AMERICAN PSYCHOLOGICAL ASSOCIATION

Psychological Bulletin

ISSN: 0033-2909

2022, Vol. 148, Nos. 3–4, 129–157
https://doi.org/10.1037/bul0000363

Did Cooperation Among Strangers Decline in the United States? A Cross-Temporal Meta-Analysis of Social Dilemmas (1956–2017)

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Cooperation among strangers has been hypothesized to have declined in the United States over the past several decades, an alarming trend that has potential far-reaching societal consequences. To date, most research that supports a decline in cooperation has relied on self-report measures or archival data. Here, we utilize the history of experimental research on cooperation in situations involving conflicting interests (i.e., social dilemmas). We meta-analyzed 511 studies conducted between 1956 and 2017 with 660 unique samples and effect sizes involving 63,342 participants to test whether the average level of cooperation observed in these studies had declined over time. We found no evidence for a decline in cooperation over the 61-year period. Instead, we found a slight increase in cooperation over time. In addition, some societal indicators (e.g., income inequality, societal wealth, urbanization level, and percentage of people living alone) measured 10 to 5 years prior to measures of cooperation were found to be positively associated with cooperation, suggesting that they may be potential societal underpinnings of increases in cooperation. These findings challenge the idea that social capital and civic cooperation among strangers have declined in the United States over time, and we offer directions for future research to understand causes of an increase in cooperation.

Public Significance Statement

This meta-analysis reveals that Americans' level of cooperation among strangers has increased over the 61-year period from 1956 to 2017. This finding challenges the idea that social capital and norms of cooperation have declined in the American society over time. Changes in American society support greater cooperation among strangers, which could underlie an ability for Americans to cooperate to solve present and future challenges (e.g., solutions to climate change, pandemics, and sustainable resource consumption).

Keywords: cooperation, social capital, social dilemmas, meta-analysis, time

Supplemental materials: https://doi.org/10.1037/bul0000363.supp

Social capital, civic participation, and generally, norms of trust and cooperation among strangers facilitate societies to develop sustainable high-quality institutions (Portes, 1998; Putnam, 1994), to reduce transaction costs in market exchange (Coleman, 1988), to enhance public health and well-being (Putnam, 2000), and to effectively compete with other societies (Boyd & Richerson, 2009; Francois et al., 2018; Putnam, 2000, 2020). Indeed, cross-societal variation in trust and cooperation among strangers is

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All materials (including the preregistration, raw data, and R analysis scripts) needed to reproduce all analyses including figures and tables are provided online on the Open Science Framework (https://osf.io/jm2sg/).This research was supported by (a) the European Research Council Starting Grant (635356) awarded to Daniel Balliet, (b) the Peace and Conflict Studies at the Vrije Universiteit (VU) Amsterdam awarded to Paul A. M. Van Lange, and (c) the Fellowship from China Scholarship Council (201806040053) awarded to Mingliang Yuan, the National Natural Science Foundation of China (31971011, 71901028) awarded to Yu Kou and Junhui Wu, and the Ministry of Education Project of Key Research Institutes of Humanities and Social Science at Universities (16JJD880007) awarded to Yu Kou.

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positively associated with variations in government effectiveness, market competitiveness, and economic growth (Putnam et al., 1994; Zak & Knack, 2001).

Notably, norms of cooperation among strangers do not remain permanent or stable in a society but can shift with changes in ecology and culture (Boyd & Richerson, 2009; Richerson et al., 2016). In fact, norms of civic participation and cooperation among strangers are thought to have declined in American society over the past several decades. For example, in Putnam's (2000, 2020) book titled *Bowling Alone*, he argued that Americans have become increasingly less connected with one another outside the marketplace and thus are less prepared to cooperate for shared goals (the classic book, Putnam, 2000, is cited ~95,100 times as of April 2022 according to Google Scholar). If true, this has strong implications for the future of American society. Yet, much of the research supporting this conclusion is based on archival and survey data, such as an observed decrease in self-reported trust in strangers (Putnam, 2000; Rahn & Transue, 1998; Twenge et al., 2014), a reduction in participation in community organizations, less attendance at meetings on public affairs, and less contribution to community projects (Putnam, 2000). Although archival and survey data can provide compelling evidence, an overreliance on these methods may limit conclusions and raise alternative interpretations. For example, there may be a shift in cultural norms for specific activities (e.g., civic participation) that does not necessarily reflect a shift in Americans' willingness to cooperate with strangers. More controlled, internally valid methods are required to infer whether there has been a decline in Americans' willingness to cooperate with other American strangers.

In the present research, we utilized a 61-year history of experimental research on cooperation among young American adults to test for possible changes over time in cooperation among strangers. The now famous social dilemma paradigms (e.g., the prisoner's dilemma [PD]) have been widely used to study cooperation in the last several decades. Here, we synthesize results from 511 studies of cooperation in social dilemmas using cross-temporal meta-analytic methods to detect changes in cooperation over time (1956–2017) among young American adults (M_{age} = 18–28 years). As in previous research (e.g., Curran & Hill, 2019; Eagly et al., 2020; Twenge et al., 2004), by combining evidence among participants from the same age group at different points in time, this cross-temporal meta-analysis tests the correlation between mean levels of cooperation and the year of data collection to examine possible differences in cooperation across birth cohorts. In addition, we test for several potential sociocultural underpinnings for the changes in cooperation by retrieving relevant sociocultural indicators (e.g., income inequality, societal wealth, and urbanization) that occurred 10 and 5 years prior to the measures of cooperation and testing whether these indicators predict future levels of cooperation.

Social Capital and Impersonal Cooperation

Social capital refers to connections among individuals—the set of social networks and norms of trust, reciprocity, and cooperation that facilitate collective action in the pursuit of shared goals (Coleman, 1988; Putnam, 2000). A key feature of social capital is that people are willing to cooperate with others, especially those with whom they do not share a relationship history, even when there is no knowledge of these others' reputation or when it is uncertain whether they will interact in the future (hereinafter, we refer to this cooperation among strangers as impersonal cooperation; Buchan et al., 2009; Chudek & Henrich, 2011; Henrich, 2004). Social norms supporting impersonal cooperation are important sources of social capital in a society. This is because these norms facilitate people to form new relationships, expand their networks, and foster generalized reciprocity, which they can rely on when they need others' help to achieve certain goals (Ostrom, 2000; Putnam, 2000).

Over the past several decades, theory and experimental research on impersonal cooperation has intensely focused on understanding behavior in social dilemmas (i.e., situations where there is a conflict between short-term personal gain and long-term collective gain; Dawes, 1980; Van Lange et al., 2013). In such situations, cooperation is broadly defined as behavior that benefits the group or collective but is costly for the individual (Rand & Nowak, 2013; Van Lange & Rand, 2022). Many theories have attempted to explain how people can solve social dilemmas, and empirical research has repeatedly placed people in experimental social dilemmas to study cooperative behavior. In the present meta-analysis, we analyze studies that use two highly similar social dilemma paradigms to study impersonal cooperation: The PD and the public goods dilemma (PGD).

In a typical PD (Rand & Nowak, 2013; Rapoport & Chammah, 1965a; Van Lange & Rand, 2022), two players simultaneously decide whether to cooperate or to defect with each other. If both players cooperate, they always receive a larger payoff (reward outcome [R]) than if both defect (punishment outcome [P]). However, the highest payoff (temptation outcome [T]) is earned by a defector whose partner cooperates, whereas the lowest payoff (sucker outcome [S]) is earned by a cooperator whose partner defects. Thus, all PDs have the same payoff structure: $T > R > P > S$.

Similarly, in PGDs (Fehr & Fischbacher, 2004) with n persons ($n \geq 2$), each player is given an initial monetary endowment E. All players simultaneously decide how much (0–E) of their personal resource E to keep for themselves and how much to contribute to a group fund. The total contributions to the group fund are multiplied by a constant b ($1 < b < n$) and then divided evenly among the n players irrespective of their initial contributions. These two social dilemma paradigms (PD and PGD) have a similar incentive structure because each player can maximize their individual profit by contributing nothing (i.e., defecting) regardless of their partner's contributions, but each person contributing everything to their partner(s) can maximize the collective profit. Thus, the PGD is sometimes referred to as an N-person PD (Fehr & Fischbacher, 2004; Rand et al., 2009; Rand & Nowak, 2013).

Taken together, social dilemma paradigms capture the dynamics of many real-world cooperation problems (e.g., investments in a joint research project or combating climate change) and measure actual behavior rather than hypothetical decisions or behavioral intentions (Balliet et al., 2011). These experimental game paradigms provide a parsimonious model of complex social interactions in highly internally valid and standardized settings (Murnighan & Wang, 2016; Thielmann et al., 2021). To illustrate, all studies included in this meta-analysis involved a social interaction in a situation with conflicting interests among people who have no interaction history, reputational information, or opportunities of future interactions outside of the experiment. As described earlier,

these features are characteristic of many civic engagement behaviors and social capital. In fact, empirical evidence supports the external validity of these paradigms, although some mixed findings in this regard should also be noted (for a review, see Galizzi & Navarro-Martinez, 2019). For example, prior research has found that cooperation in economic games is associated with tendencies to cooperate outside of the lab, such as with charity donations (Benz & Meier, 2008), self-reported cooperation with members of the community (Soler, 2012), and civic participation (e.g., blood donations, volunteering behaviors, and activism; Haesevoets et al., 2020). Moreover, both cooperation in economic games and real-life prosocial behaviors (e.g., civic engagement, helping behavior) are predicted by individual differences in trust and social value orientation (Balliet & Van Lange, 2013a; Jennings & Stoker, 2004; Haesevoets et al., 2020; Thielmann et al., 2021; Wu, Yuan, et al., 2020). Thus, using the history of experimental research on social dilemmas to examine possible changes in impersonal cooperation over time can help us further understand whether changes in cooperation underlie changes in social capital.

Did Impersonal Cooperation Change Over Time in the United States?

Cooperation can shift over time with changes in the sociocultural environment (Chudek & Henrich, 2011; Richerson et al., 2016). Indeed, research and theory have proposed that sociocultural environments within a society vary over time and generations and shape individuals' attitudes, beliefs, personality, and behavior (Greenfield, 2016; Markus & Kitayama, 2010; Oishi & Graham, 2010; Twenge & Campbell, 2001; Varnum & Grossmann, 2017). Specifically, individuals born at different times grow up in different sociocultural environments that vary in economic, social, and technological conditions (e.g., income inequality, societal wealth, urbanization level, percentage of people living alone, and internet use), which can contribute to different attitudes, beliefs, and norms (Twenge & Campbell, 2001). For example, changes in women's roles and social positions have caused shifts in gender-related attitudes and personality traits (Eagly et al., 2020; Twenge, 1997, 2001). An increase in anxious and controlling parenting practices has produced higher perfectionism among college students (Curran & Hill, 2019). Similarly, such macro sociocultural environments could result in birth cohort or generational differences in impersonal cooperation.

Yet, few studies have investigated the potential changes in cooperation over time. For example, Putnam (2000, 2020) used long-term historical archival and survey data with nationally representative samples and found a decline in Americans' social capital in the form of cooperation from 1970s to 1990s, such as decreasing generalized trust, less participation in community organizations, less attendance at meetings on public affairs, and less involvement in community projects. Importantly, American society has also experienced remarkable sociocultural transformations in the past several decades that could have contributed to this decrease in impersonal cooperation, including increasing urbanization, more business and time pressure, disruption of marriage and family ties, and the electronic revolution (Putnam, 2000, 2020). Yet, barely any research has considered whether there has been a decline in cooperation using more controlled, experimental methods. In the only example we found, García et al. (2015) conducted two different studies in which they compared cross-temporal observations of Mexican children in an experimental cooperation task at two points in time (1970 vs. 2010 and 1985 vs. 2005, respectively; $N_{1970} = 40$, $N_{2010} = 88$, $N_{1985} = 236$, $N_{2005} = 378$). They found evidence for a decline in children's cooperative behavior over time. Yet, this study was limited to a Mexican sample and had a relatively small sample size from only two time points. Therefore, previous support for a decline in cooperation in American society has been limited to archival and survey data and lacked observations of cooperative behavior within internally valid experiments.

The archival and survey evidence used to support Putnam's (2000) arguments for a decline in cooperation cannot rule out alternative interpretations. For example, the changes in economic and social environment may only influence people's lifestyle or forms of civic engagement but do not decrease Americans' actual cooperative behavior in social interactions. To address the limitation of archival and survey data and provide more robust behavioral evidence, we conducted a cross-temporal meta-analysis utilizing a 61-year history of experimental research on cooperative behavior among American young adults to test for a potential decline in cooperation among strangers. Next, we elaborate on how changes in certain sociocultural conditions may have influenced changes in cooperation in American society.

Understanding a Possible Decline in Cooperation Over Time in the United States

In line with Putnam's (2000, 2001a, 2020) argument that Americans have become remarkably less civic, less socially connected, less trusting, and less committed to the common good, we hypothesize that impersonal cooperation in American society has decreased in the past several decades. Several shifts in sociocultural conditions could be responsible for a decrease in impersonal cooperation, including increases in (a) income inequality, (b) urbanization, (c) individualism, and (d) materialism, along with (e) a decrease in social trust. Below, we discuss each of them in detail.

First, the level of income inequality (i.e., Gini index) in the United States has increased steadily from 0.39 in 1968 to 0.48 in 2017 (U.S. Census Bureau, 2018). Notably, income inequality has been found to be negatively associated with social trust (Kawachi et al., 1997; Morselli & Glaeser, 2018; Twenge et al., 2014), whereas social trust is positively linked to cooperation (Balliet & Van Lange, 2013b). In addition, income inequality predicts greater perceived competitiveness that may reduce individuals' willingness to cooperate (Sommet et al., 2019). In fact, the visibility of income inequality (e.g., asymmetrical endowments in a PGD) can yield lower cooperation (Nishi et al., 2015). An increase in income inequality in the United States also corresponds with a sustained growth in the unemployment rate across the past decades (U.S. Bureau of Labor statistics, 2018). Indeed, Putnam (2000) suggested that an increase in economic distress, along with the corresponding time pressure and financial anxiety, can modestly explain the decline in civic engagement and social connectedness among Americans. Moreover, evidence from the European Values Survey and the World Values Survey showed that environmental adversity (e.g., low income) is associated with less investment in collective actions (Lettinga et al., 2020). Although there has been much evidence that income inequality is associated with less cooperation, to what extent these indicators of income inequality actually elicit a decrease in cooperation

among citizens over time is an open research question that we can address in this meta-analysis.

Second, the urbanization level (i.e., percentage of a population living in urban areas) in the United States increased steadily from 70% in 1960 to 82.26% in 2018 (World Bank, 2019b). This trend may weaken cooperative behavior through lowering citizens' reputational concerns (Ge et al., 2019; Wu et al., 2016), because compared to those living in small towns and rural areas, people living in large cities often have less stable social connections and fewer interactions with familiar others. Thus, their behavior is less likely to be gossiped within their social network and translated into indirect benefits. In addition, the increasing urban sprawl (i.e., suburbanization) is associated with increasing social segregation, such as a geographical separation between the places where people work, live, and shop, which may weaken individuals' sense of community (Putnam, 2001a). Meanwhile, more time spent alone in the car or commuting means less time spent for friends and neighbors, community projects, and less chance to build connections and trust with strangers (Putnam, 2000, 2020), and thus may make people less cooperative toward strangers.

Third, American culture has become markedly more individualistic in recent decades (Grossmann & Varnum, 2015; Hamamura, 2012; Santos et al., 2017). Higher individualism suggests that people are more autonomous and liberated from social bonds and tend to prioritize their personal goals over collective goals. Modernization theory claims that modernization (largely due to technical innovation, economic growth, and urbanization) has made people more independent (and less interdependent), thereby "nudging" people and cultures into self-reliance and individualism (Hamamura, 2012; Inglehart & Baker, 2000). People in modern societies have more freedom and independence to direct their lives, to make their own choices, and to pursue their own goals. These social trends have coincided with (a) an increase in competitive individualism, such as higher levels of both dominance and independence (Helson et al., 2002) and (b) decreasing dispositional empathy (Konrath et al., 2011)—each of which could be associated with lower cooperation (Batson & Ahmad, 2001; Rumble et al., 2010; Thielmann et al., 2020). The rise in individualism is also reflected in a breakdown in social connectedness, as indicated by a higher divorce rate, higher percentage of self-employed workers, higher percentage of people living alone (U.S. Census Bureau, 2001), less participation in community organizations, and less likelihood to visit friends (Putnam, 2000, 2020).

Fourth, materialism (i.e., emphasizing the importance of money and of owning expensive material items) among American youth has increased over generations (Pew Research Center, 2007; Twenge & Kasser, 2013). Research suggests that rising materialistic values seriously undermined individuals' social trust (Rahn & Transue, 1998), which is positively related to cooperation (Balliet & Van Lange, 2013b). In addition, people who endorse materialistic values have lower empathy (Sheldon & Kasser, 1995), lower identification with prosocial norms (Ryan, 1995), more greed, and thus engage in less cooperative behaviors in social dilemmas (Sheldon et al., 2000; Sheldon & McGregor, 2000).

Last, research using large U.S. samples (e.g., high school seniors, undergraduates, and other adult groups) shows a decline in trust in others over time (Trzesniewski & Donnellan, 2010; Twenge et al., 2014). Trust reflects one's willingness to accept vulnerability on the basis of the positive expectations of others' intentions or behaviors and is a key antecedent of cooperation (Balliet & Van Lange, 2013a). Indeed, empirical research suggests that expected others' cooperation reflects one's trust in others and robustly predicts one's cooperation in social dilemmas (Balliet & Van Lange, 2013a; Pletzer et al., 2018). Thus, a decrease in social trust would undermine individuals' expectations of others' cooperation and thus further lower their own cooperative behavior.

A Possible Rise in Cooperation Over Time in the United States

Although much of the debate about Americans' changing levels of civic engagement and social capital has been dominated by a focus on a potential decline, there has also been some discussion about how these features of American society may have actually increased over time.[1] For example, the observed rise in residential mobility, urbanization, and individualism within American society may lead to *higher* levels of impersonal cooperation because individualists are more likely to interact with strangers (Oyserman et al., 2002; Triandis, 2018) and have greater generalized trust in others (Beilmann et al., 2018; Yamagishi & Yamagishi, 1994). In fact, some prior research has already found that individualists, compared to collectivists, are more likely to cooperate when interacting with strangers (Berigan & Irwin, 2011; Chen & Li, 2005; Koch & Koch, 2007). The present meta-analysis will be able to identify whether Americans' level of cooperation has either increased or decreased across the past several decades.

The Present Research

To examine whether Americans' level of cooperation has changed across the past several decades (1956–2017), we performed a cross-temporal meta-analysis on cooperative behavior of American participants in experimental studies using social dilemma paradigms. All the studies included in the meta-analysis report observations of cooperation in a social dilemma (i.e., the PD and the PGD). We tested the relation between the year of data collection and participants' mean levels of cooperation in social dilemma studies. To consider any birth cohort differences that result in generational variation, we limited the participant sample to American college students and other young adults (mean age between 18 and 28 years). We further reported the correlations between cooperation in each coded study and the sociocultural indicators that were measured 10 and 5 years prior to the year of data collection for each study to explore whether these sociocultural indicators can potentially explain the changes in cooperation.

Method

The objectives, hypotheses, inclusion criteria, and analytic procedure were preregistered in the Open Science Framework (https://osf.io/jm2sg/) prior to all analyses.

[1] We did not preregister the alternative hypothesis that impersonal cooperation has actually increased over time in American society. However, after we learned about the results, we discovered this perspective in the existing literature. Therefore, we address this perspective more thoroughly in the discussion of the article.

Literature Search

We used the mean levels of cooperation in the eligible studies from the Cooperation Databank (CoDa; Spadaro et al., in press; see https://cooperationdatabank.org). CoDa contains the entire history of experimental research on human cooperation using social dilemmas that was written in English, Japanese, or Chinese: (a) the English-written documents were retrieved through PsycINFO, Web of Science, and Google Scholar databases as well as online university library repositories; (b) the Japanese-written documents were retrieved through the CiNii and Google Scholar databases; (c) the Chinese-written documents were retrieved through China National Knowledge Infrastructure (CNKI), Wanfang Data, and China Science and Technology Journal (CSTJ) databases. The search log included the following terms: "Public goods dilemma*," "Public good*," "Public good* game*," "Prisoner's dilemma*," "Voluntar* contribut* experiment*," "Voluntary contribution mechanism," "Social dilemma," "Mixed-motive game*," "Resource dilemma*," "Matrix games," "Cooperation" AND "Experiment," "Common pool game," "Give-some dilemma," "Take-some dilemma," "Give-some game," "Take-some game." The output of the search included published research articles, online working articles, book chapters, and doctoral dissertations. Additionally, the search included backward selection and screening of relevant documents from the references of published books, review articles, and meta-analyses on social dilemmas (for more detail, see Spadaro et al., in press). We only searched research documents that included American samples in CoDa, which were only written in English and Japanese (only five samples from one article written in Japanese were included in the meta-analysis). No documents written in Chinese included American samples.

Inclusion Criteria

To be included in the meta-analysis, a study had to meet the following criteria: (a) data were collected in the United States; (b) participants were American young adults, including college students (participants' M_{age} = 18–28 years)[2]; (c) the study employed the PD or PGD paradigm; (d) cooperative behavior was assessed in interactions with strangers; (e) the overall mean level of cooperation could be extracted from the article; (f) the mean level of cooperation was reported either across all periods or in the first period of the game. To increase the homogeneity of studies included in the meta-analysis, we excluded studies that used a nonlinear payoff structure of the social dilemma or measured cooperation in diverse real-life contexts. These inclusion criteria resulted in a total of 513 unique studies (with 667 effect sizes) conducted between 1956 and 2017 involving 64,234 participants. After excluding seven effect sizes that were considered as extreme outliers ($|Z| > 3.29$; Tabachnick & Fidell, 2007; see preliminary analysis in the Results section), the final meta-analysis was based on 511 studies comprising 660 unique cooperation estimates involving 63,342 participants (for a corresponding Preferred Reporting Items for Systematic reviews and Meta-Analyses [PRISMA] flow diagram, see Figure S1 in the Supplemental Materials).

Coding of Year of Data Collection

When possible, we coded the year of data collection mentioned in the article ($k = 42$). When this information was unavailable, we used several approaches to estimate the year of data collection (Konrath et al., 2011, 2014; Twenge et al., 2004): (a) if the article reported that the data were presented at a conference, we used the year of the conference ($k = 14$); (b) if the article was presented as a working article, we used this year ($k = 23$); (c) if the article reported the original date on which the article was first submitted, we used this year ($k = 327$); (d) if the article reported only the final date on which the article was accepted, we subtracted this by 1 year to correct for the publication year ($k = 7$); (e) if the data source was a dissertation available online, we subtracted one from the dissertation defense year to account for time taken for data collection and writing ($k = 4$); (f) if the article was available/published online or published, the year of data collection was coded as 2 years prior to publication ($k = 243$). Accordingly, year of data collection was annotated for all studies and ranged from 1956 to 2017 (Mdn = 1,999; see Figure S2 in the Supplemental Materials).

Effect Size (Logit-Transformed Cooperation Rates) Calculations

To compute the effect size, we used the mean level of cooperation in PDs and PGDs. Effect sizes (i.e., cooperation estimates) were generated from the overall proportion of cooperation in dichotomous-choice games and the percentage of endowment contributed in continuous-choice games. The observed proportions of cooperation were converted to logits using the formula: $y_{i(\text{coop})} = \log_e [p/1 - p]$, and all the analyses were performed on these logit-transformed cooperation rates. After analyzing the data, we converted these cooperation estimates back to cooperation rates for an easier interpretation. Variance for effect sizes from studies involving dichotomous choices was calculated using the standard formula for proportions: $v_{i(\text{coop})} = 1/np + 1/(n - np)$ (see Lipsey & Wilson, 2001).

Cooperation estimates for studies involving a continuous measure of cooperation were calculated from percentage of endowment contributed using the formula: $p_{\text{cont}} = (M - E_{\text{LL}})/(E_{\text{UL}} - E_{\text{LL}})$. Here, p_{cont} is computed by scaling the mean contribution (M) by the range of the endowment [E_{LL}, E_{UL}] and thus ranges from 0 to 1. Among all the studies included in our analysis, E_{LL} equals 0, which means that p_{cont} equals the ratio of mean endowment contributed (M) to the maximum amount (i.e., endowment) that participants could potentially contribute (E_{UL}).

Then, the cooperation estimates were calculated using a logit transformation: $y_{i(\text{cont})} = \log_e [p_{\text{cont}}/(1 - p_{\text{cont}})]$, and the variance was calculated using the following formula:

$$v_{i(\text{cont})} = \frac{SD^2}{M^2} \times \frac{1}{(1 - p_{\text{cont}})^2 n}. \quad (1)$$

In case of missing values in the standard deviation (SD) within a study, we proceeded by imputing the median value of the coefficient of variation (CV = SD/M) calculated beforehand for all the studies that reported the standard deviation: $v_{i(\text{cont})} = \text{CV}^2/[(1 - p_{\text{cont}})^2 n]$. We found 82 studies with 108 unique samples that reported the SD, and among these studies, CV had a median value of 0.53 ($M = 0.55$,

[2] Nineteen studies (i.e., 26 unique samples including 3,034 participants) that did not report participants' mean age or student information were also included in the analysis. We obtained the same results when excluding these studies (see Table S17 in the Supplemental Materials).

$SD = 0.21$) and ranged from 0.11 to 1.29. This value was used to estimate variance for 98 studies with 133 unique samples.

Cooperation Within Studies That Manipulated Study Characteristics

We coded for several study characteristics (see, e.g., Conflict of Interests or Communication section) to be used as control variables in the meta-regression models. If study characteristics were manipulated within a study, we then took two approaches to calculate cooperation estimates. First, if the study used a between-subjects design and provided information about the cooperation rates in each treatment, we calculated a cooperation estimate for each level of the study characteristic variable. Therefore, some cooperation estimates are nested within the same study. Second, if this information was not available or the study used a within-subject design, we used the overall cooperation rate across all periods or in the first period of the game. This procedure resulted in 667 unique cooperation estimates computed from 513 independent studies. After excluding seven extreme outliers, we retained 660 cooperation estimates from 511 studies for the meta-analysis.

Coding of Study Characteristics

The CoDa contains the annotation of each study and their sample characteristics. For each of these variables, the interrater agreement was estimated across 10% of the entire sample of annotated studies.[3] The interrater agreement was assessed using Krippendorff's α (Hayes & Krippendorff, 2007; Krippendorff, 2011) and the percentage of agreement (i.e., agreement rate; for categorical variables only). All coded study and sample characteristics in this databank displayed high interrater agreement (Spadaro et al., in press; for a complete list of variables coded in the databank, see https://cooperationdatabank.org/codebook-2/). In the current meta-analysis, we included as control variables in the meta-regression models all of the following study characteristics that have been hypothesized to explain a statistically significant amount of variation in cooperation across studies (Jin et al., 2021). These study characteristics had a high and/or adequate level of interrater agreement (α ranged from 0 .68 to 0.97; agreement rate ranged from 82.90% to 96.60%).

Dilemma Type

In our analysis, the PD ($k = 416$, coded 0) was the most common dilemma type, followed by PGD ($k = 244$, coded 1).

Proportion of Male Participants

We coded the proportion of men in the sample as a continuous variable. Excluding samples that did not report the proportion of men ($k = 267$), the mean proportion of men was 0.51 ($k = 393$, $SD = 0.28$) and ranged from 0 to 1.

Repetitions

In social dilemma studies, participants are allowed to interact with the same person only once or repeatedly for several iterations. The sample of studies includes both one-shot ($k = 181$, coded 0) and iterated dilemmas ($k = 466$, coded 1). A few studies manipulated whether participants had one-shot interactions or repeated interactions, but cooperation rates were not reported for each level of the variable. These studies were coded as mixed dilemmas on repetitions ($k = 13$, coded 0.5).[4]

Group Size

We coded group size (i.e., the number of people interacting in the dilemma) as a continuous variable. For studies that manipulated group size but did not report cooperation rates in each group size condition, we coded the median group size in these studies. Across all samples with group size information ($k = 658$), the group size ranged from 2 to 100 (mode = 2, $Mdn = 2$, $M = 4.56$). Because group size was skewed toward dyads and smaller groups, we log-transformed group size prior to data analyses.

Conflict of Interests

We coded the degree of conflict of interests between players' payoffs in social dilemmas as a continuous variable. The indicator of conflict of interests in the PD is the K index (Rapoport, 1967), which measures the relation between payoffs resulting from the possible combination of players' choices. Specifically, $K = (R - P)/(T - S)$, where R = the reward for mutual cooperation, P = the punishment outcome for mutual defection, T = the temptation outcome for unilateral defection, and S = the sucker outcome for unilateral cooperation. In continuous social dilemmas where players decide *how much* to contribute to a group account, cooperation means contributing everything, whereas defection means contributing nothing. Thus, the K index can also be applied to other social dilemmas such as the PGD,[5] which is viewed as an N-player ($N \geq 2$) variant of the PD[6] (Thielmann et al., 2020). The K index ranges from 0 to 1 because social dilemmas with conflicting interests have the following hierarchical payoff structure: $T > R > P > S$. A higher K (also called index of cooperation) implies lower temptation to defect and higher reward for mutual cooperation than for mutual defection (Balliet & Van Lange, 2013a). Additionally, for studies that manipulated the degree of conflict of interests in the social dilemma but did not report the cooperation rates for each treatment, we coded the median of the K index. Across all studies with information to calculate the K index ($k = 577$), the K index ranged from 0.01 to 0.95 ($Mdn = 0.45$, $M = 0.46$, $SD = 0.18$).

[3] We did not estimate the interrater agreement for sanctions because it was coded at a later stage.

[4] The social dilemma studies that displayed mixed levels of the categorical study characteristics (i.e., repetitions, communication, and sanctions) were coded 0.5. We used dummy variables in the regression models, contrasting 0.5 and 1 with 0.

[5] A more common way to calculate the degree of conflict of interests in the PGD is the marginal per capita return (MPCR; Isaac et al., 1984), which equals the ratio of the factor b, by which total contributions to the group account are multiplied, to the group size N (i.e., b/N). In the current analysis, MPCR was highly correlated with the K index ($k = 246$, $r = .66$, $p < .001$), suggesting that both can reflect the degree of conflict of interests (Thielmann et al., 2020).

[6] The K index for N-person PD can be calculated by the following modified equation: $K' = (C_N - D_0)/(D_{N-1} - C_1)$ (Komorita, 1976). In the equation, C_N denotes the payoff when everyone cooperates and D_0 denotes the payoff when everyone defects. D_{N-1} denotes the payoff when a person defects and everyone else cooperates and C_1 equals the outcome when a person cooperates and everyone else defects. The value ranges from 0 to 1.

Communication

In some social dilemma studies, participants are allowed to communicate with group members prior to the first trial or across several trials. Most studies implemented communication as face-to-face discussion or through written messages either transmitted digitally or on article. Studies that involved no communication were coded 0 ($k = 530$). Studies that allowed any form of communication between participants were coded 1 ($k = 118$). In addition, for studies that involved both no communication and communication conditions, but then cooperation rates were not reported for each treatment, we coded these studies as mixed dilemmas on communication ($k = 12$, coded 0.5).

Sanctions (Punishment and Reward)

To reduce free riding and encourage cooperation in social dilemmas, participants are often rewarded and/or punished for their behaviors. For example, many experiments have participants make a payment to either reward or punish their partners. Studies without any punishment or reward mechanisms were coded 0 ($k = 611$). Studies with any punishment or reward mechanisms were coded 1 ($k = 35$). Additionally, for studies that involved both no sanction and sanction conditions, but then cooperation rates were not reported for each treatment, we coded these studies as mixed dilemmas on sanctions ($k = 14$, coded 0.5).

Period of Cooperation

We coded whether the study reported cooperation across all periods ($k = 643$, coded 0) or in the first period of the game ($k = 17$, coded 1).

Coding of Sociocultural Indicators

Through publicly available sources, we retrieved several sociocultural indicators in the United States that were noted earlier and are hypothesized to be associated with cooperation among strangers: (a) economic conditions, including income inequality (i.e., Gini index), gross domestic product (GDP) per capita, social welfare function, and unemployment rate; (b) urbanization level; (c) social connectedness, including divorce rate and percentage of people living alone; (d) materialism; (e) social trust. In addition to these indicators, we also retrieved (f) party of president and (g) violent crime rate that were of interest to us. Table 1 reports details about each sociocultural indicator. Sociocultural indicators operationalizing beliefs and values (i.e., social trust and materialism) were extracted from surveys that include young adults as respondents. Sociocultural indicators that describe the general economic, political, and social environment were extracted from reports released by authorities, such as U.S. Bureau of Labor statistics (2018), U.S. Census Bureau (2001, 2018), and World Bank (2019a, 2019b).

Meta-Analytic Procedure

To examine whether impersonal cooperation has declined in the United States over time, we conducted meta-regression analyses using the *metafor* package in R (R Core Team, 2019; Viechtbauer, 2010). Considering the dependency between effect sizes in our data set, we applied a three-level mixed-effects meta-regression model (Assink & Wibbelink, 2016; Van den Noortgate et al., 2013). This three-level meta-analytic model considers three different variance components distributed over the three levels of the model: sampling variance of the extracted cooperation estimates (Level 1), variance between cooperation estimates extracted from the same study (Level 2), and variance between studies (Level 3). Further, the three-level approach allows examining differences in outcomes within studies (i.e., within-study heterogeneity) as well as differences between studies (i.e., between-study heterogeneity).

To handle missing data in our model, we performed multiple imputation with the *mice* package (Van Buuren & Groothuis-Oudshoorn, 2011). This package can simultaneously handle missing values in data sets from different types of variables and can be used in combination with the *metafor* package. The *mice* package can be used to predict missing values on variables with different estimation methods—each using the other variables in the imputation model—and then analyzing the imputed data and pooling the results across analyses.

For all analyses, year of data collection was entered as the predictor, and the cooperation estimate as the outcome variable. We also simultaneously added all of the study characteristic variables that we described earlier as control variables to the meta-regression models to account for the possibility that changes in cooperation are explained by study characteristics.

Following the meta-regression analyses, we also calculated the magnitude of change in Americans' cooperation. To do so, as in previous studies (e.g., Curran & Hill, 2019; Twenge et al., 2004), we used regression equation ($y = bx + c$, with b = the unstandardized regression coefficient, x = the year, c = the regression constant or intercept, and y = the cooperation estimate) to derive predicted values for the first year (1956) and the last year (2017) in the data set. Then, we computed the percent of change in cooperation over the 61-year period.

Finally, we reported the correlations between the sociocultural indicators and cooperation. Correlating cooperation with sociocultural indicators provides a view of possible underpinnings of the change in Americans' cooperation over time. Sociocultural indicators were matched with the cooperation data in three ways (Twenge, 2000): 10 years before data collection, 5 years before data collection, and during the year of data collection. Then, sociocultural indicators were each entered separately as predictors of cooperation, with the study characteristics as control variables in the meta-regression models.

Results

Preliminary Analysis

Prior to our analysis, cooperation estimates (y_i) were standardized to screen for extreme outliers. We deemed an effect size to be an extreme outlier when it would be randomly sampled less than one time in a thousand times (Tabachnick & Fidell, 2007; $|Z| > 3.29$). Seven cooperation estimates were identified as extreme outliers and excluded from all the analyses (see Table S1 in the Supplemental Materials).[7] The mean cooperation rate across the entire sample of studies (after excluding the seven outliers; $k = 660$) was 0.49 (see Table 2). In addition, we examined the potential publication

[7] We also conducted the analyses including 513 studies with seven extreme outliers in the sample (i.e., 667 unique cooperation estimates involving 64,234 participants). These analyses including the outliers resulted in the same conclusions (see Table S5 in the Supplemental Materials).

Table 1
Descriptive Information of Sociocultural Indicators

Definition of sociocultural indicators	*M* (*SD*)	Range	Time period	Source
Income inequality: Gini index (range: 0–1). Higher scores indicate greater income inequality.	0.44 (0.03)	0.39–0.48	1967–2017	U.S. Census Bureau. https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-income-inequality.html
Gross domestic product (GDP) per capita (current U.S. dollars): The GDP per capita was log-transformed in our analyses.	9.77 (0.96)	8.01–11.05	1960–2018	World Bank. https://data.worldbank.org/indicator/NY.GDP.PCAP.CD
Social welfare function (SWF): SWF = GDP per capita × (1 − Gini index; Sen, 1976). Higher SWF indicates better living conditions because it generates low values with low GDP and high-income inequality, and high values with high GDP and low inequality.	5.59 (0.18)	5.05–5.79	1967–2017	U.S. Census Bureau (Gini index) Word Bank (GDP per capita)
Annual unemployment rate: The percentage of job seekers aged 16 and above to the overall laboring population.	5.76 (1.61)	2.93–9.71	1948–2018	U.S. Bureau of Labor Statistics. https://data.bls.gov/timeseries/LNS14000000
Political conditions: party of president (0 = *democrat*, 1 = *republican*).	*N/A*	*N/A*	1945–2018	Wikipedia. https://en.wikipedia.org/wiki/List_of_Presidents_of_the_United_States
Urbanization level: percentage of urban population to the total population.	76.27 (3.53)	70–82.26	1960–2018	World Bank. https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS
Divorce rate: number of divorces per 1,000 total population.	3.93 (0.92)	2.2–5.3	1960–2017	U.S. Census Bureau (1960–2008). https://www.census.gov/library/publications/time-series/statistical_abstracts.html National Center for Health Statistics (NCHS) (2009–2017). https://www.cdc.gov/nchs/nvss/marriage-divorce.htm?CDC_AA_refVal=https%3 A%2 F%2Fwww.cdc.gov%2Fnchs%2Fmardiv.htm
Percentage of people living alone: ratio of households with one person to all households.	0.23 (0.05)	0.13–0.28	1960–2018	U.S. Census Bureau. https://www.census.gov/topics/families/families-and-households.html
Violent crime rate: number of offenses of murder, rape, robbery, and aggravated assault per 100,000 population.	454.83 (166.29)	120.70–758.20	1958–2017	U.S. Census Bureau (1958–2008). https://www.census.gov/library/publications/time-series/statistical_abstracts.html Federal Bureau of Investigation (2017). https://ucr.fbi.gov/crime-in-the-u.s/2017/crime-in-the-u.s.-2017/topic-pages/tables/table-1
Materialism: How important it is to "have lots of money" (1 = *not important*, 4 = *extremely important*).	2.83 (0.11)	2.51–3.00	1976–2017	Monitoring the Future (MTF). https://www.icpsr.umich.edu/icpsrweb/NAHDAP/series/35?start=0&sort=TITLE_SORT%20asc&SERIESQ=35&ARCHIVE=NAHDAP&rows=50#
Social trust: The following three items were averaged to indicate social trust.				
1. Generally speaking, would you say that most people can be trusted or that you cannot be too careful in dealing with people (1 = *can't be too careful*, 2 = *don't know, undecided*, 3 = *most people can be trusted*).	1.78 (0.09)	1.68–1.95	1976–2017	Monitoring the Future (MTF). https://www.icpsr.umich.edu/icpsrweb/NAHDAP/series/35?start=0&sort=TITLE_SORT%20asc&SERIESQ=35&ARCHIVE=NAHDAP&rows=50#
2. Would you say that most of the time people try to be helpful, or that they are mostly just looking out for themselves (1 = *just looking out for themselves*, 2 = *don't know, undecided*, 3 = *try to be helpful*).				
3. Do you think most people would try to take advantage of you if they got a chance or would they try to be fair (1 = *try to take advantage of you*, 2 = *don't know, undecided*, 3 = *try to be fair*).				

Note. *N/A* means "not applicable", hereafter the same.

Table 2
Estimated Population Mean Cooperation Rate

Variable	*M*	*SE*	95% CI	τ^2 (Level 2)	τ^2 (Level 3)	I^2 (Level 2)	I^2 (Level 3)
Cooperation	0.49	.03	[0.47, 0.50]	.34	.10	74.10	21.43

Note. $k = 660$. τ^2 = tau-squared, the estimate of total amount of heterogeneity; I^2 = percentage of total variance due to heterogeneity; Levels 2 and 3 represent within-study and between-study variance, respectively (hereafter the same); heterogeneity was significant, $Q_{residual}(659) = 11039.74$, $p < .001$. CI = confidence interval.

bias and found little bias in our sample (see analyses and Figure S3 in the Supplemental Materials).

Primary Analysis

To examine the effect of time on cooperation, we conducted a series of three-level mixed-effects meta-regression models. The results of these analyses are presented in Table 3 and Figure 1.

Models of Changes in Cooperation Over Time

We first used year of data collection (time) to predict cooperation in a mixed-effects meta-regression model (Model 1). In contrast to our main hypothesis, we found that Americans' cooperation increased significantly over time ($b = 0.006$, $SE = .002$, $p = .001$). We also examined whether the pattern of cooperation over time was curvilinear by using both year and year squared to predict cooperation (for more details on the curvilinear model results, see the Supplemental Materials). We still found that the year of data collection had a significant positive association with cooperation ($b = 0.005$, $SE = .002$, $p = .013$, $\beta = .10$), but year squared did not significantly predict cooperation ($b = -0.0001$, $SE = .0001$, $p = .400$, $\beta = -.05$). These analyses suggest that year of data collection has a linear, positive association with cooperation.

Next, we fitted a multivariate meta-regression model to test whether the predicted effect of historical time still existed after controlling for study characteristics of the social dilemma studies. We simultaneously added all the study characteristics (i.e., dilemma type, proportion of male participants, repetitions, group size, *K* index, communication, sanctions, and period of cooperation) to the meta-regression model (Model 2). Time continued to have a statistically significant positive relation with cooperation in this model ($b = 0.005$, $SE = .002$, $p = .012$), suggesting that Americans' cooperation levels increased over time. Moreover, the presence of communication and sanctions in the social dilemmas increased cooperation. In addition, people were more cooperative in social dilemmas with less conflicting interests (i.e., higher *K* index).

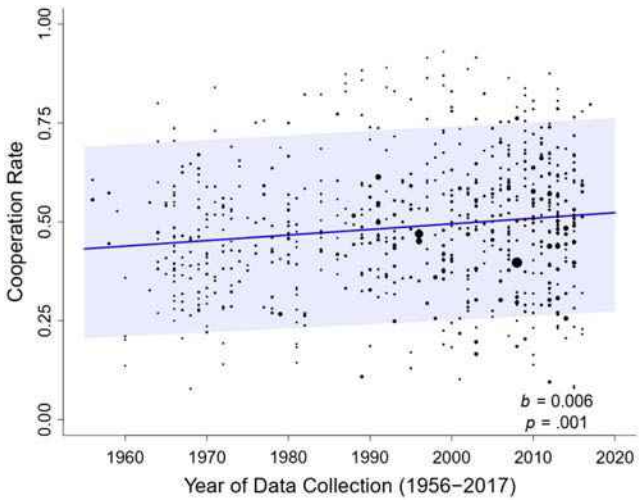
Table 3
Meta-Regression Models Without Control Variables (Model 1) and Including Control Variables (Model 2)

	Model 1				Model 2			
Variable	*b*	*SE*	95% CI	β	*b*	*SE*	95% CI	β
Birth cohort								
Time	0.006*	.002	[0.002, 0.009]	.13	0.005*	.002	[0.001, 0.009]	.11
Dilemma type[a]					0.03	.08	[−0.13, 0.19]	.03
% male					−0.003	.14	[−0.29, 0.28]	−.0004
Repetitions[b]								
Mixed					−0.09	.20	[−0.48, 0.30]	−.02
Repeated					−0.13	.07	[−0.264, 0.001]	−.08
Group size					−0.01	.05	[−0.12, 0.10]	−.01
K index					0.44*	.16	[0.11, 0.76]	.10
Communication[c]								
Mixed					0.23	.23	[−0.23, 0.69]	.04
Communication					0.54*	.08	[0.39, 0.69]	.28
Sanctions[d]								
Mixed					0.42*	.19	[0.05, 0.80]	.08
Sanctions					0.39*	.12	[0.15, 0.63]	.12
Periods[e]					0.05	.19	[−0.33, 0.42]	.01
Model statistics								
$Q_{model}(df)$	10.83 (1)*				90.85 (12)*			
$Q_{residual}(df)$	11030.15 (658)*				10043.07 (647)*			
R^2	.02				.11			
τ^2 (Level 2)	.33				.28			
τ^2 (Level 3)	.09				.11			
I^2 (Level 2)	74.69				68.30			
I^2 (Level 3)	20.75				26.47			

Note. $k = 660$. [a] 0 = *prisoner's dilemma*; 1 = *public goods dilemma*. [b] Comparison group = one-shot interaction. [c] Comparison group = no communication. [d] Comparison group = no sanctions. [e] 0 = *overall*, 1 = *first*. CI = confidence interval.
* $p < .05$.

Figure 1

Historical Changes Over Time in the Mean Cooperation Rate in Social Dilemmas



Note. The unstandardized regression coefficient (*b*) and *p* value are from the simple meta-regression model (Model 1). The blue line represents average model predictions converted back from logits to cooperation rates. Data points represent study means and the size of the data point is proportional to study (inverse variance) weighting. Larger dots are equated with means that have a smaller variance. The shaded blue (gray) region indicates the 90% prediction intervals based on average model predictions and residual heterogeneity; on average, 90% of true cooperation rates will fall within this region. See the online article for the color version of this figure.

Evaluating the Magnitude of Change Over Time

We calculated the magnitude of cooperation level change from the first year (1956) to the last year (2017) in the data set using unstandardized regression coefficients from the meta-regression. With control variables (Model 2), the regression equation yielded a predicted cooperation rate of 0.38 in 1956 and 0.46 in 2017. There was an increase in cooperation of 19.67% across the 61 years. Without control variables (Model 1), the cooperation rate increased from 0.43 in 1956 to 0.52 in 2017, which reflects an increase of 19.81% of cooperation during this period.

Associations Between Societal Conditions and Cooperation

As noted earlier, we used sociocultural indicators to predict cooperation separately in the meta-regression model while controlling for dilemma type, proportion of male participants, repetitions, group size, *K* index, communication, sanctions, and period of cooperation, as in previous models. Table 4 provides correlations of sociocultural indicators of 10 years prior, 5 years prior, and during the year of data collection with Americans' cooperation. The results showed that Gini index, GDP per capita, urbanization, percentage of people living alone, and materialism were positively correlated with cooperation. The significant correlations, especially when lagged 10 and 5 years into the past, suggest that these social changes are associated with the increase in cooperation. In addition, we found that social trust was negatively associated with cooperation.

General Discussion

Following seminal work by Putnam (2000, 2020), there is an increasing consensus that Americans have become less socially connected, more individualistic, less trusting, and less cooperative, all of which reveal less social capital over the past several decades. But is there indeed a systematic decline in social capital? For example, have citizens in the United States become more self-centered, and less helpful or cooperative toward fellow Americans, at least to strangers? As noted earlier, the perspective that impersonal cooperation has declined in the United States has been primarily supported by archival data (e.g., civic participation) and surveys (e.g., trust items; Putnam, 1994, 2000; Rahn & Transue, 1998; Twenge et al., 2014). However, this evidence cannot rule out alternative interpretations, especially the role of other unidentified variables that are associated with time and cooperation.

Table 4

Relation Between the Societal Indicators and Cooperation

Societal indicators	10 years prior		5 years prior		Current year	
	b	β	*b*	β	*b*	β
Economic conditions						
Gini index	2.94*	.12	2.72*	.11	2.67*	.12
GDP per capita	0.09*	.12	0.08*	.11	0.09*	.11
Social welfare function	0.23	.08	0.26	.09	0.29	.09
Unemployment rate	−0.04	−.06	0.02	.03	0.02	.05
Political condition: party of president	*N/A*	*N/A*	*N/A*	*N/A*	−0.11	−.07
Urbanization	0.03*	.11	0.02*	.11	0.02*	.11
Social connectedness						
Divorce rate	0.01	.02	0.02	.03	−0.01	−.002
Percentage of people living alone	1.57*	.11	1.66*	.11	1.81*	.10
Violent crime rate	0.0002	.07	0.0002	.06	0.00	.005
Materialism	0.35	.08	0.53*	.11	0.41	.07
Social trust	−0.69*	−.09	−0.72*	−.09	−0.70*	−.09

Note. $k = 660$. For the party of president, 0 = *democrat*, 1 = *republican*. Each model includes study characteristics as control variables. GDP = gross domestic product.

* $p < .05$.

Moreover, past research has not directly examined changes in Americans' actual cooperative behavior toward strangers within experimental social dilemma paradigms. Our research relied on studies that measured impersonal cooperation within controlled experimental settings and applied an analysis that statistically controlled for other variables known to affect cooperation.

Inspired by theory and research on social capital, it is reasonable to anticipate that a meta-analysis based on more than 60 years of research on experimental social dilemmas is likely to provide evidence for a similar decline in cooperation in the United States. However, our meta-analysis yielded a surprising finding. Across 511 studies with 660 unique samples and effect sizes ($N = 63{,}342$; $M_{age} = 18$–28 years) that were conducted across 61 years (1956–2017), we found that cooperation among strangers in American society has actually *increased* over time: The cooperation rate had increased from 0.38 in 1956 to 0.46 in 2017 after controlling for other variables. This result challenges previous arguments that Americans are becoming less cooperative. We also examined whether certain sociocultural indicators 10 and 5 years prior to the observed cooperation were associated with cooperation, which may explain the potential changes in cooperation. We found that income inequality, societal wealth, urbanization, the percentage of people living alone, and materialism were all positively correlated with cooperation. In what follows, we address the discrepancy between our findings and past research and discuss potential explanations for the observed increase in cooperation in American society.

Social Capital, Impersonal Cooperation, and American Society

Social capital reflects the extent to which social networks embody norms of trust, reciprocity, and cooperation that facilitate collective action in the pursuit of shared goals (Coleman, 1988; Putnam, 2000). Thus, a willingness to cooperate with others is a key feature of social capital. This is especially true for impersonal cooperation—a willingness to cooperate with strangers and without any clear potential for direct and indirect reciprocity (Chudek & Henrich, 2011; Henrich, 2004). Yet, our meta-analysis found that Americans' willingness to cooperate with strangers did not decline over time, as was predicted by theory and research on social capital in American society (Putnam, 2000). There are several possible reasons for the discrepancy between our findings and previous theoretical arguments and evidence.

First, social capital is a multidimensional construct (Bjørnskov, 2006; Coleman, 1988; Putnam, 2001b). Key features of social capital involve trust, cooperation, and willingness to enforce norms of cooperation (Coleman, 1988; Ostrom, 2000). Here, we have only focused on one feature of social capital—cooperation. It could be that although a willingness to cooperate with strangers did not decline in the United States, other features of social capital did decline, such as trust and a willingness to enforce norms of cooperation. Prior research has indeed found robust survey evidence to support the idea that trust has decreased in the United States over the last 40 years (Twenge et al., 2014). Thus, one intriguing implication of these findings is that while Americans' cooperation has increased over the 61-year period, their beliefs about others' willingness to cooperate has actually declined. Future cross-temporal meta-analyses could focus on experimental tasks that operationalize trust, such as measures of expectations of others' behavior in social dilemmas (Balliet & Van Lange, 2013a) or trusting behavior in the trust game (Berg et al., 1995). These experimental settings have high internal validity, and complement existing evidence of whether trust among strangers has indeed declined in American society. Alternatively, it could be that changes in norms and willingness to punish norm violators (e.g., meta-norms) underlie a decline in social capital in American society. To more closely examine this possibility, cross-temporal meta-analyses can evaluate whether the punishment of norm violators has changed over time, with a focus on both surveys and experiments on second-party and third-party punishment of social norm violators (Molho et al., 2020).

Second, there may be potential differences between cooperation in real-life situations (e.g., blood donation, contribution to community projects) and cooperation in experimental settings (e.g., social dilemmas), although both types of measures can reflect one's cooperation tendency (McAuliffe et al., 2019) and have been found to be interrelated in previous research (Haesevoets et al., 2020). For example, the structure of interdependence may be different in experimental social dilemma situations compared to daily life situations that involve cooperation, such as decisions to help a stranger, participating in volunteer work, and voting in an election (Columbus et al., 2021). That is, behaviors that were the focus of prior research on social capital (e.g., volunteering, donation, and political participation) could present a stronger conflict of interest to people compared to the conflicting interests experienced in experimental social dilemmas. Despite these differences, compared to previous research, our research focused on cooperation measured within internally valid experimental settings and also controlled for several variables that can affect cooperation and thus provides robust evidence for an increase in impersonal cooperation in American society over time.

Because we did not observe a decline in cooperation over time, we did not find support for any of the hypotheses about the sociocultural underpinnings for the decline in cooperation. In fact, some of the social and economic indicators measured 10 to 5 years prior to the measure of cooperation were actually positively related to cooperation. For example, from a social capital perspective, one would expect that over time an increase in urbanization goes hand in hand with a decline of cooperation, but we found that urbanization was positively associated with an increase in impersonal cooperation. Also, one would expect that an increase in income inequality would be associated with lower cooperation, but we found some (albeit indirect) evidence for the reversed pattern of results. One possibility is that variations in the macro sociocultural environments, such as income inequality, may be differentially related to specific forms of cooperation. Consistent with this idea, a recent meta-analysis found that early life stress was differentially related to prosociality in economic games and self-reported prosocial behaviors (Wu, Guo, et al., 2020). In addition, we cannot completely exclude other confounding variables that are associated with sociocultural indicators and cooperation. For example, the positive association between some of the sociocultural indicators and cooperation may simply be due to these variables having had a strong linear increase over time, rather than each having a causal effect on cooperation. More empirical research is needed to explore the specific path or process through which changes occurring at the distal societal level influence cooperation in social dilemmas.

In summary, our meta-analysis showed no empirical support for the highly influential claim that impersonal cooperation, and therefore social capital, has declined in American society over the past several decades. This could be the result of social capital being a multidimensional construct and the fact that we only focused on one facet of social capital. Alternatively, the discrepancy with past research could be due to the differences between experimental research and archival/survey data. What we did find, however, was an unexpected positive increase in impersonal cooperation over time. Furthermore, we found that some sociocultural indicators were associated with this increase in cooperation. We believe that these findings can offer some guidance for future research on social capital, cooperation, and their sociocultural underpinnings.

Explanations for an Increase in Cooperation in the United States

How can we interpret an increase in impersonal cooperation in the United States? We offer several possible explanations. First, individualism (i.e., independence and autonomy) may be a necessary prerequisite for the development of trust among strangers and impersonal cooperation. Indeed, some evidence shows that states with higher levels of individualism (e.g., percentage of people living alone, divorce to marriage ratio, and percentage of self-employed workers) in the United States tend to have higher levels of general trust, more donations to charity, and more time spent on volunteering for the community (e.g., Allik & Realo, 2004; Kemmelmeier et al., 2006). Moreover, cross-national research has revealed that societies with higher levels of individualism have greater levels of general trust (Hofstede, 1991; see also Balliet & Van Lange, 2013a; Van de Vliert & Van Lange, 2019). Personal freedom, autonomy, and looseness of social norms have also been positively associated with greater levels of general trust (e.g., Eriksson et al., 2017; Gelfand et al., 2006; Gunia et al., 2011; Kiyonari et al., 2006). Still, why would individualism be associated with greater impersonal cooperation?

Economic development and technical innovation, along with increasing urbanization, have made the United States a highly industrialized society with large social organizations, a fine-grained division of labor, and sophisticated forms of food sharing, producing, and collective welfare. In such a society, people frequently depend on strangers to achieve what they want in daily life. Individualism could be associated with higher impersonal cooperation, in part, because individualistic societies have greater relational mobility—that is, people regularly interact with and form relations with new people (Oishi et al., 2015; Schug et al., 2010; Yuki & Schug, 2012). Relational mobility has been found to be positively associated with trust and cooperation among strangers across societies (Romano et al., 2020; Thomson et al., 2018). This could at least account for our finding that urbanization and the percentage of people living alone were associated with higher impersonal cooperation.[8]

Second, increases in education and cognitive skills over the past several decades may help explain the increase in cooperation. Complex cognitive abilities, such as numerical quantification, learning and memory, cheater detection, are associated with higher cooperation (Moreira et al., 2013; Stevens & Hauser, 2004). Participants in social dilemma experiments need to (a) understand that their choices have consequences for both themselves and their partners, (b) remember other partners' previous choices, (c) anticipate other players' choices, and (d) make strategic decisions concerning the best behavioral option in a given situation (Brosnan et al., 2010; Nowak & Sigmund, 1998). Indeed, more intelligent people are more cooperative in repeated PDs (Jones, 2008; Proto et al., 2014). Research has shown that the mean intelligence quotient (IQ) of many countries (including the United States) on various intelligence tests has been rising over time (Flynn, 1999; Neisser, 1998; Uttl & Van Alstine, 2003). This increase in cognitive ability over time can help people understand and resolve social dilemmas better and may partially explain an increase in impersonal cooperation among Americans.

Third, the studies in the meta-analysis were based on student samples, often majoring in one of the disciplines in the social and behavioral sciences (Balliet et al., 2021). This raises a few relevant issues. Perhaps, only educated young adults have become more cooperative over the decades, while earlier research supporting a decline in social capital is based on samples with more variations in demographic characteristics. Also, textbooks in the social and behavioral sciences, and psychology in particular, discuss helping and cooperation in terms of the benefits of reciprocity, the benefits of a prosocial reputation, and the psychological and health-related benefits of helping (e.g., Myers & Twenge, 2018)—which could lead to higher cooperation among students. That said, more recent research on cooperation has included relatively more economics students (Balliet et al., 2021), and economics students tend to behave less cooperatively in social dilemmas (Frank et al., 1993a; Van Lange et al., 2011). However, when we further analyzed whether cooperation still increased over time when we controlled for students' disciplines, we found that discipline did not affect cooperation and that the overall pattern of an increase in cooperation over time did not change (see the Supplemental Materials). Thus, the discipline differences in social and behavioral sciences cannot account for the observed increase in impersonal cooperation over time in the current meta-analysis.

Additional Findings

Surprisingly, we found a negative correlation between generalized trust and cooperation. In fact, generalized trust has a linear decreasing trend over time in the United States (Twenge et al., 2014), while we observe that cooperation has an increasing trend over time in the United States. The observed negative relation between trust and cooperation is out of step with past work showing that trust measured within experiments is positively associated with cooperation (e.g., Balliet & Van Lange, 2013a). These different findings may have occurred because trust measured by survey items captures generalized trust in others, including other people around the world, whereas cooperation in the experimental social dilemma tasks included in the meta-analysis measured cooperation among

[8] Another theoretical perspective suggests that urbanization should increase population density and thus lead to slower life-history strategies which may promote individuals' investment in cooperative relationships (e.g., Rotella et al., 2021; Sng et al., 2017). However, previous empirical research using social dilemmas found no support for the hypothesis that life-history strategy predicts individual variation in cooperation with unknown others (Wu et al., 2017). In addition, a meta-analysis also suggests that early life stress (i.e., proxy for life-history strategy) is not significantly associated with prosocial preference measured with laboratory behavior tasks (e.g., economic games; Wu, Guo, et al., 2020).

fellow Americans, often from the same university. Furthermore, recent research has questioned to what extent the widely used survey items for trust in the General Social Survey (GSS; i.e., the same items used in the Monitoring the Future survey) correspond to actual behavior, as the trust items do not significantly correlate with trusting behavior in the trust game or cooperative behavior in social dilemmas (e.g., Ahmed & Salas, 2009; Ahn et al., 2003; Gächter et al., 2004; Glaeser et al., 2000). Taken together, the changes in generalized trust measured with surveys do not necessarily imply that people will change their actual behavior in the same direction in a given context (Ajzen & Fishbein, 1977). In fact, state trust measured in the social dilemma task has a stronger association with cooperation, compared to measures of general trust (e.g., Acedo-Carmona & Gomila, 2014; Balliet & Van Lange, 2013a; Pletzer et al., 2018).

Limitations and Directions for Future Research

We acknowledge a few limitations in the current meta-analysis. To begin, we observed a small effect size for the relation between time and cooperation. Although there was an increase (from 0.43 in 1956 to 0.52 in 2017) in cooperation rates over the 61-year period of study (without control variables), time only explained 2% of the variance in cooperation. When including the control variables, time only explained 1% of the variance in cooperation across all the studies, although there was an estimated increase (from 0.38 in 1956 to 0.46 in 2017) in cooperation rates. This variance estimate (2% or 1%) is lower than those found in cross-temporal meta-analyses on other variables, such as locus of control (Twenge et al., 2004) and anxiety (Xin et al., 2010). Nevertheless, similar to our study, some cross-temporal meta-analyses (e.g., on perfectionism, dispositional empathy, and attitudes toward women; Curran & Hill, 2019; Konrath et al., 2011; Twenge, 1997) also found small-to-medium effect sizes. It is not surprising that we observed a relatively small effect size when considering that (a) time is a distal variable that affects cooperation and that (b) we analyzed behavioral experiments, which often included manipulations that affect cooperation, and this could undermine our ability to detect an effect of time on cooperation. Importantly, relatively small changes in impersonal cooperation may have pronounced consequences, especially when these trends may exist over the next decades.

An additional limitation should be noted about the observed correlations between the sociocultural indicators and cooperation. As mentioned in the discussion of our findings, if all these variables have strong linear trends over time, this could produce spurious correlations. Although there exist statistical methods to analyze time-series data to model and adjust for temporal autocorrelations, our meta-analytic data does not resemble time-series data and could not be analyzed with these techniques without some severe limitations, such as not being able to weight the effect sizes and being unable to statistically control for between-study heterogeneity.[9] Future research can further cross-validate our findings by using longitudinal designs and time-series data.

We have used cooperative behavior in experimental social dilemmas as an operationalization of social capital within American society. Although we have already recognized some clear advantages (e.g., well-defined decision tasks with high internal validity) of this approach relative to archival and survey data, there are some limitations in using these measures as an operationalization of social capital. One limitation is that a willingness to cooperate with fellow American citizens is only one of several features of social capital. A second limitation is that behavior and outcomes within experimental social dilemmas do not allow us to infer which psychological processes and motives (e.g., values, beliefs, and self-concept) are changing over time in American society to produce these changes in behavior. Importantly, cooperation in social dilemmas, including the studies reported in the CoDa (Spadaro et al., in press), can be used to test many other theories about cooperation and prosocial behavior that are not addressed in the present work, such as understanding prosocial personality (Thielmann et al., 2020), how institutional rules affect cooperation (Jin et al., 2021), how cooperation varies across regions, countries, and cultures around the world (Spadaro, Graf, et al., 2022). The annotation of these studies has been made open access for researchers to use to test hypotheses and answer research questions about cooperation.

Our meta-analytic results only reflect cooperation trends in American society, and it remains unclear whether the findings generalize to other Western countries. Also, we focused on a specific group of young adults in the United States, typically including a large share of college students. While we believe that this age group is especially interesting for detecting continuity and change in societal trends, it is possible that the changes over time that we observe are restricted to this group. For example, younger age groups tend to be somewhat more susceptible to social norms, authority, and trends in society (e.g., Sears, 1986). Furthermore, the study samples were mostly college students, and college demographics have changed in the United States over the past several decades, to include more women and minorities (Anderson, 2003; Becker et al., 2010). That said, prior research has not found that cooperation varies by gender (Balliet et al., 2011; Spadaro, Jin, et al., 2022) or according to ethnicity in the United States (meta-analytic summary provided in the CoDa; Spadaro et al., in press). In addition, we found no significant difference in cooperation between student and nonstudent samples, and that the overall pattern of an increase of cooperation over time did not change when controlling for student sample (see the Supplemental Materials). Moreover, young adults, particularly college students who tend to be the future professionals and leaders of their generations, similarly need to meet new people and form new relationships with fellow Americans no matter whether they are on campus or move to work, especially in a modern society with high residential and relational mobility. Their generational changes in cooperation may represent to a large extent the changing pattern of American population.

Concluding Remarks

Putnam's (2000, 2020) claim about a decline in social capital in American society has attracted widespread attention across scientific

[9] In the Supplemental Materials, we report findings from analyses that partial out the effect of the year while analyzing the relationships between cooperation and sociocultural indicators. However, these analyses have been performed after transforming our data set into a standard time-series format (i.e., a single estimate of cooperation for each year). These analyses have two major limitations: (a) these analyses are linear regression (not meta-regression) models and thus do not weight the effect sizes and (b) these analyses do not statistically control for between-study heterogeneity, which has been demonstrated to account for variance in the cooperation estimates and which can vary systematically over time.

disciplines and for good reasons. Any decline in social capital can have broad consequences for American society, including a disruption to trade, impeding the functioning of organizations, lowering the quality of public goods, and reducing the strength of democracy. Moreover, much evidence from archival and survey data has previously supported these claims. Yet, we analyzed 61 years of experiments on cooperation with strangers among American young adults and found that impersonal cooperation in the United States is not necessarily in decline. Instead, we found that impersonal cooperation actually increased during this time period. Future research on trends in social capital within a society should take into account the several facets of social capital and acquire a battery of measures that have both external and internal validity for each facet of social capital.

We posit that societal trends toward increasing urbanization and people living alone may have shaped a social ecology in which people are more likely to interact with, depend on, and form relationships with strangers (i.e., the United States has experienced greater relational mobility across the last several decades). These changes in American society may underlie a transition to higher levels of individualism as well as a greater willingness to cooperate with strangers, even at the risk of being exploited.

We close by speculating that, contrary to modernization theories, many new technical innovations, such as social media, may not always undermine impersonal cooperation. Rather, these technologies may enable and facilitate interactions among strangers, and this may boost cooperation among people within and between societies. If this optimism has some realism, then we are in a much better position to tackle national and global challenges that take the form of public goods, such as the management of refugees, responses to a pandemic, reducing climate change, and the conservation of resources. Our future will tell.

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Received December 14, 2020
Revision received April 22, 2022
Accepted May 2, 2022 ■