

EMPIRICAL ARTICLE

The Age and Time Dynamics of Pro-Sociality, Autonomy, and Well-Being

Yunxiang Chen^{1,2}  | Martin F. Lynch²

¹Psychological Research and Counseling Center, Southwest Jiaotong University, Chengdu, China | ²Warner School of Education and Human Development, University of Rochester, Rochester, New York, USA

Correspondence: Yunxiang Chen (yxchen@swjtu.edu.cn)

Received: 26 September 2025 | **Revised:** 6 March 2026 | **Accepted:** 9 March 2026

Keywords: autonomy satisfaction | cohort analysis | pro-sociality | well-being

ABSTRACT

Previous research consistently highlights a positive relationship between pro-sociality and well-being, often mediated by autonomy. However, limited attention has been paid to exploring the temporal dynamics of this relationship across age cohorts and historical periods. This study conducts a cross-sectional cohort analysis using global data from the World Values Survey ($N = 360,244$; 109 countries) to examine age and period effects across adulthood. The findings indicate that: (1) Pro-sociality, autonomy, and well-being generally decline with age, but tend to increase across more recent time periods. (2) The positive link between pro-sociality and well-being is stronger among older adults compared to younger adults, and was stronger in earlier periods compared to more recent times. (3) The mediating role of autonomy increases with age across different periods, but decreases across successive time periods when examined chronologically. The results underscore the importance of autonomy for older adults and reveal a declining contextual role of autonomy over time in the relationship between pro-sociality and well-being. Implications, limitations, and future directions are discussed.

The determinants of well-being across the lifespan and historical time are central to psychological science. The World Values Survey (WVS), spanning over 100 nations and four decades, provides critical insights into macro-level trends, showing general increases in global happiness and life satisfaction (Diener 2009; Haerpfer et al. 2022) alongside rising prosocial engagement (Helliwell et al. 2022). This study focuses on two constructs central to these trends: pro-sociality—here, voluntary participation in beneficial organizations, reflecting altruistic and empathetic action (Penner et al. 2005)—and autonomy satisfaction—the experience of self-endorsed, volitional action as defined by Self-Determination Theory (Ryan and Deci 2017). We propose that the relationships among pro-sociality, autonomy satisfaction, and well-being are dynamic, shaped by both age effects (individual development) and period effects (sociocultural change over time). To test this, we leverage the WVS (1981–2022, 109 countries) in a cross-sectional cohort analysis designed to disentangle these temporal dynamics.

1 | The Universal and Beneficial Link Between Pro-Sociality and Well-Being

The proposition that helping others benefits the helper is a well-established cornerstone of psychological research, supported by a vast body of empirical studies and meta-analyses (e.g., Dakin et al. 2022; Galante et al. 2014; Hui et al. 2020). Engaging in prosocial acts—ranging from spontaneous kindness and charitable spending to sustained volunteer work—consistently yields tangible enhancements in positive affect, life satisfaction, and meaning, while reducing negative emotions (Akkin et al. 2020; Curry et al. 2018). This link demonstrates remarkable universality. Seminal work by Akkin et al. (2013), analyzing data from 136 countries in the Gallup World Poll, found that the happiness derived from prosocial spending transcended cultural and economic boundaries. Experimental and longitudinal studies reinforce this finding, showing that recalling prosocial spending boosts well-being compared to personal spending across diverse

Key Points

- The positive link between pro-sociality and well-being grows stronger with age and has intensified in recent historical decades.
- Autonomy satisfaction increasingly mediates this link across the lifespan but, paradoxically, does so less in more recent times.

contexts (e.g., Canada and Uganda), and that sustained acts of kindness increase well-being in both the United States and South Korea with no significant cultural differences (Nelson et al. 2015).

Recent research utilizing the WVS itself has also confirmed the robustness of this link, showing that the association between prosocial behavior and happiness persists even when accounting for national cultural dimensions like individualism and uncertainty avoidance (Chen 2024). The benefits also extend across demographic lines, evident in studies of isolated agrarian societies (Aknin et al. 2015) and in broad population samples where the correlation between charitable giving and subjective well-being holds across age, gender, and income groups (Lok and Dunn 2022).

2 | Autonomy Satisfaction as a Key Mediating Mechanism

While the direct benefits of pro-sociality are clear, the psychological mechanisms underlying this link are of equal importance. Self-Determination Theory (SDT) provides a powerful explanatory framework, positing that well-being is maximized when the basic psychological needs for autonomy, competence, and relatedness are satisfied (Ryan and Deci 2017). Prosocial behavior inherently fulfills the need for relatedness by fostering social connections. However, a growing body of research highlights autonomy satisfaction as a critical mediator. When individuals engage in prosocial acts that they perceive as freely chosen and aligned with their authentic selves, their sense of autonomy is enhanced, which in turn contributes significantly to their well-being.

Martela and Ryan's (2016a, 2016b) pioneering work provides compelling evidence for this pathway. In an experimental study, autonomy satisfaction fully mediated the link between prosocial donations and enhanced well-being. Cross-sectional studies further confirmed the mediating role of basic psychological needs. The cross-cultural relevance of this mediation was also explored by Gherghel et al. (2021), who found that autonomy, competence, and relatedness jointly mediated the link between acts of kindness and well-being in a combined sample from the US, Japan, and Romania, though the specific need that was salient varied by culture (e.g., only relatedness in the US, all three in Japan). These findings solidify the role of basic psychological needs, and autonomy in particular, as a pivotal bridge connecting prosocial action to personal flourishing.

3 | The Dynamic Interplay: Age and Time Effects

Crucially, the constructs of pro-sociality, autonomy satisfaction, and well-being, along with their relationships, are embedded in time. Their interplay is likely shaped by two distinct temporal forces: development across the lifespan and evolution across historical periods.

From a developmental perspective, theories suggest nuanced age effects. Socioemotional Selectivity Theory (SST) posits that as individuals perceive their time horizon as increasingly limited, they shift their priorities towards emotionally meaningful goals and relationships (Carstensen et al. 2003). For older adults, this may mean that prosocial behaviors, especially those that deepen existing social bonds or leave a legacy, become more salient and rewarding. This emotional selectivity could strengthen the link between pro-sociality and well-being in later life, potentially through a heightened sense of autonomy that comes from acting in accordance with these prioritized, emotionally meaningful goals (Carstensen 2021). Furthermore, the Selective Optimization with Compensation (SOC) model (Baltes and Baltes 1990) suggests that successful aging involves strategically selecting goals (e.g., specific prosocial engagements), optimizing resources to achieve them, and compensating for losses. Older adults may thus selectively engage in prosocial activities that optimally satisfy their autonomy needs. Empirically, the landscape is complex. Some studies indicate that older adults engage in more prosocial behaviors like charitable giving and report higher levels of autonomy satisfaction and life satisfaction—a phenomenon sometimes termed the “age-happiness puzzle” (Bjalkebring et al. 2015; Cutler et al. 2021; Lacey et al. 2006). They may also derive greater emotional benefits from daily prosocial activities (Chi et al. 2021). However, other research points to potential declines in certain forms of pro-sociality or physical health with age (Sparrow et al. 2021), creating a need for a more integrated analysis.

Simultaneously, historical period effects exert their own influence. Societal values, technological advancements, economic climates, and watershed global events (e.g., the 2008 financial crisis, the COVID-19 pandemic) create distinct historical contexts that can alter the expression and experience of pro-sociality and autonomy. For instance, analyses of WVS and other data suggest that prosocial behaviors like helping strangers may have increased in recent times, particularly during periods of collective adversity (Smith 2019; van de Groep et al. 2020). Global happiness levels have also shown a long-term rise, attributed to societal development (Veenhoven 2017). However, countervailing forces may be at play. The very processes of modernization, globalization, and digitalization, while potentially increasing opportunities for connection, may also foster a cultural shift towards individualism and self-interest, and introduce new societal pressures (e.g., precarious work, constant digital connectivity) that can erode individuals' sense of autonomy (Chirkov 2011; Marcus et al. 2021; Twenge 2019). This erosion could, in turn, diminish the potency of autonomy satisfaction as a mediator in the pro-sociality-well-being link over historical time. The Broaden-and-Build Theory (Fredrickson 2001) complements this view by suggesting that the positive emotions generated by prosocial acts can broaden cognitive and behavioral repertoires and build lasting psychological resources. However, the efficacy of this “building” process may itself

depend on the autonomy-supportive quality of the environment, which may vary across historical epochs.

4 | The Current Study and Hypotheses

Despite extensive prior research, critical gaps remain regarding the temporal dynamics linking pro-sociality, autonomy satisfaction, and well-being. First, few studies have simultaneously examined age and period effects to disentangle their unique influences. Second, it is unclear whether the strength of the pro-sociality-well-being link systematically varies across adulthood or historical decades. Third, the mediating role of autonomy satisfaction may itself change over the lifespan and across time, a possibility not yet tested. To address these gaps, we analyze World Values Survey data (1981–2022; 109 countries) using a cross-sectional cohort design. This allows us to: (a) map trajectories of pro-sociality, autonomy, and well-being across five age cohorts and five decades; (b) test if age cohort and time period moderate the pro-sociality-well-being link; and (c) test if they moderate the mediating role of autonomy.

To isolate the effects of age and period and reduce potential confounding, our analyses include key covariates selected for their theoretical relevance to well-being and pro-sociality: demographic factors (sex, socioeconomic status, employment), regional classification, perceived importance of life domains (family, friends, leisure, work), reflection on meaning and purpose, and prosocial values (benevolence, universalism). These controls allow us to test the unique contributions of temporal dynamics beyond these established correlates.

Our hypotheses are grounded in relevant theories and empirical patterns. Socioemotional Selectivity Theory (SST) and evidence of higher well-being in later life inform predictions about age effects, while theories on societal change (e.g., autonomy erosion) and mixed temporal trends inform predictions about period effects. Self-Determination Theory (SDT) underpins our mediation predictions. **Hypothesis 1** (Levels). Reflecting SST and the “age-happiness puzzle,” we predict higher levels of pro-sociality, autonomy, and well-being in older versus younger cohorts (H1a). Based on reports of rising global well-being, we predict higher levels in more recent versus earlier periods (H1b). **Hypothesis 2** (Direct Link & Moderation). We hypothesize a positive pro-sociality-well-being link (H2a), moderated by age (H2b) and time (H2c). Guided by SST, we predict a stronger link in older cohorts (H2d). Considering changing societal contexts, we predict a stronger link in earlier periods (H2e). **Hypothesis 3** (Mediation). Grounded in SDT, we propose autonomy satisfaction mediates the pro-sociality-well-being link (H3a), with this mediation varying by age (H3b) and time (H3c). Following SST/SOC, we expect stronger mediation in older cohorts (H3d). Aligning with autonomy erosion theories, we predict stronger mediation in earlier periods (H3e).

5 | Methods

5.1 | Transparency and Openness

We analyzed de-identified, publicly available data from the World Values Survey (WVS; Inglehart et al. 2022). All measures, analytic codes, and materials are available via the Open Science

Framework (OSF; links provided in the Author Note). Analyses were conducted using SPSS 27.0 and Mplus 8.0. The study design was not preregistered. Ethical approval was obtained from the authors' institutional review board (IRB).

5.2 | Data Collection and Participants

This study utilized data from WVS and involved participants from 109 countries or territories (see Table S1). The WVS employs standardized procedures to collect nationally representative data across countries, including questionnaire translation, multi-stage sampling, and face-to-face or telephone interviews, with full details available in its methodology reports (e.g., Haerpfer et al. 2022). All waves received ethical approval; and WVS further demonstrated measurement invariance (Remizova et al. 2024; Sokolov 2021).

Additionally, the data collection of WVS spanned from 1981 to 2022, enabling valuable comparisons of values and attitudes over different time periods. To address the central research question, this study restructured the dataset ($N = 355,786$; $M_{\text{age}} = 45.03$, $SD = 14.04$) based on distinct age cohorts and specific time periods, as elucidated in Table S2. The dataset comprised 169,074 male respondents and 184,283 female respondents, with 2429 instances of missing data, providing a robust foundation for subsequent analyses.

5.3 | Measures

5.3.1 | Pro-Sociality

Pro-sociality was operationalized as individuals' active engagement in voluntary organizations. WVS asks respondents about their membership in 10 types of organizations (Balish et al. 2018; Chen 2024): (1) church or religious groups, (2) sports/recreational clubs, (3) art/music/educational organizations, (4) labor unions, (5) political parties, (6) environmental organizations, (7) professional associations, (8) charitable/humanitarian organizations, (9) consumer groups, and (10) self-help/mutual aid groups. Respondents indicated their level of involvement on a 3-point scale (0 = don't belong, 1 = inactive member, 2 = active member).

5.3.1.1 | Cultural Relevance and Item Selection via

Coder Ratings. To enhance the cross-cultural validity of our measure, we conducted a content validation exercise. Sixty-five independent coders, reflecting diverse geographic and cultural backgrounds, were recruited. They were provided with a standard, broad conceptual definition of pro-sociality from the literature: “behaviors intended to benefit others or society as a whole, often without immediate personal gain” (Eisenberg et al. 2014). Their task was to rank-order the 10 organization types based on how well each typically aligns with this definition of pro-sociality, using a 5-point scale (1 = not at all prosocial, 5 = highly prosocial). This process was designed to ensure that our final measure comprised items that are widely perceived as prosocial across different cultural viewpoints, thereby improving its relevance and accuracy for a global analysis.

5.3.1.2 | Note on Definitional Alignment. It is important to distinguish the conceptual definition used to guide coder

judgments from our study's operational definition. The coders used the broad conceptual definition to evaluate the prosocial character of each organization type. Our operational definition for analysis, however, is the reported active membership in those organizations that were consensus-based selected. Thus, the coder exercise served to select culturally robust indicators of the latent pro-sociality construct, which we then measured via self-reported participation.

5.3.1.3 | Inter-Rater Agreement and Item Exclusion. We assessed the consistency of the coders' ratings using the Intraclass Correlation Coefficient (ICC) based on a two-way random-effects model for absolute agreement. The overall ICC for the 10 items was 0.75, indicating good reliability. To establish a final scale with high cross-cultural consensus, we applied two exclusion criteria. First, any item with an ICC below 0.40 (indicating poor agreement) was considered for exclusion. Second, we examined the data for substantial non-random missingness, which could bias longitudinal comparisons. The item "church or religious organizations" had the lowest mean coder rating (3.28) and a low ICC (0.32), suggesting significant cultural divergence in its perception as a prosocial venue. Furthermore, this item, along with "sports/recreational organizations," "consumer groups," and "self-help groups," exhibited a high proportion of missing data in the earliest survey wave (1980s), potentially due to survey design or regional coverage issues. Therefore, we excluded these four items. The remaining six items (art/music/educational, labor unions, political parties, environmental, professional associations, and charitable/humanitarian organizations) showed good inter-coder agreement (ICC = 0.82) and more complete data coverage. A mean score was computed from these six items (Cronbach's $\alpha = 0.759$), where a higher score indicates more active engagement in consensually prosocial organizations and thus a higher level of behavioral pro-sociality.

5.3.2 | Autonomy Satisfaction

Autonomy satisfaction, as defined within the present study and drawing on the framework of self-determination theory (Deci and Ryan 1985, 2000; Ryan and Deci 2017), encapsulates an individual's subjective perception regarding the extent to which their actions are congruent with their intrinsic values, interests, and choices, as opposed to being influenced or constrained by external pressures or coercive forces. Central to this conceptualization is the notion of self-endorsement and alignment with personal choice, wherein individuals have opportunities to satisfy the need for autonomy.

Within the WVS, a single item was utilized to assess autonomy satisfaction; indeed SDT researchers have used this single item to represent autonomy satisfaction and have validated its use for this purpose (Gulevich and Krivoshechekov 2021; Ng 2015; Ng et al. 2019). Respondents were asked to utilize a scale ranging from 1 (*no freedom of choice at all*) to 10 (*a great deal of freedom of choice*) to express "the degree of the perceived level of freedom and control over their life outcomes." In this context, higher scores corresponded to a heightened perception of autonomy satisfaction, reflecting a stronger sense of self-endorsement.

5.3.3 | Well-Being

This study utilized three indicators of well-being: happiness, life satisfaction, and subjective state of health, drawing upon a methodological framework outlined in previous WVS-based studies (Adesanya et al. 2017; Ngamaba and Soni 2018; Okulicz-Kozaryn 2010). Each indicator was evaluated through survey items. Happiness was tapped by a single item: "Taking all things together, would you say you are *very happy* (= 1), *rather happy* (= 2), *not very happy* (= 3), or *not at all happy* (= 4)?" To ensure clarity and consistency, the originally presented 4-point Likert scale was reverse-scored, with 1 representing *not at all happy* and 4 denoting *very happy*. Similarly, life satisfaction relied on one single item: "All things considered, how satisfied are you with your life as a whole these days?" Respondents were prompted to express their satisfaction level using a 10-point Likert scale, with 1 indicating *completely dissatisfied* and 10 signifying *completely satisfied*. The subjective state of health was assessed through a single item: "All in all, how would you describe your state of health these days? Would you say it is... 1 = *very poor*, 2 = *poor*, 3 = *fair*, 4 = *good*, 5 = *very good*." We kept these three indicators separate, and higher scores suggested that participants experienced higher levels of well-being.

Bivariate correlations among the three indicators ranged from 0.31 to 0.48, with internal consistency reliability (Cronbach's alpha) of 0.50. Based on these results and for the purpose of conducting structural equation modeling, happiness and life satisfaction served as the observed indicators of the latent variable, subjective well-being; self-reported health was considered a separate observed indicator.

5.3.4 | Covariates

Our analyses incorporated a comprehensive set of covariates to account for potential confounding influences and to isolate the unique effects of age cohort and time period on our core variables. Each covariate was operationalized using specific World Values Survey items and applied in the analysis as follows. Demographic and socioeconomic factors included sex (coded as 0 = male, 1 = female), age, socioeconomic status, and employment status. Age was utilized in two distinct ways: as a continuous variable (in years) for foundational correlation and regression analyses, and as a categorical variable representing five age cohorts (25–34, 35–44, 45–54, 55–64, 65–80 years) for the primary cross-sectional cohort analysis. Socioeconomic status (SES) was constructed as a composite index by averaging the standardized scores (z-scores) of three indicators: educational level (on a 3-point scale), subjective social class (5-point scale), and subjective income (10-point scale). Employment status was included as a binary variable (employed vs. not employed).

Geographic and temporal context was controlled through regional classification and time period. Respondents were categorized into six major geographic regions (Africa, Asia, Europe, Latin America & the Caribbean, North America, Oceania), which were entered into regression models as dummy variables. For the cohort analysis, the year of data collection was grouped into five historical decades (1980s: 1981–1989; 1990s:

1990–1999; 2000s: 2000–2009; 2010s: 2010–2019; 2020s: 2020–2022) to model period effects.

Psychosocial factors comprised the perceived importance of four key life domains—family, friends, leisure time, and work—each measured on a 4-point scale (reverse-coded so higher scores indicate greater importance). Additionally, the frequency of thinking about life’s meaning and purpose was measured on a 4-point scale (similarly reverse-coded). These five variables were included as continuous covariates. Finally, to distinguish between behavioral pro-sociality and dispositional tendencies, we controlled for two *prosocial values* from Schwartz’s framework: benevolence and universalism. Each was measured by a single item on a 6-point scale (1 = not at all like me, 6 = very much like me) and entered as a continuous predictor. Prior to analysis, all continuous covariates were grand-mean centered to aid in the interpretation of model coefficients.

5.4 | Data Analytic Plan

The analysis proceeded in sequential steps to test our hypotheses, employing SPSS 27.0 for descriptive, correlational, and general linear model analyses (ANOVA, regression, moderation via PROCESS macro), and Mplus 8.0 for all structural equation modeling (SEM), including invariance testing, latent variable modeling, and complex multi-group mediation analyses. Continuous predictors were grand-mean centered. Model fit for SEM was assessed using CFI, TLI, RMSEA, and SRMR. Bootstrapping (5000 samples) was used to estimate confidence intervals for indirect effects.

Step 1: Measurement Invariance. Multi-group confirmatory factor analysis in Mplus tested the configural, metric, and scalar invariance of the latent constructs (pro-sociality, subjective well-being) across gender, age cohorts, time periods, and regions. This ensured meaningful group comparisons for subsequent hypothesis tests.

Step 2: Trajectory Analysis (H1). To test H1 regarding variable levels, we conducted one-way ANOVAs with Tukey’s post hoc tests in SPSS to compare means across age cohorts and time periods for each core variable. Parallel hierarchical regressions examined the continuous linear effects of age and year, controlling for covariates.

Step 3: Direct Effect and Moderation (H2). To test the direct pro-sociality-well-being link (H2a) and its moderation by age (H2b) and time (H2c), we used multiple regression in SPSS, controlling for covariates. Moderation was tested using Hayes’ PROCESS macro (Model 1) for continuous interactions and via multi-group SEM in Mplus to compare the pro-sociality → well-being path strength across age cohorts and time periods (testing H2d and H2e).

Step 4: Mediation & Moderated Mediation (H3). A baseline SEM in Mplus tested the mediating role of autonomy satisfaction (H3a). To examine whether this mediation was moderated by age (H3b) and time (H3c)—i.e., moderated mediation—we conducted multi-group SEM, estimating the model separately

within each age cohort and time period. Wald tests compared the indirect effects across groups to test H3d and H3e.

6 | Results

6.1 | The Invariance Test

To assess the invariance of latent variables, pro-sociality, and subjective well-being (happiness and life satisfaction) across gender, age, time, and region, structural equation modeling (SEM) was used. Nested models with increasing constraints were compared using fit indices (CFI, TLI, RMSEA). Changes in CFI and TLI ≤ 0.01 indicated invariance. Results showed strong invariance across gender (CFI changes: 0.001, 0.007; TLI: 0.003, 0.005), age (CFI: 0.002, 0.01; TLI: 0.003, 0.006), and time (CFI: 0.002, 0.007; TLI: 0.003, 0.003), but only weak invariance across regions (CFI: 0.006, 0.033; TLI: 0.001, 0.026). Overall, pro-sociality and subjective well-being demonstrated invariance, enabling meaningful group comparisons.

6.2 | Variable Trajectories

One-way ANOVA and post hoc tests examined age cohort and time period differences in pro-sociality, autonomy satisfaction, and well-being indicators (happiness, life satisfaction, and state of health). Significant age cohort differences ($ps < 0.001$) showed pro-sociality stable until late adulthood, autonomy satisfaction declining with age, happiness declining rapidly then slowly, life satisfaction increasing in late adulthood, and health steadily declining. Similarly, time period analysis showed significant variations across decades ($ps < 0.001$): pro-sociality and autonomy satisfaction peaking in the 2020s, happiness and life satisfaction peaking in the 1980s and 2020s but dipping in the 2000s and 1990s, and health peaking in the 2010s with a slight 2020s decline, likely due to COVID-19.

Correlation analysis (see Table S3) showed age negatively correlated with pro-sociality, autonomy satisfaction, happiness, and health but positively with life satisfaction. Regression analysis, controlling for covariates, found age positively predicted pro-sociality ($\beta = 0.010$, $p < 0.001$), autonomy satisfaction ($\beta = 0.015$, $p < 0.001$), and life satisfaction ($\beta = 0.026$, $p < 0.001$) but negatively predicted happiness ($\beta = -0.038$, $p < 0.001$) and health ($\beta = -0.231$, $p < 0.001$). Time positively correlated with all variables but negatively predicted pro-sociality ($\beta = -0.069$, $p < 0.001$) while positively predicting autonomy satisfaction ($\beta = 0.082$, $p < 0.001$), happiness ($\beta = 0.052$, $p < 0.001$), life satisfaction ($\beta = 0.076$, $p < 0.001$), and health ($\beta = 0.076$, $p < 0.001$). These results highlight the complex effects of age, time, and external factors on well-being.

6.3 | Individual Differences

6.3.1 | Operational Note

Throughout the results, pro-sociality is treated as a continuous variable. References to “low” and “high” pro-sociality, particularly when probing interaction effects (e.g.,

in simple slope analyses), follow the standard convention of representing values at one standard deviation below and above the sample mean, respectively. This is for illustrative purposes and does not imply a categorical classification of participants.

Testing H2, this section examined the positive relationship between pro-sociality and well-being indicators (happiness, life satisfaction, and state of health) and explored individual differences in age and time. Correlation analysis revealed that pro-sociality was positively correlated with happiness ($r=0.089$, $p<0.001$), life satisfaction ($r=0.068$, $p<0.001$), and state of health ($r=0.102$, $p<0.001$). After controlling for covariates, pro-sociality remained a significant positive predictor of happiness ($\beta=0.058$, $p<0.001$), life satisfaction ($\beta=0.037$, $p<0.001$), and state of health ($\beta=0.056$, $p<0.001$).

SEM analysis further supported these findings (see Figure S1), showing that pro-sociality positively predicted the latent construct of subjective well-being ($\beta=0.082$, $p<0.001$, $R^2=0.177$) and the observed construct of state of health ($\beta=0.067$, $p<0.001$, $R^2=0.019$), with acceptable model fit indices (CFI=0.924, TLI=0.899, RMSEA=0.036, SRMR=0.042).

Age was found to moderate the relationship between pro-sociality and well-being. Using the PROCESS macro, results showed that the interaction of age and pro-sociality significantly predicted happiness, life satisfaction, and state of health ($ps < 0.001$). Simple slope tests (see Figure S2) revealed that the positive relationship between pro-sociality and well-being was stronger in older cohorts compared to younger ones. For example, the relationship with happiness was stronger in older cohorts ($\beta=0.169$, 95% CI=[0.154, 0.183], $p<0.001$) than in younger cohorts ($\beta=0.078$, 95% CI=[0.064, 0.091], $p<0.001$). Similar patterns were observed for life satisfaction and state of health. Multi-group SEM analysis confirmed an age-related increasing trend in the strength of the positive link between pro-sociality and well-being ($ps < 0.001$), indicating that the well-being benefits of pro-sociality grew stronger with age.

Time periods also moderated the relationship between pro-sociality and well-being, particularly for happiness. The interaction of time and pro-sociality significantly predicted happiness ($p<0.001$) but not life satisfaction ($p=0.195$) or state of health ($p=0.240$). Simple slope tests (see Figure S3) showed that the positive relationship between pro-sociality and happiness was stronger in more recent times ($\beta=0.153$, 95% CI=[0.139, 0.167], $p<0.001$) compared to earlier periods ($\beta=0.108$, 95% CI=[0.094, 0.122], $p<0.001$). Multi-group SEM analysis confirmed a time-related increasing trend in the strength of the relationship between pro-sociality and well-being. For example, the link between pro-sociality and subjective well-being was weaker in the 1990s ($\beta=0.059$, $p<0.001$) compared to the 2000s ($\beta=0.113$, $p<0.001$) and 2010s ($\beta=0.098$, $p<0.001$). Similarly, the relationship between pro-sociality and state of health was weaker in the 1990s ($\beta=0.052$, $p<0.001$) and 2000s ($\beta=0.065$, $p<0.001$) compared to the 2010s ($\beta=0.088$, $p<0.001$). These findings highlight the growing importance of pro-sociality for well-being over time, particularly in recent decades.

6.4 | Evolving Mediation

Testing H3, this section explores age and time differences in the mediating role of autonomy satisfaction in the relationship between pro-sociality and well-being. Using SEM with Mplus, the mediation effect of autonomy satisfaction was first examined in the whole sample (see Figure S4), revealing an acceptable model fit (CFI=0.895, TLI=0.863, RMSEA=0.042, SRMR=0.047). Pro-sociality positively predicted autonomy satisfaction ($\beta=0.093$, $p<0.001$), and both pro-sociality and autonomy satisfaction positively predicted subjective well-being ($\beta=0.058$, $p<0.001$; $\beta=0.438$, $p<0.001$) and state of health ($\beta=0.059$, $p<0.001$; $\beta=0.093$, $p<0.001$). Autonomy satisfaction partially mediated the relationship, with standardized indirect effects of 0.041 ($p<0.001$) from pro-sociality to subjective well-being and 0.014 ($p<0.001$) from pro-sociality to state of health. Due to missing covariate data in the 1980s and 2020s, covariates were excluded in subsequent analyses to facilitate clearer mediation effect trajectories.

Age differences in mediation were examined across five age cohorts. The mediation effect of autonomy satisfaction strengthened with age, as confirmed by multi-group model tests (see Figure S5). In mediation pathway A (pro-sociality to subjective well-being), the indirect effects followed the order: late adulthood > late middle age > middle middle age > early middle age > early adulthood (Wald=8.560, 16.376, 18.421, 31.813, $ps < 0.01$). Similarly, in mediation pathway B (pro-sociality to state of health), the order was: late adulthood > late middle age > middle middle age > early middle age > early adulthood (Wald=16.344, 22.260, 24.765, 44.791, $ps < 0.001$). These results indicate that autonomy satisfaction's mediating role in the pro-sociality-well-being relationship became stronger with age.

Time differences in mediation were also explored across five time periods. Significant indirect effects were found in both mediation pathways A and B ($ps < 0.05$). Multi-group model tests revealed a diminishing mediation effect of autonomy satisfaction over time (see Figure S6). In mediation pathway A (to subjective well-being), the indirect effects followed: 1980s=1990s (Wald=0.281, $p=0.596$) > 2000s (Wald=24.317, $p<0.001$) > 2010s (Wald=5.503, $p<0.05$) > 2020s (Wald=54.412, $p<0.001$). In mediation pathway B (to state of health), the order was: 1980s=1990s (Wald=0.587, $p=0.444$) > 2000s (Wald=49.924, $p<0.001$) = 2010s (Wald=0.013, $p=0.909$) > 2020s (Wald=38.223, $p<0.001$). These findings suggest that autonomy satisfaction's mediating role in the pro-sociality-well-being relationship weakened over time.

Finally, to provide the most granular view of the moderated mediation, we examined the mediation model across all 25 subgroups defined by the intersection of age cohort and time period. Given the volume of results, the full model estimates, including standardized indirect effects for each subgroup, are presented in Figure S7. The overall pattern from this detailed analysis consistently supported the key findings summarized above: the mediating effect of autonomy satisfaction generally strengthened in older cohorts within a given period but showed a weakening trend across periods within a given age cohort.

7 | Discussion

This study conducted a cohort analysis to explore developmental differences across diverse age and time groups in three key aspects: the trajectories of pro-sociality, autonomy satisfaction, and well-being levels; the moderating roles of age and time in the relationship between pro-sociality and well-being; and the evolving mediating role of autonomy satisfaction.

7.1 | Developmental Trajectories

Analyses revealed distinct trajectories for our core variables. The age-related decline in pro-sociality, particularly in late adulthood, may be attributed to reduced social networks, health limitations, and shifting priorities, as suggested by Socioemotional Selectivity Theory (Carstensen et al. 2003; Löckenhoff and Carstensen 2004). However, when controlling for covariates such as gender, education, and social class, age positively predicted pro-sociality, potentially reflecting generativity and the pursuit of meaning in later life (Erikson and Erikson 1981; Sparrow et al. 2021). The observed increase in pro-sociality from the 1980s to the 2020s must be interpreted in light of its operationalization as active membership in formal organizations. While this trend may reflect a genuine growth in prosocial engagement, alternative explanations related to measurement validity exist. The rise could be partially attributed to the global expansion and professionalization of the non-profit and non-governmental organization (NGO) sector, increasing opportunities for formal participation. Additionally, changing social norms may have made reporting membership in certain organizations (e.g., environmental, humanitarian) more socially desirable over time. The dip in the 2010s is intriguing; while we suggested social media and polarization as factors, it could also coincide with a shift in prosocial expression from traditional organizations to more informal, digital, or grassroots networks—a form our measure may capture less effectively. Thus, the trend likely reflects a combination of true behavioral change and evolving societal structures that shape how pro-sociality is institutionally channeled.

Autonomy satisfaction showed a general increase from the 1980s to the 2020s, peaking in the most recent period. This rise is consistent with macro-level societal shifts towards greater individual choice in consumer markets, education, and lifestyle in many parts of the world. The notable dip in the 1990s, as noted, aligns with periods of significant economic restructuring and geopolitical uncertainty post-Cold War (Held et al. 1999; Pedersen 2002), which can constrain perceived life control. The subsequent recovery and peak may be linked to the diffusion of technologies facilitating personal agency (e.g., internet, mobile phones) and growing cultural discourse around self-determination and mental well-being (Twenge and Campbell 2012). However, it is critical to distinguish between reported levels of autonomy and the contexts in which it is experienced. Rising average scores may mask the fact that autonomy in key life domains (e.g., work) may have become more polarized or contingent.

Well-being indicators showed complex age-related patterns. Life satisfaction increased with age, aligning with the U-shaped curve theory, according to which older adults focus on positive aspects

and emotional regulation (Chang et al. 2022; Salces-Cubero et al. 2019). However, happiness and perceived health decline with age, reflecting midlife challenges and physiological changes (Kim et al. 2021). Over time, well-being indicators generally improved, with happiness peaking in the 1980s, 2010s, and 2020s, and life satisfaction recovering in the 2020s after a decline in the 1990s and 2000s. Perceived health peaked in the 2010s, declining slightly in the 2020s, likely influenced by technological advancements and economic cycles (Twenge et al. 2019).

7.2 | Direct and Moderating Effects

The direct well-being benefits of pro-sociality—encompassing happiness, life satisfaction, and perceived health—are well-established and operate through fostering positive emotions, social connection, purpose, and stress-buffering support (Lazar and Eisenberger 2022; Raposa et al. 2016; Snippe et al. 2018; van Tongeren et al. 2016; Yamaguchi et al. 2016). These effects align with key theoretical frameworks, including positive psychology (Klein 2017; Nelson et al. 2016), the broaden-and-build theory (Yang et al. 2023), social exchange (Flynn and Yu 2021; Zhang and Epley 2009), and Self-Determination Theory, which highlights the fulfillment of basic psychological needs (Martela and Ryan 2016a, 2016b).

This direct link was moderated by both age and historical time. Consistent with Socioemotional Selectivity Theory (Carstensen 2021; Pethel et al. 2018) and the life course perspective (Holman and Walker 2021; Moen 1996), the association strengthened across successive age cohorts, culminating in the strongest benefits in late adulthood, where prosociality aligns with goals of generativity and legacy (Newton et al. 2020). Simultaneously, the link intensified over recent decades, a trend potentially driven by cultural shifts valuing community (Twenge et al. 2012; Twenge and Campbell 2019) and amplified during collective crises—such as post-9/11 solidarity and COVID-19 pandemic responses—where prosocial actions became crucial for maintaining purpose and mental health (Beyerlein and Sikkink 2008; Flynn et al. 2015; Mak and Fancourt 2022; Mcguire et al. 2020).

7.3 | Evolving Mediating Effects

Grounded in Self-Determination Theory (Ryan and Deci 2017) and the Eudaimonic Activity Model (Sheldon 2018), autonomy satisfaction mediated the pro-sociality–well-being link. Prosocial behaviors satisfy the need for relatedness and enhance autonomy by facilitating action–value congruence, thereby fostering agency and self-determination (Eustice-Corwin et al. 2023; Fritz et al. 2023; Sheldon et al. 2018; van Tongeren et al. 2016). They also cultivate competence through mastery experiences (Kim et al. 2020; Rifkin et al. 2021). The ensuing autonomy satisfaction promotes well-being via psychological empowerment, authenticity, and intrinsic motivation (Legault et al. 2017; Lynch 2014, 2023; Lynch et al. 2009), consistent with SDT's need-fulfillment pathway (Sheldon 2018).

This mediating role strengthened with age. Older adults typically experience greater decisional autonomy and clearer

values (Behzadnia et al. 2020; Ferrand et al. 2014), enabling prosocial engagements that are more congruent with their self-concept. Accumulated social expertise also enhances the efficacy of these interactions (Chopik et al. 2017; Davis et al. 2019). Furthermore, as posited by Socioemotional Selectivity Theory (Carstensen 2021), the prioritization of emotionally meaningful goals in later life makes prosocial acts—particularly those deepening social bonds—more inherently fulfilling (Pethtel et al. 2018). Consequently, autonomy satisfaction becomes a more potent mediator in late adulthood.

A key and seemingly paradoxical finding is that while self-reported autonomy satisfaction increased over the decades (H1b), its mediating role in the pro-sociality-well-being link weakened (H3e). This apparent contradiction can be resolved by considering the distinction between the absolute level of a psychological resource and its functional relevance within a specific behavioral context. We propose a two-part interpretation. First, the rise in mean autonomy levels likely reflects broad socio-historical gains in personal freedoms, choice availability, and the cultural valorization of individualism, as previously discussed.

Second, the weakening mediating role suggests that the link between prosocial action and autonomy satisfaction has become less robust over time. In earlier decades, prosocial behavior within community organizations might have been more intrinsically motivated and strongly tied to a sense of volition and personal congruence. In contrast, in contemporary societies, prosocial acts may increasingly be prompted by external pressures or norms—such as corporate social responsibility requirements, performative social media challenges, or resumes-building—that can dilute the experience of autonomy (Chirkov 2011). Furthermore, the scale of autonomy measurement (a general sense of freedom/control) may not capture the specific autonomy experienced in the prosocial domain. One might feel generally autonomous in life but feel pressured or obligated in one's prosocial engagements. Thus, the pathway from “doing good” to “feeling autonomous” has been attenuated, even as people report higher general autonomy. This interpretation aligns with concerns that modernization, while expanding choices, can also introduce new heteronomous pressures that compromise the quality of motivation (Ryan et al. 2015). It underscores that the meaning and motivational underpinnings of pro-sociality are crucial for its well-being benefits, a dimension that may have shifted over time.

7.4 | Limitations and Future Directions

Several interpretive cautions are warranted. First, while our large sample size ($N > 355,000$) provides high statistical power, detecting even minuscule effects as significant, the observed effect sizes for key relationships (e.g., between pro-sociality and well-being) were modest. This underscores that pro-sociality and autonomy, while significant, are two among many factors shaping well-being. Second, the cross-sectional cohort design is a fundamental limitation. It precludes causal inference and confounds age, period, and cohort effects. For instance, differences between a 60-year-old in the 1990s and a 60-year-old in the 2020s reflect both cohort (generational) and period influences, which we cannot perfectly

disentangle. Our interpretations of age and time trends are therefore tentative, suggesting associations that require confirmation from longitudinal and time-lag studies.

Several key limitations stem from our cross-sectional design and measurement choices. Causality cannot be inferred, and the confounding of age, period, and cohort effects complicates the interpretation of developmental and temporal trends (Carstensen et al. 2003). Measurement validity is another concern. The pro-sociality measure, based on organizational membership, has variable internal reliability (especially in early waves) and captures only a narrow, formal facet of the construct, overlooking depth of involvement (Djuwita and Mangunsong 2016; Zheng et al. 2021). Our autonomy item, focused on perceived control, may not fully capture SDT's emphasis on self-endorsed volition and risks conflating autonomy with self-efficacy (Chirkov 2011; Ryan and Deci 2017). Furthermore, we lacked data on the quality of motivation (intrinsic vs. extrinsic), a critical SDT moderator of prosocial benefits (Deci and Ryan 1985, 2000). Consequently, while statistically significant due to large N , the observed effect sizes were modest, indicating these constructs are two among many pathways to well-being and their measurement may not capture full complexity.

Future research should address these gaps. Longitudinal designs are needed to establish causality and disentangle age-period-cohort effects. Studies should employ nuanced measures of prosociality (capturing motivation and depth) and multifaceted autonomy. Crucially, research should explore the bidirectional pro-sociality-well-being link (Aknin 2012; Hui 2022; Layouts et al. 2017) and the conditions under which autonomy acts not only as a mediator but also as a moderator, as suggested by work on autonomous choice (Cash et al. 2022; Moche and Västfjäll 2022; Weinstein and Ryan 2010).

8 | Conclusion

This cohort analysis demonstrates that the psychological benefits of pro-sociality are not fixed but evolve dynamically across the life course and historical time. While autonomy satisfaction becomes an increasingly vital mechanism linking pro-sociality to well-being as individuals age, its mediating potency has diminished in more recent eras. These contrasting temporal dynamics—strengthening with age yet weakening over time—highlight that the very meaning and motivational quality of prosocial engagement are shaped by both developmental priorities and shifting sociocultural contexts. Future research must continue to disentangle these complex intersections to understand how to foster well-being through prosocial action in an aging and changing world.

Author Contributions

Yunxiang Chen is the main author, with contributions and edits by Martin Lynch.

Funding

Southwest Jiaotong University New Interdisciplinary Cultivation Fund (2682024ZDPY004).

Ethics Statement

All procedures involving human participants were following the ethical standards of the Institutional Review Board and the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. This study has received approval from the Institutional Review Board (IRB).

Consent

Informed consent was obtained from all individual participants.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Prior dissemination of the data: The World Values Survey (WVS) is a widely disseminated global public dataset that has been openly shared with researchers, policymakers, and the public for decades. Its longitudinal cross-national data on cultural, moral, and political values has been extensively used in academic studies, reports, and policy analyses, ensuring broad accessibility and transparency. Access to the data: <https://www.worldvaluessurvey.org/wvs.jsp>. Access to the analytic codes: <https://osf.io/r7atn>. Access to the study materials: <https://www.worldvaluessurvey.org/WVSEVStrend.jsp>.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Table S1:** The distribution of participants across countries or territories. **Table S2:** Participant distribution by age cohort and time period. **Table S3:** Means, standard deviations, and correlations. **Figure S1:** Direct effects of pro-sociality on well-being. **Figure S2:** Age moderates pro-sociality and well-being indicators. **Figure S3:** Time moderates pro-sociality and well-being indicators. **Figure S4:** Indirect effects of pro-sociality on well-being through autonomy pro = pro-sociality; ausa = autonomy satisfaction; swb = subjective well-being; hap = happiness; lisa = life satisfaction. Results of covariates

were not presented because of space limits. The standardized coefficients for all pathways were significant at the 0.001 level. **Figure S5:** Age differences in autonomy satisfaction's mediation. **Figure S6:** Time differences in autonomy satisfaction's mediation. **Figure S7:** Age and time differences in autonomy satisfaction's mediation.