that cultural values, learning environment, and child behavior will also shift toward *Gesellschaft* adaptation.

In psychological science, we are accustomed to syndromes of interrelated behavioral or psychological features. Taking an interdisciplinary approach, more familiar in sociology and anthropology than psychology, we here conceptualize the sociodemographic environment as an ensemble of interrelated features. Just as we consider psychological syndromes as a whole, we here assess the implications of the sociodemographic ensemble as a whole - not a single particular factor - for child behavior. Of course features of the macro environment - such as ethnic diversity - are reflected in the sociodemographic characteristics of individuals in the population.

1.1.1. The effect of social change on multiple levels

With China, we can provide an example of change on all of these levels. As China developed a market economy, at the same time becoming more urban and educated - in other words, as it moved towards a more *Gesellschaft* ecology - values, reflected in content analysis of thousands

of books, became more individualistic Zeng and Greenfield (2015). At the micro level, parent socialization, seen through the eyes of grandmothers, was perceived to shift towards more support and praise, practices that were linked with the grandmothers' perception of more autonomous behavior in their grandchildren (Zhou et al., 2017). The two studies together documented parallel shifts in societal-wide cultural values, learning environment provided by parents, and child behavior, shifts that were correlated with ecological shifts in the *Gesellschaft* direction.

1.2. Experimental studies of cooperation and competition with peers: the role of development, ecology, and social change

1.2.1. Development

Warneken (2018) after an exhaustive review of the literature, proposed two major issues to be distinguished in the study of cooperation: generating benefits and distributing benefits. He identified the ability to cooperate to develop as early as infancy and toddlerhood. Further, he concluded that: "The ways in which children solve the second cooperation problem may be tied to their specific social ecology and cultural traditions, so some (but not all) of these skills will be more sensitive to such cultural inputs" (p. 223). Although cultural studies of children's cooperation and competition with peers have not followed the development of these skills longitudinally, they have all hit on middle childhood as a period ripe for their investigations. Why middle childhood?

Focus on this age period is in line with Piaget's (1932) developmental theory and his study of children's marble play. In Piagetian theory, middle childhood is the time at which children reach the cognitive stage of concrete operations; fundamental to this stage is an understanding that physical operations can be reversed. Understanding of reversible or two-way operations is, then, in Piaget's analysis of moral development, observable in a marbles game. There the concept of reversibility is applied to children's consciousness of rules as a product of mutual agreement among players, an awareness that develops in middle childhood. Mutual agreement among players is, in turn, based on and necessary for cooperation (Linaza, 1984).

1.2.2. Ecology

Correa-Chávez et al. (2016) have documented differences in cooperative play depending on a family's experience with formal education and an urban environment, two features of a *Gesellschaft* ecology. Structuring a Chinese checkers game so that teams of two Mexican children (ages 8–10) could play more collaboratively or more individually, the research team found that rural children whose mothers had fewer than nine years of education manifest the most cooperative interaction in their play, whereas the urban children whose mothers had nine or more years of schooling manifest the least cooperative interaction. Showing the influence of both factors, urban children whose mothers had less than nine years of schooling were in the middle. In this study, cooperative behavior was contrasted with individualistic behavior. In Madsen and colleagues' research (to be reviewed next) and in the present study, cooperation is contrasted with competition rather than individual activity. The fact that cooperation contrasts with both individualistic and competitive behavior suggests a connection between individualism and competition, as is also posited in Greenfield (2009) theory. Correa-Chavez and colleagues' study also reveals the synergistic effect of two *Gesellschaft* features, schooling and urbanization.

Contrasting cooperation with competition, Madsen (1967) was the first to develop experimental procedures to assess these behaviors in different ecological contexts; other researchers followed suit. Using Madsen's cooperation board, "researchers have found that urban and European children are generally more competitive and less cooperative than rural, non-Western groups such as Canadian Indians (Miller, 1973, Miller and Thomas, 1972) [or] Australian Aborigines (Sommerlad and Bellingham, 1972)." [33, p. 88]. Comparison of urban and rural groups revealed greater cooperation and less competition among Polynesian

children in the Cook Islands and rural Maori children in New Zealand than among urban Maori or urban European-origin children in New Zealand (Thomas, 1978). Madsen (1967) and those who followed him using his cooperation board operationally defined competitive behavior as behavior that prevents another person from attaining their goal; we adopt this definition in the present research.

1.2.3. Social change

Showing the effect of social change, the Cook Islands children tested for the 1978 article were more competitive on the cooperation board than they had been in 1974 and 1975 (Thomas, 1978, Thomas, 1975, Graves and Graves, 1975). In the few years in between the two testings, the education system of the Cook Islands developed to resemble that of New Zealand and universal secondary education developed. Thus the Cook Islands were evolving in the *Gesellschaft* direction, with corresponding augmentation of children's competitive behaviors. Children in all of these studies were in middle childhood.

1.3. Cultural shifts in Mexico: implications for children's learning environments and behavior

As noted earlier, both collectivistic values and cooperative behavior are adaptive and prevalent in *Gemeinschaft* ecologies, whereas individualistic values and competitive behavior are adaptive and prevalent in *Gesellschaft* ecologies. Using Hui's (1988) individualism-collectivism scale, Shkodriani and Gibbons found Mexican university students to be more collectivistic than university students in the United States (Shkodriani and Gibbons, 1995). However, there are indications that collectivism may not be a stable value in Mexico; instead, it may be in decline because of increasing *Gesellschaft* influences, such as higher education for women (Diaz-Loving, 2011). Based on anthropological fieldwork, Cancian (1992) found that giving to the community through sponsoring religious fiestas, a cooperative and collectivistic practice, was in decline in a Maya community in Chiapas, Mexico, as men's commercial activity developed. First-generation Maya university students in Chiapas felt that their values and practices - specifically values regarding choice and independence - were more individualistic than those of their mothers because of experiencing formal education and migrating from rural village to urban city (Manago, 2012). But is young children's group behavior sensitive to these historically mediated shifts in values and behavior? This is the focus of our cross-cohort comparative research on Mexican children's cooperation and competition, to which we now turn.

This research focuses on the effects of social change in the *Gesellschaft* direction on children's cooperative and competitive behavior. Using Millard Madsen's Marble Pull apparatus with children between 7 and 11 years of age, Garcia, Rivera, and Greenfield (Garcia et al., 2015) showed that, as Mexico has moved in the *Gesellschaft* direction in recent decades, children's cooperative behavior has declined and competitive behavior has increased. This shift took place in rural San Vicente and in urban Veracruz.

Complementing these studies of increasing child competitiveness, an individualistic behavior, Garcia et al. (2017) demonstrated that learning environments also changed to encourage greater child individualism in the small town of San Vicente in Baja California: over a period of more than 40 years, the reward behavior of mothers in an experimental beanbag game became less giving and increasingly focused on encouraging high personal achievement in their elementary school children. In Experiment 1, the later cohort showed an increased tendency to reward child success and withhold reward after failure, becoming more like U.S. mothers 40+ years earlier. In Experiment 2, the current cohort of mothers selected difficult targets in a beanbag game more frequently than the earlier cohort. In fact their tendency to select the harder targets made their target selection behavior indistinguishable from that of U.S. mothers in the early 1970s (Garcia et al., 2017, Madsen and Kanig, 1973).

1.4. The present study

Whereas Madsen's Marble Pull game was designed to allow pairs of children to cooperate or compete, Madsen (1967) developed the Cooperation Board to assess cooperation and competition in groups of four children. Group cooperation is an important social skill, whether the context be family, community, school, or commercial enterprise. Therefore, one goal of our study was to explore the historical trajectory and implications of social change in Mexico for the development of children's cooperative behavior in groups.

The Cooperation Board study also added mixed-gender groups to the same-sex groups studied in the Marble Pull study (Garcia et al., 2015). Because cooperative activity in family, school, community, and society often takes place in mixed-gender groups, studying historical change and cooperative behavior across both same-sex and mixed-sex groups was another important goal. The function of having both mixed-gender and single-gender groups in this study was to demonstrate the generality of the overall ecological change in the society, i.e., that shifts in children's social interaction were similar, no matter what the gender composition of the group.

Finally, the marble pull study (Garcia et al., 2015) had shown a historical decline in children's cooperative behavior in both rural and urban environments. However, cities are sociodemographically heterogeneous. In the prior study (Garcia et al., 2015), the urban sample was not differentiated by social class. In contrast, the present study included both a very low-income group and a middle-class group; hence, we could also test the generality of any historical shift in cooperative and competitive behavior across social class lines, holding urban location constant.

The nature of the cooperation board game (to be described in the Method section in detail) is such that noncooperative behavior is intrinsically competitive; this is because non-cooperative behavior prevents the other players from obtaining a reward. As in Madsen (1967), the prevention of others from obtaining their goal or reward is the operational definition of competition used in the present study.

5 Hypothesis

In line with Thomas (1978) and our own research (Garcia et al., 2015), we predicted that, as Mexican environments have moved in the *Gesellschaft* direction over five decades, children's cooperative behavior would decline in the cooperation board game, as competition rose. We predicted that the historical shift from cooperation to competition would take place in all three ecologies and all three types of gender groupings: boys' groups, girls' groups, and mixed-gender groups.

2. Method

2.1. Design

The basic design was a cross-temporal comparison between data published by Madsen in 1967 (Madsen, 1967) on children's cooperation and competition in three Mexican settings and data using the same procedure in parallel samples in the same settings collected in 2017. This is not a longitudinal study of individuals; instead it is a longitudinal study of communities - by means of a cross-cohort comparative design.

In each wave of data collection, three ecologies were represented: rural village, middle-class urban and low-income urban.

2.2. The three ecologies

The rural sample was situated in the village of San Damián Texóloc in the state of Tlaxcala. Madsen (1967, p. 1309) described contextual characteristics of the first cohort in this way: "Only a few children wore shoes to school, but local officials reported little extreme poverty or malnutrition in the village.... The campesinos followed the typical practice in Mexico of living in small villages and walking to their plots of land." In 2017, the researchers were able to collect data in the same school that Madsen had utilized about 50 years earlier. Changes in the

Table 1

Sociodemographic Transformation from 1967 to 2017 in Three Settings in Mexico (first column based on Madsen, 1967; second column based on INEGI, and naturalistic observation).

		1967	2017
Rural	Population	2400	5,569
	Economic activity	Ninety percent in subsistence agriculture	In addition to agriculture, livestock, farmers' markets, and vendors
	Level of fathers' education	Not reported	-
	Technology	No cell phones or internet	Internet available in store fronts. No children with tablet or cell phone. About 10% of parents had very basic cell phones
	Out migration	Some fathers had been to USA as Braceros	Some fathers are migrants or returned migrants
Low-income urban	Population	300,000	1,576,259
	Economic activity	Street vendors, day laborer. Most: no formal or steady employment	Commercial activity and informal economy activities such as domestic work, casual labor, peddling
	Level of fathers' education	Most were illiterate	No one was illiterate. No one expressed a reading problem and all of them can sign financial and legal documents
	Technology	No cell phones or tablets	No children with cell phones; one child with tablet
	Out migration	All children born in Puebla; i.e., lack of recent migrants	More international or domestic migrants
Middle-class urban	Population	300,000	1,576,259
	Economic activity	Street vendors, textile workers, drivers, office workers, accountants, medical doctors	Office worker, bank worker, veterinarian, teachers, policeman, medical doctors, lawyers, and accountants)
	Level of fathers' education	Almost all had completed elementary school. Approximately 15% with one or more years of junior high	Some fathers with university studies
	Technology	No cell phones or Internet	Some children have cell phones, but every parent has at least one. Internet available in store fronts
	Out migration	A lack of recent migrants	More domestic migrants

village ecology between 1967 and 2017 are presented in the top rows of [Table 1](#).

The urban samples came from the city of Puebla. For the low-income urban children, the sample consisted of "girls attending a charity class for the urban poor operated by a Catholic teaching order of nuns in the city of Puebla" ([Madsen, 1967, p. 1308](#)). Madsen further describes the context: "This sample attended a private church-operated school but was segregated from the tuition-paying students who represented the upper middle and upper classes. The two groups were not allowed to associate or even be on the playground at the same time." ([Madsen, 1967, p. 1309](#))

This school no longer existed in 2017; nor did any schools of the same type. Therefore, we went to the poorest areas of Puebla, colonias on the outskirts of the city, and chose a school in the closest colonia to downtown. Madsen had only girls in his low-income urban sample; we did the same. Their lack of resources is indicated by the fact that the school has a breakfast program to feed the students offered by the local government. Additional characteristics of the low-income urban ecology in 1967 and 2017 are presented in the middle rows of [Table 1](#).

[Madsen \(1967\)](#) describes the middle-class urban sample of the first cohort in the following way: "The Puebla public school sample very roughly represents the Mexican urban middle class. The children attended a large modern school and were clean, well groomed, and uniformed, as specified by school regulations... The school population was limited at both ends of the socio-economic scale in that the majority of children from wealthy families attended private schools and many of the very poor attended charity classes in private schools, or did not attend school at all." ([Madsen, 1967, pp. 1308-1309](#))

For the 2017 middle-class sample, we selected the public school closest to the cathedral at the center of town to provide the sample. It was one of two downtown schools that had been in existence at the time of Madsen's study. While we do not know which school was used by Madsen, the two schools are within one or two blocks of each other and both serve the same neighborhood. The bottom rows of [Table 1](#) provides additional contextual information.

The columns in [Table 1](#) show some differences between samples at each time period, while the rows show the historical change in each ecological context.

2.3. Participants

Second-grade students were the target group in both waves of data collection. In the 2017 sample all 228 participants were second graders. In the 1967 sample of 280, all the urban participants were second graders. In order to expand the 1967 rural sample to the size of the urban sample (after all second graders in the village had participated), the rural sample included three older first-graders and three younger third-graders. There were fewer participants in 2017 because fewer second-grade children were available in the rural and middle-class urban school. Following standard local practice, the researchers received oral permission from the school principals, the participants' teachers, and the participants themselves.

Groups of four played together. Except in the low-income urban sample, which consisted entirely of girls' groups, there were equal numbers of girls' groups, boys' groups, and mixed-gender groups. [Table 2](#) shows the distribution of groups in 1967 and 2017.

2.4. Procedure and materials

[Fig. 1](#) shows the experimental setup. Under the group reward condition, there was a white sheet of paper covering the entire surface of the apparatus with four circles printed, one on each side ([Figs. 1 and 2a](#)). Each circle, five centimeters in diameter, had a number from 1 to 4 in counterclockwise direction. "Ss were instructed to move the pen by pulling their strings in such a way as to draw a line over circles one-two-three-four, in that order. They were also told that each time all four circles were crossed in that order each child would receive one piece of candy. Thus no child was rewarded independently of the rest of the group. Five 1-min. trials were given under this condition." ([Madsen, 1967, p. 1312](#)). [Fig. 3](#) portrays a line that resulted when players drew



Fig. 1. Photograph of experimental setup, as it was for the 2017 cohort.

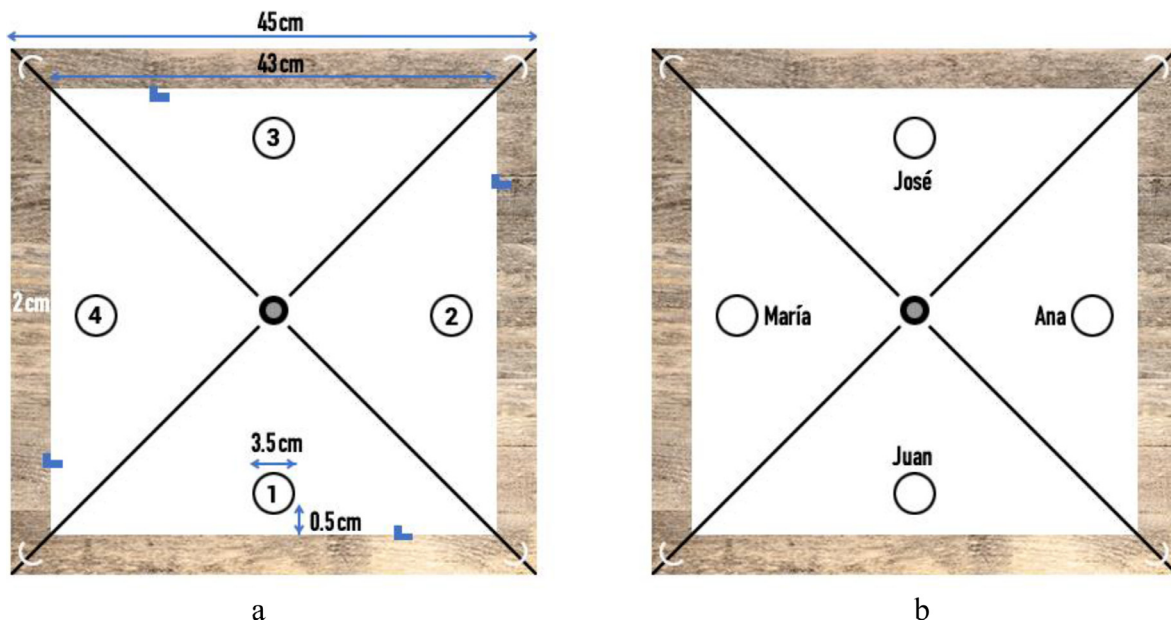


Fig. 2. Cooperation Board (Madsen, 1967). Each of the four corners has an eyelet. Each side of a square white paper contains a numbered target circle. In the center there is a container (pen holder) with four strings attached to it on one end, while the other end leads to one of the eyelets. This arrangement allows each of the participants the possibility of pulling the containers towards their own corner. As seen in Figure 1, the penholder was a metal cylinder with a hole in the center able to support a pen that was marking on a paper as it moved on the board's surface. In the Group Reward condition (Fig. 2a), the players had to pull the string through each circle in numerical sequence to receive a candy reward. Thus, the children were interdependent in all their moves: in order to cooperate, two children had to release the string to let the pen go to a circle other than their own. In the individual reward condition, (Fig. 2b), the numerals were replaced by each player's name on one of the four circles. However, cooperation was still necessary for any player to receive a reward.

Table 2
Sample Distribution in 1967 and 2017.

		1967 (N=280)			2017 (N=228*)				
		Groups	Boys	Girls	Mixed	Groups	Boys	Girls	Mixed
Settings	Rural	30	10	10	10	24*	8	8	8
	Low-income urban†	10	0	10	0	10	0	10	0
	Middle-class urban	30	10	10	10	23*	6	9	7

* The sample was exhausted.

† Girls only.

In the actual sample there were boys, but Madsen did not use them in his 1967 article.

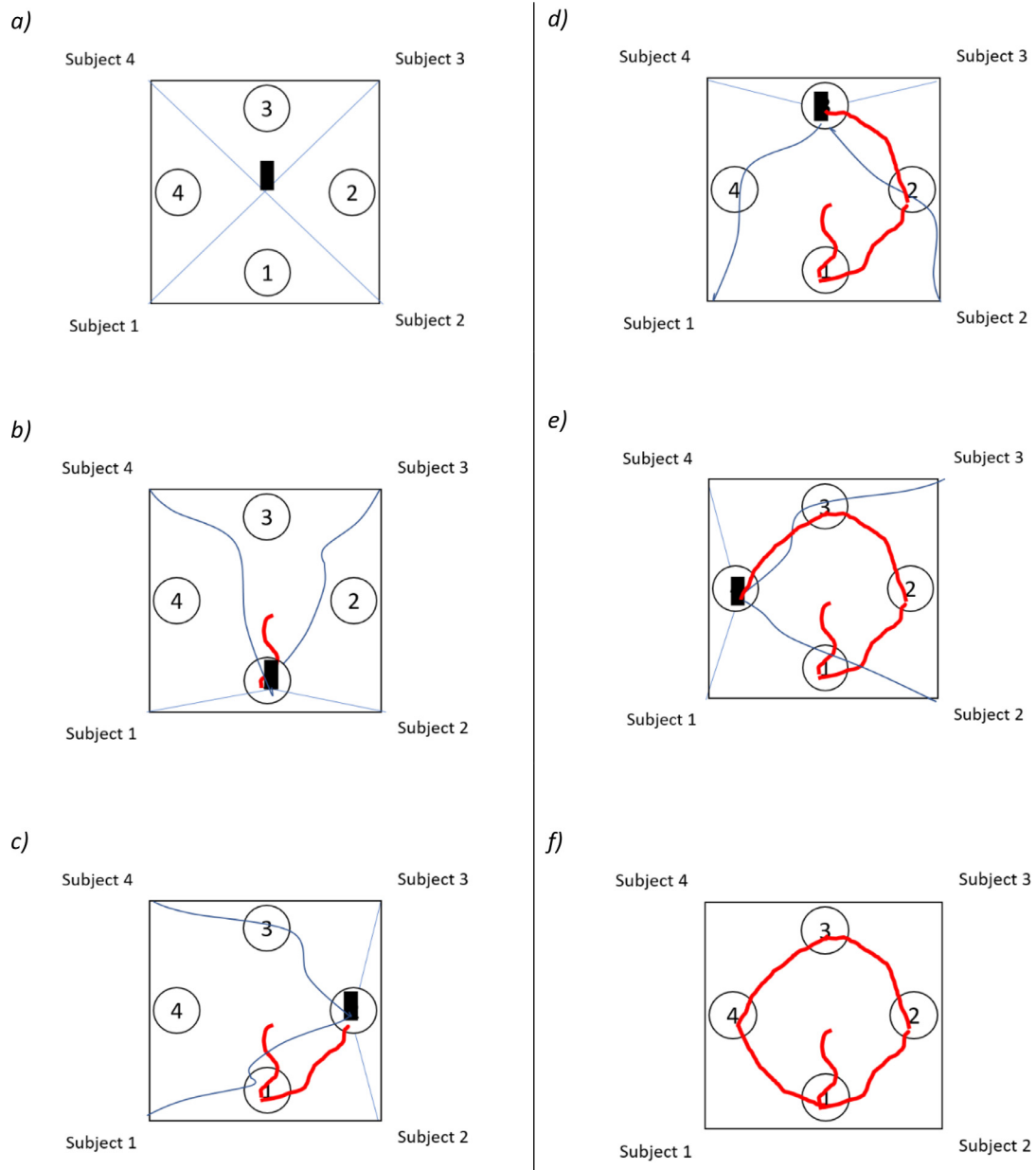


Fig. 3. Here we see one group’s moves through four circles in sequence in the Group Reward condition. The penholder (black rectangle) moves from the center of the board (a) to Circle 1 (b) to Circle 2 (c) to Circle 3 (d), to Circle 4 (e) and back to Circle 1 (f), ready start over. The sequence through (e) would yield one reward for each player in this condition. The sequence through (f) would yield a score of 5 crossed circles. The red lines show the pen’s path. The black lines in (a) through (e) represent the strings. One sees in (b), (c), (d) and (e) how two players need to release their string while the other two pull in order to get the pen to go through each circle.

Table 3
Mean Number of Circles Crossed in Each Ecological Context at Two Historical Periods.

		1967		2017		Wilcoxon T	
		Mean	SD	Mean	SD	Z	p
Group reward	Rural	4.34	1.93	4.20	1.62	0.341	0.733
	Middle-class urban	6.61	3.36	3.33	1.34	2.897	0.004*
	Low-income urban	4.5	1.97	3.86	1.14	1.214	0.225
Individual reward	Rural	9.26	2.16	7.38	1.79	3.237	0.001*
	Middle-class urban	8.02	3.57	2.93	1.25	3.408	0.001*
	Low-income urban	7.38	2.59	5.12	0.27	1.761	0.078

* $p < .005$

a line through every circle in the correct order and then were ready to start over at Circle 1. The number of crossed circles was the measure of cooperative behavior. This drawing would give a total score of five because Circles 2, 3, and 4 were crossed once and Circle 1 was crossed twice.

The instructions changed on Trial 6, and five trials of the individual reward condition (Fig. 2b) began. Instead of numbers on each circle, "Each child's name was written on one of the circles. Ss were then told that they would be given a piece of candy as an individual for each time the pen crossed their circle. Five 1-minute trials were also given under this condition" (Madsen, 1967, p. 1312). Again, the number of crossed circles was the measure of cooperative behavior.

It is important to note that, although the reward contingencies differed in the two conditions, both required that the whole team cooperate in order for any child to receive a reward - two participants had to release their string, while two pulled - in order to cross any individual circle. In other words, under both conditions, competition was dysfunctional. In this research, we refer to both cooperation and competition partly to maintain the definitions that have been used in Madsen's and our prior research. But in addition, note that, with the cooperation board, both cooperative and competitive behavior are operationally defined in terms of specific behaviors - competition is not just the absence of cooperation. Cooperation to successfully reach a goal and maximize reward occurs when two children pull and the other two children release. Fig. 3 shows how this works in the group reward condition. Competition occurs when one child prevents another child or children from crossing a circle.

As in Madsen's original study, even though no communication, verbal or nonverbal, was allowed in either condition, the children did communicate. The instructions not to communicate were equally applied for all conditions at both historical periods; thus cross-cohort differences in cooperation could not be attributed to these instructions. (See Section 2.5.2 for information on recording the children's communications in 2017.)

2.5. Data analysis

2.5.1. Comparing the cohorts

We were limited to Madsen's published data for the first historical cohort. These data consisted solely of means on separate trials for each group. However, we had 10 trial-by-trial group data points (i.e., number of circles crossed by each group on each trial) from each of seven groups for both 1967 and 2017, yielding a total of 140 group data points for the overall data analysis. These data points enabled us to calculate means and standard deviations for each of the seven groups in 1967 and 2017; they also enabled us to carry out the Wilcoxon signed-ranks test to assess the statistical significance of historical results, both overall and group by group. The seven gender and ecologically-defined groups are described above in the Participants section. When appropriate, the Wilcoxon was complemented by another nonparametric statistic, the binomial test. In order to address the issue of multiple comparisons, we use the .025 level as a more stringent criterion for statistical significance than the usual .05 level.



2.5.2. Children's communication

In the 2017 cohort, one of the experimenters was in charge of writing notes while the other two were alert to particular reactions to any kind of events during their performance. Observers focused on communication and behavior used before, during, and after the participants performed the tasks. In order to assure reliability of these observations, at the end of each group performance, each of the experimenters contributed to a brief report which was annotated on each record. The examples provided in the Results section were typical ones observed in each group. For 1967, we have only a few examples from Madsen's published report.

3. Results

3.1. The decline of cooperation

We hypothesized that, between 1967 and 2017, children's cooperative behavior would decline. Cooperative behavior, as measured by the group means of crossed circles, was greater in 1967 ($M = 6.90$, $SD = 3.25$) than in 2017 ($M = 4.65$, $SD = 2.19$), this difference was statistically significant (Wilcoxon Signed Ranks Test, $Z = 5.83$, $p < 0.001$). Fig. 4 shows that this is the case for both the group and individual reward conditions across all three ecologies (binomial test, $p = 0.016$). Because the binomial test ignores the size of each historical change, this statistic shows that the overall finding is not driven by middle-class urban children, the group with the largest quantitative decline. This same pattern of historical decline in cooperative behavior held for male groups, female groups, and mixed groups (binomial test, $p = 0.016$).

Table 3 shows which of the historical declines was individually statistically significant: for middle-class urban children under both conditions and for rural children under the individual reward condition. While the urban low income group followed the same pattern (decline of cooperation from Time 1 to Time 2 under both group and individual reward conditions), the fact that sample size was much smaller than sample size in the two other ecologies may have prevented the historical pattern from reaching statistical significance.

Concerning the behavior differences between the group and individual reward condition, we attribute increased cooperative behavior in almost every group under the individual reward condition (Trials 6-10) simply to learning from experience. If Madsen had counterbalanced order of the two conditions, a better comparison - one that would control for differential experience - could have been made between the group reward and individual reward conditions.

3.2. Children's communication

In his 1967 publication, Madsen reported that "the most frequent expression among the urban middle-class children...was *para mi* (for me). This expression was never heard in the other two samples, but the expression "*para ti*" (for you) was frequently heard." (Madsen, 1967-, p. 1318). In 2017, again, it was only in the middle-class urban sample that communication indicating a competitive mindset was heard: "Ahora yo voy a ganar." (Now I will win.) and "Es que él sólo quiere para él." (It's that he only wants it for himself.) Also similar to the 1967 study, the

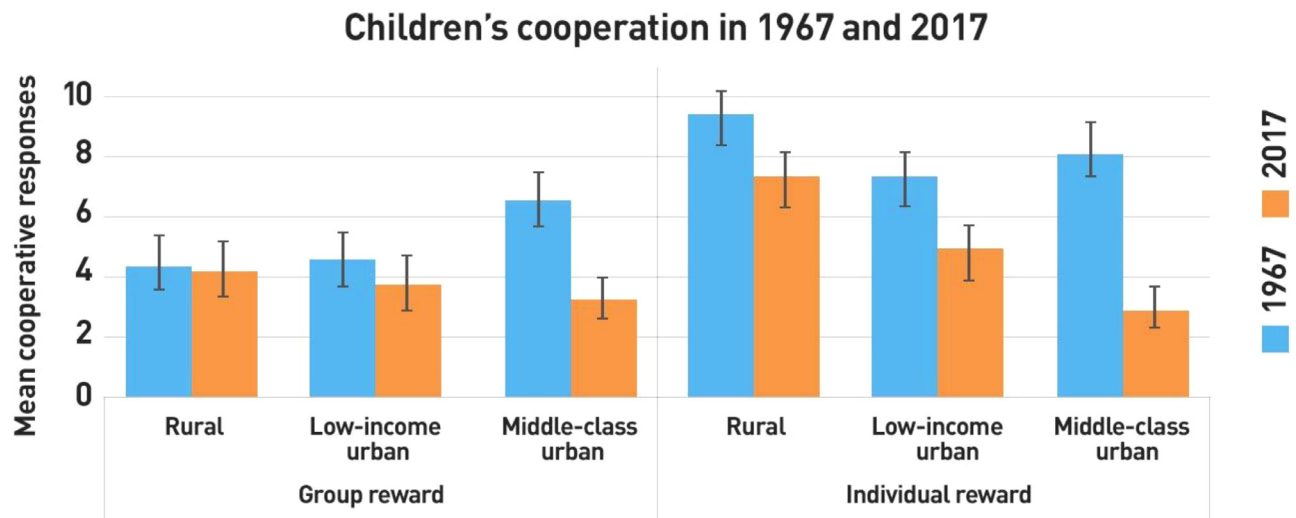


Fig. 4. Children's cooperation in 1967 and 2017: Group and individual reward conditions in three different ecologies

only communication indicating a cooperative mindset occurred in the low-income urban and rural groups, where children clapped once all of the group had received candies.

4. Discussion

As Mexican ecologies moved in the *Gesellschaft* direction over recent decades, our hypothesis was confirmed: children's cooperative behavior (defined as working together for a common goal) declined, as their competitive behavior (defined as acting to prevent others from reaching their goal) augmented. Using a unique historical data set of children's social interactions in an experimental situation at two chronological points 50 years apart, we have generalized the decline of cooperation and rise of competition in children's behavior from dyadic interaction (Garcia et al., 2015) to group interaction among four children. We have also been able to generalize the decline of cooperation from children's interactive play in single-gender groups (Garcia et al., 2015) to interactive play in mixed-gender groups.

Compared with the 2015 publication (Garcia et al., 2015), which investigated only two ecologies, middle-class urban and rural village, we can now add a third ecology to the pattern of historical change: a low-income urban environment.

The main sociodemographic shifts in the *Gesellschaft* direction documented across all three ecologies were large population increases and the use of cellular technologies. The question then arises as to how overall ecological change was implemented in children's environments in the three ecologies. Why these changes would reduce cooperative behavior is clearest in the rural environment. Madsen notes that "in a subsistence agricultural situation, the family works together as a unit to raise enough food for family survival. If a child is competitive...toward other members of the family unit. He is likely to be suppressed as he serves no adaptive purpose for other members of the family. Working in cooperation with other members of the family serves a useful purpose in that all will benefit [29, p. 1319].

Unlike the 1970s, in 2017, the rural village no longer had fields or crops near the school, a situation indicative of a reduction in children's opportunity to cooperate in the family's agricultural work. Other components of a *Gesellschaft* ecology had entered their lives. Computer technology had become available to village children through public Internet shops where they were able to access the Internet for a small fee. Music technology had become available in informal CD shops.

In the low-income urban group, increased wealth, another *Gesellschaft* influence, affected children's lives in several ways. Madsen wrote of the urban charity school, "The school authorities attempted

to deal with problems of hygiene, clothing, and malnutrition as well as with formal education." (Madsen, 1967, p. 1309). In 2017, children in the low-income urban setting looked healthy and clean; and they wore uniforms (which their parents had to purchase). In addition, family-based subsistence, typical of a *Gemeinschaft* ecology, had been partially replaced by the government's free breakfast program for children from low-income families.

In the middle-income urban group, children now bought their lunch at the school store rather than bringing it from home. So children's involvement in commercial transactions, a characteristic of life in a *Gesellschaft*, had expanded, while the family's role in directly providing children's nourishment, typical of a *Gemeinschaft* ecology, had contracted.

Unlike 1967, children in both the low-income and middle-class urban groups had to deal with a physical environment containing multiple highways, noisy and congested traffic, and traffic lights. In this way, the augmentation of transportation technologies, another shift in the *Gesellschaft* direction, modified the ecology in which urban children lived and with which they had to cope.

Our findings concerning historical shifts on the micro-level of children's social behavior not only relate to changes in the immediate ecology; they also reflect the macro level of Mexican society: A drastic shift in the political and economic environment has been documented in Mexico for the last five decades. In politics, Pastor and Wise (2005) identified the year 2000 as a major event: after seven decades in political power, the controlling political party was replaced in the first competitive election in 70 years. Political competition continued: three years later, the same party lost half the congress as other parties successfully competed.

On the economic level, major competitive processes were unchained during recent decades; for example, in 1993, the Government of Mexico enacted the Federal Act Governing Economic Competition (Walton and Levy, 2009), which pushed Mexico to transition from state companies to competitive private companies. The enhancement of competition in the economic sphere is also a direct product of globalizing forces: In 2018, the World Bank published a document titled "Promoting competition in local markets in Mexico" (World Bank 2018).

Even the domain of religion has seen increased competition. In the 70s Protestantism began to compete with Catholicism, which had, in the 1960s, been the sole religion in Mexico; this competition in the religious sphere grew in subsequent decades Dow (2005). Our research has demonstrated that these economic, political, and religious shifts towards a more competitive society on the macro level are reflected at the micro level in children's social behavior.

4.1. Limitations

The major limitation was the fact that we are limited to the published group data for the first wave of data collection. The greatly reduced number of data points in the group data because of lack of individual data is probably why some of the shifts in specific ecological groups (Table 3) do not reach statistical significance. Because of the greater number of data points in the overall analysis, the overall historical differences are highly statistically significant, as is the overall pattern of change across all groups.

Other limitations of this historical comparison arise from limitations in the original study. One of these is the absence of low-income urban boys in the two samples, making the design incomplete. Most, likely, with the addition of an equal number of boys' groups and mixed-gender groups in the low-income urban ecology, the decline of cooperation would have been statistically significant in the low-income urban group with both individual and group reward, especially if we had had individual data points for each group of four in the earlier cohort. Additionally, the small sample of low-income urban children has prevented us from going further in the analysis of the role of social class; the role of social class in our study is therefore limited to showing the generality of the effects of ecological shifts on child behavior across social class lines.

Another limitation of the original study was the absence of a baseline condition to assess children's psychomotor skill. However, our historical comparison does not support the contention that a decline of psychomotor skill was responsible for the decreasing cooperation. First of all, there were no table-top games for children in this culture at either point in time; the cooperation board was a completely novel task for both generations. More important, the cooperation board game is essentially a social task, and the results reflect social skill in dealing with others, rather than pure psychomotor skill. To sum, this and other studies support the decline of cooperation rather than the decline of psychomotor skill. For example, the marble pull game showed the same decline of cooperation over time in Mexico; yet its psychomotor requirements were much simpler (Garcia et al., 2015).

There is also one anomalous finding: In 1967, the middle-class urban group was more cooperative than the rural group, a finding that not only goes counter to Greenfield (2009) theory and many other studies (e.g. Shapira and Madsen (1969)), but also is contradicted by Madsen's own Discussion section in which he uses the quotes cited above to substantiate his conclusion that the rural and low-income urban children were more cooperative than the urban children (Madsen, 1967). Not having done the 1967 data collection ourselves, we cannot explain this anomaly and suspect an error. This anomaly also made us wary of interpreting different amounts of change in different ecological groups, as well as wary of interpreting the differences among groups in 1967. In any case, note that in 2017, when we did do the data collection ourselves, the rural children were more cooperative than either urban group, both under group and under individual reward conditions. The examples of verbal communication we have presented also substantiate the more competitive mindset of the middle-class urban children.

5. Conclusions

Using a unique historical data set of children's social interactions in an experimental situation at two chronological points 50 years apart, we have generalized the decline of cooperation and rise of competition in children's behavior from dyadic interaction (Garcia et al., 2015) to group interaction among four children. Compared with the 2015 publication, which investigated only two ecologies, middle-class urban and rural village, we can now add a third ecology to our generalization concerning historical change: low-income urban.

In conclusion, we provide continuing evidence that child behavior is responsive to ecological conditions and shifts over time in order to adapt to them. This finding is also consistent with Warneken's (2018) suggestions regarding cultural differences in cooperation. Given that cooperation

is a fundamental human trait that binds social units together, our study also contributes to the conclusion that globalized social change in the Gesellschaft direction entails human loss - the loss of crucial social ties, as well as gain - in the form of competitive skills, useful in the march to a commercial, technological society.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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