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Relational diversity in social portfolios predicts well-being

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We document a link between the relational diversity of one's social portfolio—the richness and evenness of relationship types across one's social interactions—and well-being. Across four distinct samples, respondents from the United States who completed a preregistered survey ($n = 578$), respondents to the American Time Use Survey ($n = 19{,}197$), respondents to the World Health Organization's Study on Global Aging and Adult Health ($n = 10{,}447$), and users of a French mobile application ($n = 21{,}644$), specification curve analyses show that the positive relationship between social portfolio diversity and well-being is robust across different metrics of well-being, different categorizations of relationship types, and the inclusion of a wide range of covariates. Over and above people's total amount of social interaction and the diversity of activities they engage in, the relational diversity of their social portfolio is a unique predictor of well-being, both between individuals and within individuals over time.

well-being | relationships | diversity | conversation

Significance

The link between social connection and well-being is well-documented: Happier people tend to spend more time with others, and people experience greater happiness while socially engaged. But, over and above people's total amount of social interaction, which set of interactions—with which types of relationship partners (e.g., family members, close friends, acquaintances, strangers), and how many interactions with each type—is most predictive of well-being? Building on research showing the benefits of variety—in activities, experiences, and emotions—for well-being, we document a link between the relational diversity of people's social portfolios and well-being. Assessing the social interactions and happiness of over 50,000 people reveals that interacting with a more diverse set of relationship types predicts higher well-being.

Over the course of a day, which portfolio of interactions might be associated with the greatest well-being: interacting with three close friends, or interacting with one close friend, one family member, and one coworker?

A rich literature highlights the innate human need to seek social contact, form relationships, and experience a sense of connection, belonging, and shared reality (1–3). Indeed, the amount of social interaction in an individual's daily life is one of the most consistent predictors of psychological well-being (4–13). The link between social connection and well-being is well-documented, as a stable characteristic [happier people spend more time with close others (4, 8)] and as a momentary experience—both when initiated naturally [people report greater positive affect while socially engaged (14–16)] and when induced by experimental intervention [people encouraged to interact with others report high levels of enjoyment, depth, and closeness (17–19)].

Granovetter's (20) pioneering research on tie strength in social networks—the "amount of time, emotional intensity, intimacy, and reciprocal services" that define every relationship—launched decades of research in sociology, social psychology, and computational social science investigating how the nature of one's relationships moderates the link between people's social lives and their well-being. On one hand, strong ties (i.e., close others) serve as powerful sources of intimacy, support, and emotional richness (21–24). Compared to interactions with strangers or colleagues, people tend to feel happiest after interactions with their partners, friends, and family members (7, 25). Indeed, interactions with close others offer a greater opportunity for more authentic, substantive, and responsive conversations, which may increase well-being (8, 13, 26).

On the other hand, interactions with weak ties (i.e., distant others) can generate surprisingly positive experiences too (18, 20, 27). In a laboratory experiment, participants who were randomly assigned to interact with a stranger were just as happy as those assigned to interact with their romantic partner (28). In the field, individuals instructed to interact with a stranger reported more positive experiences than those who were instructed to remain in solitude (18, 27). In fact, recent work suggests that individuals discuss important topics with their weak ties more often than traditional network theory would predict (29, 30)—especially in one-on-one conversation when relational stakes are lower (31, 32). At the network level, weak ties play a critical role in bolstering one's network, by serving as bridges that provide access to information and resources (20–24).

While the benefits of interacting with strong and weak ties for well-being are well explored, relatively less attention has been paid to understanding which combinations of different types of interaction partners are most predictive of well-being. That is, controlling for both the total time spent socializing and the total number of social interactions, which portfolio of interaction partners is associated with the greatest well-being? Previous research demonstrates an association between network scope—the variety of people one knows (e.g., friend, coworker, neighbor)—and many positive outcomes,

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including lower risk of mortality (33), reduced susceptibility to the common cold (34), subjective well-being (35), and enhanced social learning (36). However, network scope, as conceptualized and measured in past work, captures the existence or absence of different relationship types in one's network, but not the relative frequency of one's interactions across those relationship categories. For example, the frequency of interaction with a sibling likely matters in addition to the simple fact of having a sibling.

Borrowing the notion that a diverse financial portfolio is ideal (37, 38), we suggest that the relational diversity in one's social portfolio—the relative diversity of relationship types across one's social interactions—is an important predictor of well-being. This construct captures how many different relationship categories an individual interacts with (richness—similar to network scope), but also how evenly their interactions are distributed among those categories (evenness). This approach builds on research demonstrating the benefits of diversity—in activities, experiences, and emotions—for well-being (39–44).

We adapt Shannon's biodiversity index, which quantifies the number and relative distribution of species in an ecosystem (45, 46) to measure social portfolio diversity—which quantifies the number and relative distribution of relationship types across one's social interactions during a specific time horizon:

$$H = -1 * \sum_{i=1}^{s} (p_i * \ln p_i),$$

where s represents the total number of relationship categories (e.g., family member, coworker, close friend, stranger) an individual has reported interacting with, and p_i represents the proportion of total interactions (or proportion of total amount of time spent interacting) reported by a participant that falls into the ith relationship category (out of s total relationship categories reported). The diversity measure captures the number of relationship categories that an individual has interacted with (richness) as well as the relative abundance of interactions (or amount of time spent interacting) across the different relationship categories that make up an individual's social portfolio (evenness) over a certain time period (e.g., yesterday). We multiply this value by −1, so higher portfolio diversity values represent a more diverse set of interaction partners across relationship categories (see Fig. 1).

Importantly, high relational diversity in one's social portfolio may be associated with other aspects of an individual's life that may also contribute to well-being. For example, individuals with greater opportunities for interpersonal contact in their daily lives may also be more likely to be employed; employed individuals have greater autonomy over their time, are in more valued social positions, engage in more collective purposes, or simply have higher levels of variety in their daily activities—all factors which contribute to higher well-being (47–49). Therefore, we also disentangle the benefits of relational diversity—who people interact with, and, specifically, who people are to each other (i.e., the nature of their relationships)—from the latent consequences of structural aspects of one's life, such as one's employment status or the range of activities in one's daily life.

We investigated the relationship between social portfolio diversity and well-being across four distinct samples (total n = 51,866), utilizing different operationalizations of social interaction (number of interactions yesterday, number of minutes spent interacting yesterday, or number of interactions across weeks), various measures of well-being (life satisfaction, quality of life, discrete emotions), and a wide range of covariates and model specifications.

Results

Study 1: Preregistered Cross-Sectional Survey. First, we sought to test our hypothesis that social portfolio diversity would be positively associated with well-being using a preregistered study (https://aspredicted.org/blind.php?x=6w6gu4). We assessed participants' (n = 578 individuals living in the United States, 46% male; mean age [M_{age}] = 35; SD = 13) well-being with two commonly used items: "Taking all things together, how happy would you say that you have been during the past 24 hours?" (0: Not at all, 10: Extremely) and the Cantril ladder, "Please imagine a ladder with steps numbered from 0 at the bottom to 10 at the top. The top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. If the top step is 10 and the bottom step is 0, on which step of the ladder do you feel you personally stood during the last 24 hours?". We averaged these to create a composite measure of global well-being (r = 0.67, 95% CI [0.62, 0.71], $P < 0.001$; refs. 32 and 33). To capture people's daily social interactions, respondents completed a day reconstruction (16), recalling their day yesterday in a series of episodes (up to a maximum of nine), reporting who they were interacting with for each episode. We calculated participants' portfolio diversity across these interactions yesterday.

In line with previous research (5, 50), the proportion of episodes that participants spent socializing yesterday was a significant predictor of well-being (*SI Appendix*, Table S1). However, in support of our preregistered hypothesis, respondents' in-person social portfolio diversity predicted higher well-being over and above this relationship (β = 0.13, b = 0.54, 95% CI [0.15, 0.92], P = 0.007, n = 576). Additionally, generalized additive models suggest this effect was largely linear (estimated degrees of freedom, edf, = 1.27; Fig. 2). We explored the robustness of this effect to alternative specifications—including different specifications of well-being and the inclusion of covariates (*SI Appendix*, Table S8). We conducted a specification curve analysis (SCA) (51) in which we demarcated every reasonable analytical pathway (i.e., using every possible operationalization of well-being and all theoretically relevant covariates; see *SI Appendix* for additional detail). The positive effect of social portfolio diversity was robust across a wide range of combinations of outcome variables and covariates (including gender, age, number of children under 18 y, number of people in household, employment status, and annual income): specification curve median β = 0.19, 95% CI [0.11, 0.28], SE = 0.04, $P < 0.001$, n = 578, and 59/60 specifications showed a significant positive relationship (see Fig. 3 and *SI Appendix* for details). These results provide initial evidence that social portfolio diversity may be an important predictor of well-being, above and beyond the total amount of social interaction.

Study 2: American Time Use Survey. One potential alternative explanation for the observed effect is that diversity in activities, which likely covaries with diversity in interaction partners, explains the positive relationship between social portfolio diversity and well-being (47–49). We used data from the American Time Use Survey (ATUS), which contains detailed information about a representative sample of US individuals' activities throughout the day (n = 19,197; 44% male; M_{age} = 46.39, SD = 17.35).

Respondents completed an in-depth interview, including a day-reconstruction exercise in which they recalled their previous day's activities. For each activity, respondents indicated what they were doing, the number of minutes they spent on the activity, and with whom they were interacting during the activity. Additionally, respondents completed several items assessing

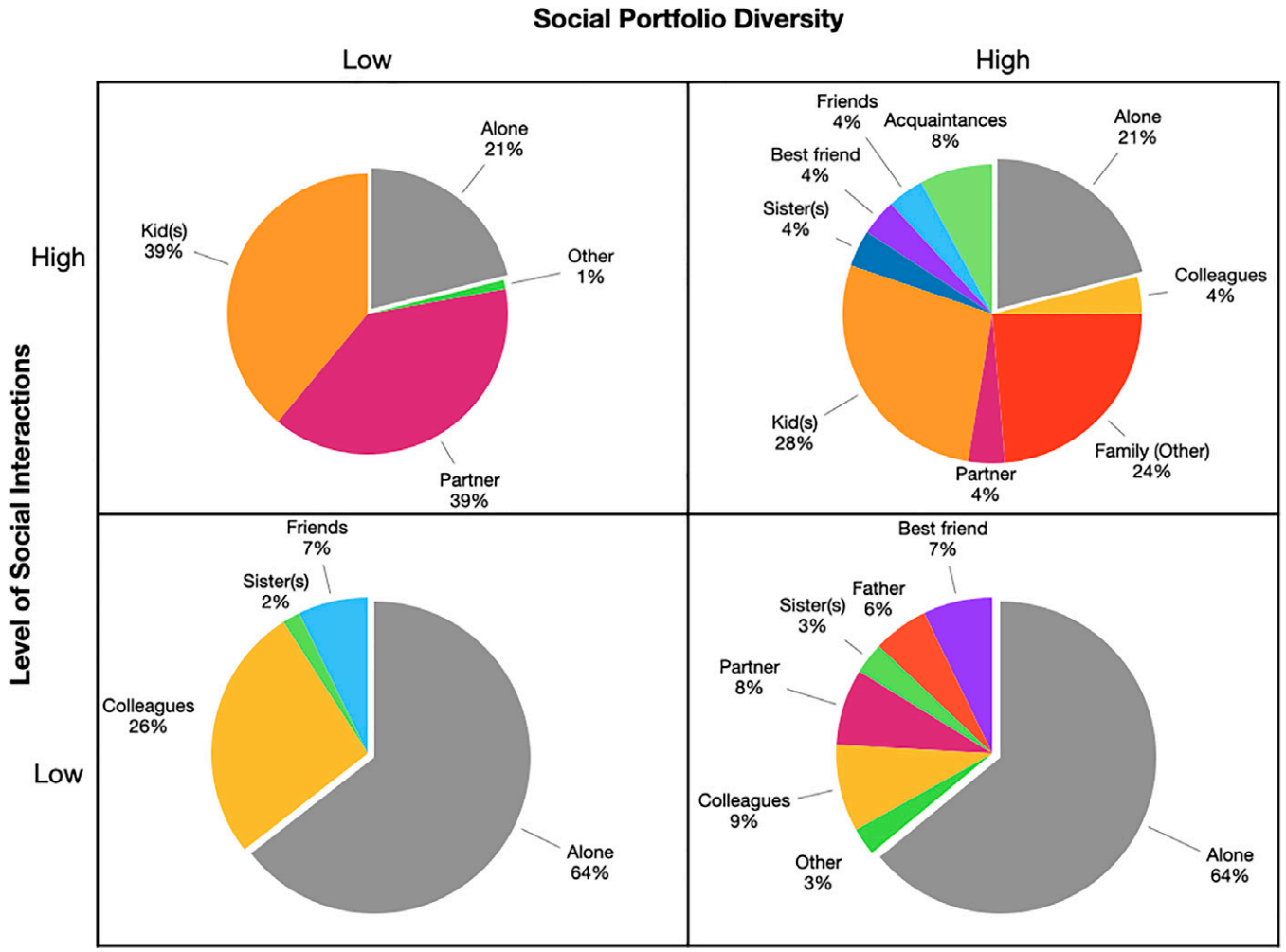

Fig. 1. Schematic representing prototypical respondents low and high in: level of social interaction (one SD below vs. above the sample mean: low = 36%, high = 79%) and level of social portfolio diversity (one SD below vs. above the sample mean: H_{low} = 0.78, H_{high} = 1.71) in the French experience-sampling dataset (Study 4).

well-being, including their quality of life—responding to the same Cantril ladder item included in our preregistered study—and a subjective evaluation of their health: "Would you say your health in general is 1: Excellent, 2: Very good, 3: Good, 4: Fair, or 5: Poor?" (reverse-coded).

We calculated social portfolio diversity as a measure of the richness and evenness in the amount of time (in minutes) that respondents spent interacting with different categories of social partners yesterday. This data allowed us to capture variance in interaction length by calculating portfolio diversity in the number of minutes spent with each interaction partner (rather than the number of interactions, regardless of length, as in the previous study). In addition, we calculated a measure of activity diversity—the richness and evenness of the number of minutes spent on various activity types across one's social interactions—to control for the effects of activity type on well-being.

Social portfolio diversity predicted both measures of well-being even when controlling for the proportion of minutes spent socializing (quality of life: $\beta = 0.08$, $b = 0.36$, 95% CI [0.28, 0.43], $P < 0.001$, $n = 19{,}195$; subjective ratings of health: $\beta = 0.09$, $b = 0.22$, 95% CI [0.19, 0.25], $P < 0.001$, $n = 30{,}586$; *SI Appendix*, Table S2 and Fig. 2). Additionally, while activity diversity was also positively related to well-being, social portfolio diversity was a significant predictor of well-being beyond the effects of activity diversity (quality of life: $\beta = 0.08$, $b = 0.34$, 95% CI [0.27, 0.42], $P < 0.001$, $n = 19{,}195$, edf = 1.006; subjective ratings of health: $\beta = 0.07$, $b = 0.13$, 95% CI [0.13, 0.21], $P < 0.001$, $n = 30{,}586$; *SI Appendix*, Table S2 and Fig. 2). The SCA showed the robustness of these effects controlling for additional covariates (including gender, age, race, relationship status, number of children, age of youngest child, employment status, weekly hours worked, weekly earnings, day of week, time spent on each activity type): median $\beta = 0.10$, 95% CI [0.09, 0.11], SE = 0.007, $P < 0.001$, $n = 19{,}196$; 123/126 specifications showed a significant positive relationship (Fig. 3; see *SI Appendix* for details). These results suggest that diversity in the types of relationship partners with whom people interact is a unique predictor of well-being, beyond the benefits of the amount of social interaction and diversity in activities that people experience in their daily lives.

Study 3: World Health Organization's Study on Global Aging and Adult Health. We next extended our investigation to a large, international sample and a more diverse set of outcome measures. We analyzed data from the 10,447 respondents (43% male; M_{age} = 57.99, SD = 14.62) who participated in Wave 1 (collected between 2007 and 2010) of the World Health Organization's Study on Global Aging and Adult Health (SAGE)—a longitudinal study that collected data from nationally representative samples from China, Ghana, India, Mexico, Russian Federation, and South Africa.

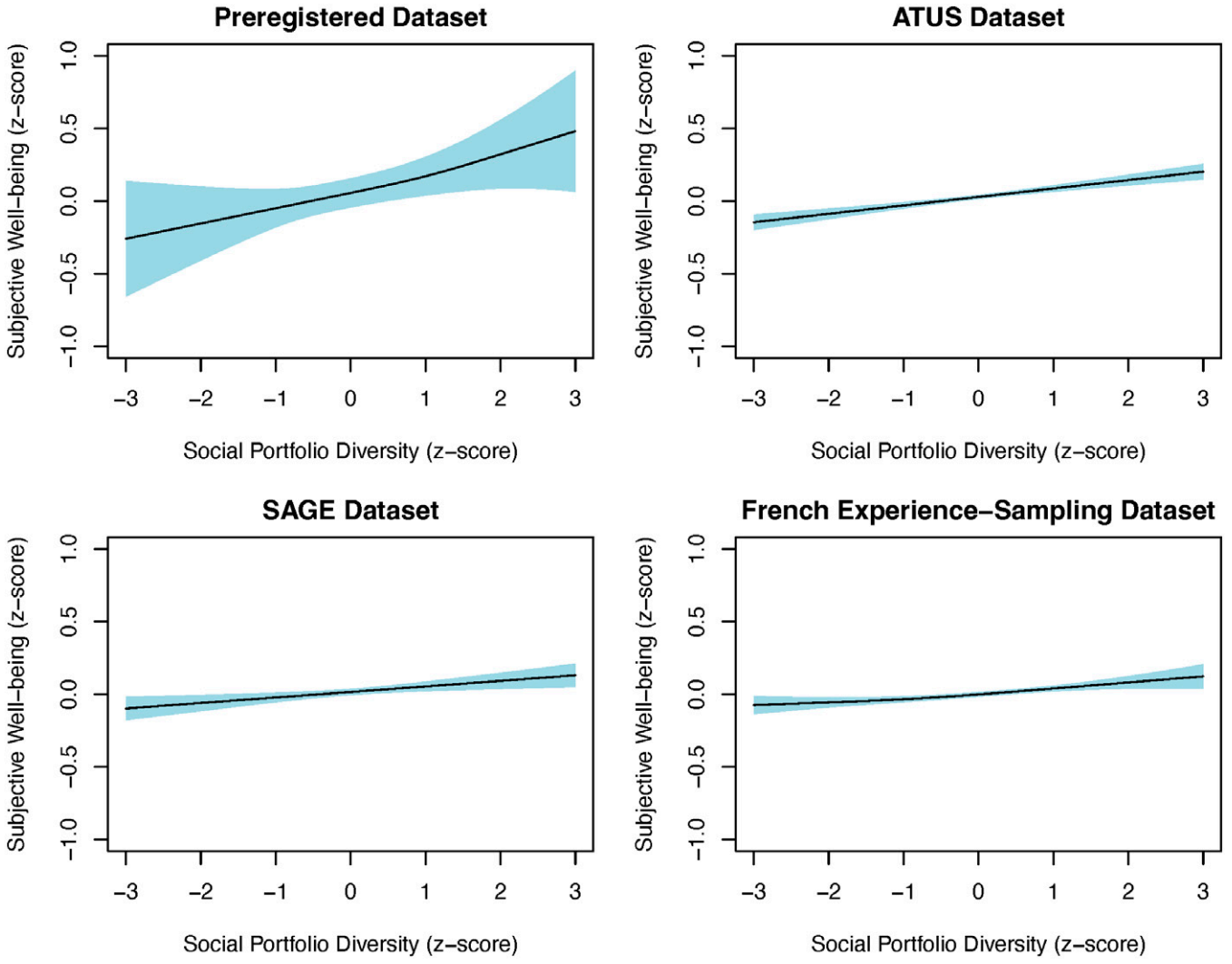

Fig. 2. Standardized relationship between social portfolio diversity and subjective well-being in all four datasets. This figure shows the relationship between portfolio diversity and global well-being in the preregistered dataset (β = 0.13, *b* = 0.54, 95% CI [0.15, 0.92], *P* = 0.007, *n* = 576; controlling for proportion of time spent socializing), quality of life in the ATUS dataset (β = 0.08, *b* = 0.34, 95% CI [0.27, 0.42], *P* < 0.001, *n* = 19,195; controlling for proportion of time socializing and activity diversity), life satisfaction in the SAGE dataset (β = 0.05, *b* = 0.08, 95% CI [0.04, 0.12], *P* < 0.001, *n* = 8,824; controlling for proportion of time socializing and activity diversity), and global happiness in the French experience-sampling dataset (β = 0.04, *b* = 1.33, 95% CI [0.85, 1.81], *P* < 0.001, *n* = 21,645, edf = 1.72; controlling for proportion of time socializing and activity diversity).

As part of the study interview, respondents reported their life satisfaction: "Taking all things together, how satisfied are you with your life as a whole these days?" (1: Very Satisfied, 5: Very Dissatisfied), and provided a rating of their subjective health: "In general, how would you rate your health today?" (1: Very Good, 5: Very Bad; reverse-coded). Additionally, providing a proxy measure of their physical health, participants reported: "In total, how many times did you receive health care or consultation in the last 12 months?" (not including any instances in which respondents received care but did not stay overnight).

Respondents completed a day reconstruction, recalling their day yesterday in a series of episodes, reporting what they were doing, and who they were with for each episode. We calculated respondents' social portfolio diversity yesterday, as well as their activity diversity.

As before, social portfolio diversity was a significant positive predictor of subjective well-being when controlling for the proportion of episodes that participants spent socializing yesterday and the level of diversity in their activities (life satisfaction: β = 0.05, *b* = 0.08, 95% CI [0.04, 0.12], *P* < 0.001, *n* = 8.824, edf = 1.006; subjective ratings of health: β = 0.06, *b* = 0.11, 95% CI [0.06, 0.15], *P* < 0.001, *n* = 8,847; *SI Appendix*, Table S3 and Fig. 2). Additionally, social portfolio diversity was associated with better physical health, showing a negative relationship with the number of overnight health consultations in the previous 12 months controlling for these two covariates (β = −0.05, *b* = −0.67, 95% CI [−1.10, −0.23], *P* = 0.003, *n* = 5,190; *SI Appendix*, Table S3). The SCA revealed that the association between portfolio diversity and well-being was robust to a wide range of specifications across outcome variables, and covariates (including gender, age, relationship status, education level, employment status, days worked per week, hours worked per day, country of residence, number of episodes spent on each activity type): median β = 0.06, 95% CI [0.04, 0.09], SE = 0.01, *P* < 0.001, *n* = 5,191; 566/585 specifications showed a significant positive relationship (Fig. 3; see *SI Appendix* for additional details).

Study 4: French Mobile Application Experience-Sampling Survey. We next analyzed longitudinal data from the users of a French language mobile application (41, 52) who provided responses to our variables of interest using an experience-sampling technique (*n* = 21,644; 68% female; M_{age} = 27.77, SD = 9.15). At various survey points (*SI Appendix*), users

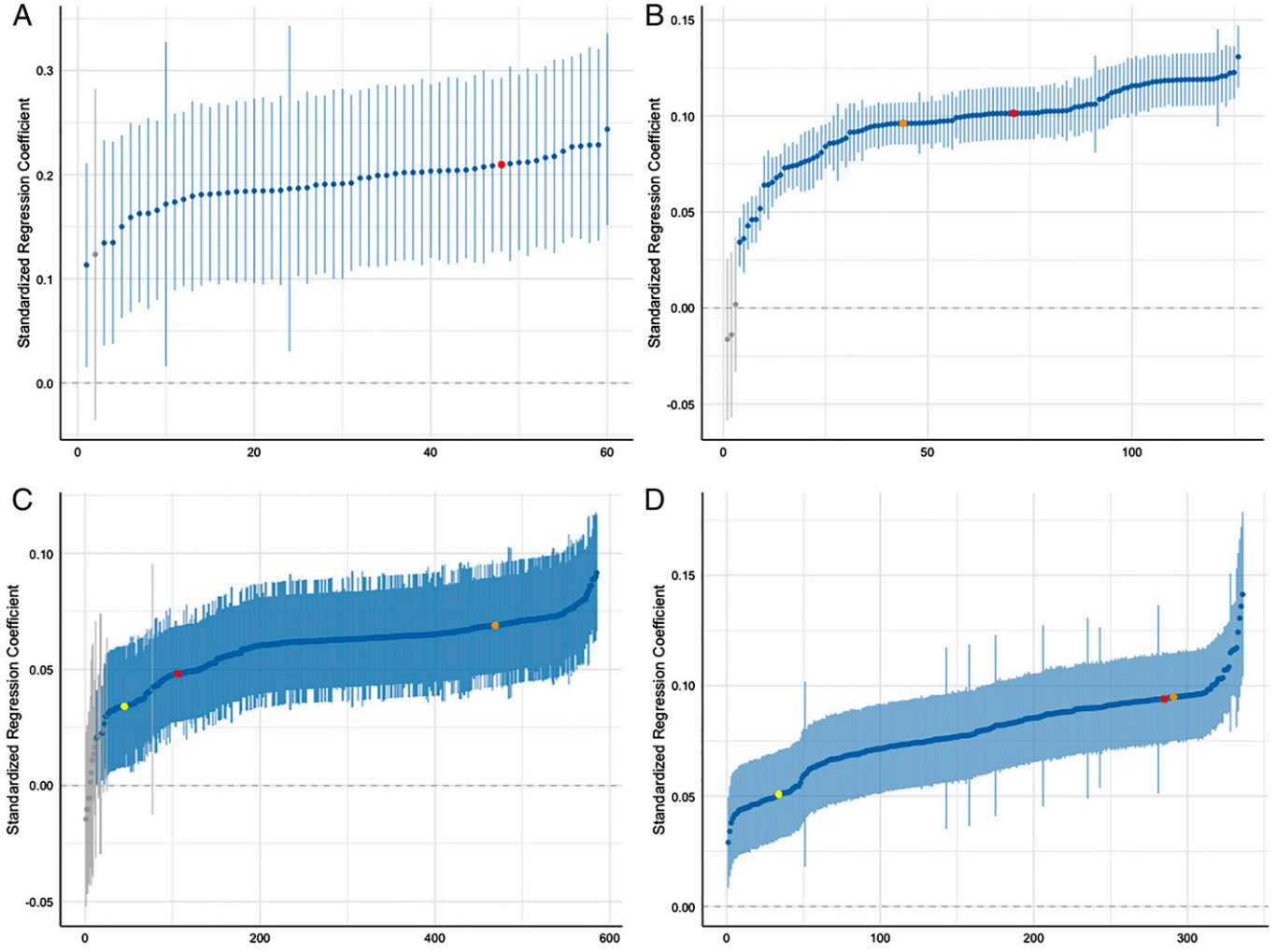

Fig. 3. Results from SCA for each dataset, showing the standardized regression coefficient for each model specification (*x* axes show the model numbers, which are sorted from smallest to largest effect size). (*A*) SCA results on our preregistered dataset, with the raw association (no controls) between portfolio diversity and global well-being in red. (*B*) SCA results for the ATUS data, with the raw association (no controls) between portfolio and quality of life in red, and subjective ratings of health in orange. (*C*) SCA results the SAGE dataset, with the raw association (no controls) between portfolio diversity and life satisfaction in red, subjective health in orange, and number of overnight hospital visits in the past 12 mo in yellow. (*D*) SCA results for the French experience-sampling dataset, with the raw association (no controls) between portfolio diversity and global happiness in red, positive emotion in orange, and negative emotion (reverse coded) in yellow.

reported their current happiness (0: Very unhappy, 100: Very happy), the extent to which they were experiencing each of 18 specific emotions (52) (Differential Emotion Scale), with whom they were interacting, and what activity they were engaged in.*

SCA revealed that the overall association between social portfolio diversity and well-being in the French population was robust to a wide range of specifications across outcome variables and covariates (including the proportion of responses spent socializing and activity diversity, as well as demographic variables such as gender, age, relationship status, employment status, days worked per week, hours worked per day, country of residence): median $\beta = 0.08$, 95% CI [0.06, 0.10], SE = 0.01, $P < 0.001$, $n = 9{,}555$; 336/336 specifications showed a significant positive relationship (*SI Appendix*, Table S5 and Fig. 3; see *SI Appendix* for additional details).

An additional alternative explanation for our results is that happier people have more diverse social portfolios due to some unobserved variable(s) (e.g., personality) that, when we look across individuals, produces a correlation between social portfolio diversity and well-being. The longitudinal nature of these data allowed us to address this in two ways.

First, we analyzed this data within-person over time (at the week level), including a random intercept for user to account for the nested structure of the data, and fixed-effects for our predictor variables. For each user, we calculated social portfolio diversity across the interactions users reported throughout each week (*SI Appendix*). We did the same for activity diversity. We centered each predictor variable within participant to assess the effect of variations from each person's individual-level mean on well-being. We calculated three primary outcome measures, taking a weekly average of user daily questionnaire responses, and centering these within-person: 1) global happiness, 2) positive emotion (alertness, amusement, awe, contentment, joy, gratitude, hope, love, and pride), and 3) negative emotion (anger, sadness, embarrassment, fear, disgust, guilt, shame, contempt, and anxiety).

*Across our datasets, the order in which individuals reported their subjective well-being and their social interactions varied. In the preregistered survey, SAGE interviews, and French experience-sampling data, individuals reported their subjective well-being prior to reporting about their interactions. Therefore, their well-being reports were not influenced by their reports about their social interactions. In the ATUS interviews, individuals completed the day-reconstruction exercise prior to reporting their subjective well-being. This variation across studies suggests that the observed results are not merely an artifact of question order or priming.

Within-person analyses over time supported our key findings: Individuals who reported higher-than-their-usual levels of social portfolio diversity in a given week reported significantly greater-than-their-usual levels of subjective well-being—even when taking into account any effects of the proportion of time spent socializing and activity diversity (happiness: $\beta = 0.02$, $b = 0.37$, 95% CI [0.19, 0.06], $P < 0.001$, $n = 13{,}606$; positive emotion: $\beta = 0.03$, $b = 0.82$, 95% CI [0.36, 1.28], $P < 0.001$, $n = 4{,}355$; negative emotion: $\beta = -0.01$, $b = -0.48$, 95% CI [−0.98, 0.02], $P = 0.06$, $n = 4{,}355$; *SI Appendix*, Table S6; models included a random intercept to account for the nested structure of the data; see *SI Appendix* for details of specifications). Thus, even when we take into account the role of the person by looking within people over time (instead of between people at a single timepoint), we observe a positive relationship between social portfolio diversity and well-being.

Second, we sought to address the possibility that the observed effect was cause by spurious variance due to the subjective reporting of both social interactions and well-being at the same timepoint. Thus, we conducted lagged regression analyses in which we predicted week-level well-being variables (happiness, positive emotion, negative emotion) from the previous week's level of social portfolio diversity, including a random intercept for user to account for the nested structure of the data and fixed effects for our predictor variables. Results revealed that week-level well-being was significantly positively predicted by social portfolio diversity throughout the previous week—a relationship that held when controlling for the concurrent week's level of social portfolio diversity, proportion of social interaction, and activity diversity (happiness: $\beta = 0.02$, $b = 0.59$, 95% CI [0.38, 0.79], $P < 0.001$, $n = 13{,}305$; positive emotion: $\beta = 0.03$, $b = 1.23$, 95% CI [0.70, 1.75], $P < 0.001$, $n = 4{,}293$; negative emotion: $\beta = -0.01$, $b = -0.68$, 95% CI [−1.25, −0.11], $P = 0.02$, $n = 4{,}293$; *SI Appendix*, Table S7).

The estimated effects in the lagged regression analyses are approximately one-quarter the size of the estimated effects in the cross-sectional analyses, which may reflect the influence of additional variables not observable when we look within (rather than between) people. In other words, while part of the benefits of social portfolio diversity are derived directly from having a diverse set of interactions, some of the benefits may be conferred through other unobserved mechanisms. For example, perhaps social portfolio diversity confers greater access to social support, which would not necessarily predict a direct boost in well-being from diverse interactions but rather confers benefits to the individual over time.

Discussion

Four distinct samples (composed of more than 50,000 respondents from eight countries) establish a positive relationship between people's social portfolio diversity and well-being, over and above people's total time spent in social interaction, and total number of social interactions. This relationship persisted when controlling for the diversity of activities that people engaged in across their social interactions. In addition, the effect was evident across time within person—during weeks with greater social portfolio diversity than usual, people also experienced greater subjective well-being than usual. The link between social portfolio diversity and well-being was robust across a broad range of model specifications (according to specification curve analyses), including different measures of well-being and an extensive set of covariates. The size of these effects was comparable to the effects of several key demographic determinants of well-being in each dataset, including marital status, income, age, and gender (*SI Appendix* and *SI Appendix*, Fig. S6). For example, social portfolio diversity was a stronger predictor of subjective well-being than being married—a well-established determinant of well-being (53–57)—in three of the four datasets. Across datasets, we found that the relationship between social portfolio diversity and well-being was strongest on measures of subjective well-being (i.e., life satisfaction, quality of life) and weaker, though still significant, on measures of physical health (e.g., ratings of physical health, number of hospital stays) and discrete emotions (i.e., positive and negative emotion).

While lagged analyses provide suggestive evidence that the relational diversity of social portfolios causally influences subjective well-being (e.g., within individuals from one week to the next), the correlational nature of these datasets precludes us from ruling out that subjective well-being influences social portfolio diversity. Indeed, poor health or well-being may lead people to narrow their social portfolios, and happy people may attract more diverse conversation partners. Moreover, there may be other aspects of social interaction and well-being that may or may not relate to the diversity of one's social portfolio—such as the characteristics of interaction partners (e.g., race, gender), their relationship to each other (e.g., closeness, relative status), or the conversation content (e.g., topics discussed, emotions experienced). Indeed, some relationship types may differentially influence well-being: Exploratory analyses that dropped relationship categories like "romantic partners" or "colleagues" one at a time from our diversity index revealed different effects on well-being, though these differences were not consistent across datasets (*SI Appendix*).

To provide initial insight into one potential mediator of the link between social portfolio diversity and well-being, we conducted mediation analyses using data from the SAGE and French experience-sampling datasets, which both included measures of discrete emotion. Social portfolio diversity predicted greater diversity in one's emotional experiences (23), which partially mediated the relationship between portfolio diversity and well-being, explaining between 4 and 11% of the effect across different outcome measures (*SI Appendix*). Another potential mediator may be social support, a crucial determinant of subjective well-being that has been associated with reduced stress, improved emotional and psychological well-being, physical health, and longevity (58–64). Different types of social support (e.g., emotional, instrumental, financial, informational) tend to be provided by different social relations [e.g., partner, immediate kin, friends, colleagues (65–70)]. Diversity in social portfolios may be associated with greater access to different types of social support, resulting in enhanced well-being.

Future research could also examine people's lay beliefs about the influence of social portfolio diversity on well-being. People may intuit this association but are unable to alter their social portfolios (e.g., because they are single, unemployed, without internet access, or live in a socially isolated location), but it is also possible that their beliefs about optimal social portfolios do not align with our results. Indeed, a large literature demonstrates individuals' surprising inability to anticipate which decisions will result in their highest well-being (71).

People's time is scarce, such that increasing the number or frequency of social interactions can prove challenging (72, 73). Our results suggest that a more relationally diverse social portfolio may offer a time-neutral means of shaping well-being.

Materials and Methods

Study 1. We recruited 603 US respondents from Prolific Academic. Consistent with our preregistered exclusion criteria, 25 respondents failed an attention check (*SI Appendix*), leaving a final sample of 578 respondents. This study was approved by the Harvard University Institutional Review Board (IRB), and all participants provided informed consent.

In this study, participants first responded to the two subjective well-being questions. Then, participants completed a day-reconstruction protocol. For each episode recalled during the day reconstruction, respondents reported whether they were "interacting with anyone in-person during this episode" (1: Yes, 2: No, I was interacting with someone virtually, 3: No, I was alone). If respondents responded yes, they specified with whom they were interacting from seven nonmutually exclusive categories: spouse/significant other, adult children, young children or grandchildren, family other than spouse/child, friends, coworkers, or other people not listed. Social portfolio diversity was calculated as follows: 1) dividing the number of episodes yesterday for which an individual reported interacting with someone in a specific social category by the total number of episodes they reported interacting with someone in any of the categories, giving us pi; 2) multiplying this proportion by its natural log (pi × ln pi); 3) repeating this for each of the seven social categories; and 4) summing all of the (pi × ln pi) products and multiplying the total by −1.

SCA. At the end of our preregistered survey, participants reported their age, gender (1 = male, 2 = female, 3 = other, 4 = prefer not to answer), marital status (1 = single, 2 = married, 3 = living with someone as a couple, 4 = other), number of people in their household, whether they have any children (1 = yes, 0 = no), number of children under the age of 18 y, and annual income (1 = ≤$10,000, 2 = $10,000 to 19,999, 3 = $20,000 to 29,999, 4 = $30,000 to 39,999, 5 = $40,000 to 49,999, 6 = $50,000 to 59,999, 7 = $60,000 to 69,999, 8 = $70,000 to 79,999, 9 = $80,000 to 89,999, 10 = $90,000 to 99,999, 11 = $100,000 or more). We computed a proxy variable to represent current working status based on whether participants reported interacting with someone in the "coworker" category at least once yesterday. These covariates were included in our SCA (*SI Appendix*, Table S8; see *SI Appendix* for specification details).

Study 2. We used data from a representative sample of Americans who completed the "Well-Being Module" of the ATUS in the years 2010, 2012, and 2013. This study was considered exempt from IRB approval given that it involved secondary analysis of a publicly available dataset.

In this study, participants first completed a day-reconstruction protocol. For each episode recalled during the day-reconstruction protocol, respondents reported who they were interacting with from six categories: customers/clients/coworkers, with their own children, with nonown children, with friends, with family, or with romantic partner. Social portfolio diversity was calculated as follows: 1) dividing the number of minutes an individual spent interacting with someone in a specified social category yesterday by the total number of minutes they spent interacting with someone in any of the categories, giving us pi; 2) multiplying this proportion by its natural log (pi × ln pi); 3) repeating this for each of the six social categories; and 4) summing all of the (pi × ln pi) products and multiplying the total by −1.

ATUS respondents also reported what activity they were engaging for each episode during the day-reconstruction protocol. These activities were coded according to the ATUS Activity Coding Lexicon. Each activity was categorized into one of 17 categories: 1) Personal Care Activities, 2) Household Activities, 3) Caring For & Helping Household Members, 4) Caring For & Helping Nonhousehold Members, 5) Work & Work-Related Activities, 6) Education, 7) Consumer Purchases, 8) Professional & Personal Care Services, 9) Household Services, 10) Government Services & Civic Obligations, 11) Eating and Drinking, 12) Socializing, Relaxing & Leisure, 13) Sports, Exercise, & Recreation, 14) Religious & Spiritual Activities, 15) Volunteer Activities, 16) Telephone Calls, and 17) Traveling. Activity diversity was calculated as described above, assessing the number of minutes for each activity category rather than each social category.

After they completed this day-reconstruction protocol, they responded to a series of questions assessing their subjective well-being and physical health. We focus on three of these questions in our main analyses, reporting the results on additional well-being measures in *SI Appendix*.

SCA. The ATUS dataset provided important demographic information about respondents, including their age, gender (1 = male, 2 = female), race (26 categories), relationship status (1 = married–spouse present, 2 = married–spouse absent, 3 = widowed, 4 = divorced, 5 = separated, 6 = never married), educational attainment (31 = less than first grade, 32 = first, second third, or fourth grade, 33 = fifth or sixth grade, 34 = seventh or eighth grade, 35 = ninth grade, 36 = 10th grade, 37 = 11th grade, 38 = 12th grade–no diploma, 39 = High school graduate = diploma or equivalent, 40 = Some college but no degree, 41 = Associate degree = occupational/vocational, 42 = Associate degree–academic program, 43 = Bachelor's degree, 44 = Master's degree, 45 = Professional school degree, 46 = Doctoral degree), US state of residence, employment status (1 = employed–at work, 2 = employed–absent, 3 = unemployed–on layoff, 4 = unemployed–looking, 5 = not in labor force), multiple job status (1 = yes, 2 = no), full or part-time status (1 = full, 2 = part), number of hours worked per week, presence of children (yes/no), number of household children younger than 18 y, age of youngest household child, and day of the week for day reconstruction (1 = Sunday, 2 = Monday, 3 = Tuesday, 4 = Wednesday, 5 = Thursday, 6 = Friday, 7 = Saturday). In addition to these demographic covariates, we control for the amount of time (in minutes) spent alone, spent with each social category, and the proportion of time spent socializing. To examine the role of activity type, we controlled for activity diversity, as well as the amount of time (in minutes) spent on activities within each of 17 categories. These covariates were included in our SCA (*SI Appendix*, Table S8; see *SI Appendix* for specification details).

Study 3. The data for Study 3 consisted of nationally representative samples from China (n = 3,629), Ghana (n = 1,286), India (n = 2,769), Mexico (n = 645), Russian Federation (n = 1,071), and South Africa (n = 1,047). This study was considered exempt from IRB approval given that it involved secondary analysis of a publicly available dataset.

In this study, participants first responded to the questions regarding their subjective well-being and health prior to completing the day-reconstruction protocol. For each episode recalled during the day reconstruction, respondents reported who they were with, reporting "yes" or "no" for each of the following seven nonmutually exclusive categories: spouse, adult children, young children or grandchildren, family other than spouse/child, friends, coworkers, or other; alternatively, respondents could select that they were alone. Social portfolio diversity was calculated as follows: 1) dividing the number of episodes yesterday for which an individual reported interacting with someone in a specific social category by the total number of episodes they reported interacting with someone in any of the categories, which gave us p_i; 2) multiplying this proportion by its natural log ($p_i \times \ln p_i$); 3) repeating this for each of the seven social categories; and 4) summing all of the ($p_i \times \ln p_i$) products and multiplying the total by −1.

SAGE respondents also reported what activity they were engaging for each episode during the day-reconstruction protocol. Each activity was categorized into one of 23 categories: 1) Working, 2) Subsistence Farming, 3) Preparing Food, 4) Doing Housework, 5) Watching Children, 6) Shopping, 7) Walking Somewhere, 8) Traveling by Bicycle, 9) Traveling by Car/Bus/Train, 10) Rest, 11) Chatting with Someone, 12) Playing, 13) Reading, 14) Listening to Radio, 15) Watching TV, 16) Exercising or Leisurely Walk, 17) Other Leisure Activity, 18) Grooming or Bathing (Self), 19) Eating, 20) Religious Activity, 21) Providing Care to Someone, 22) Intimate Relations/Sex, and 23) Went to Sleep for the Night. Activity diversity was calculated as described above, assessing the number of episodes for each activity category rather than each social category.

The results presented in the main text represent those conducted at the episode level, but we replicate our findings in terms of the number of minutes (*SI Appendix*, Table S4).

SCA. The SAGE dataset includes important demographic covariates including country (1 = China, 2 = Ghana, 3 = India, 4 = Mexico, 5 = Russian Federation, 6 = South Africa), gender (1 = male, 2 = female), age, relationship status (1 = never married, 2 = currently married, 3 = cohabitating, 4 = separate/divorced, 5 = widowed), education level (1 = less than primary, 2 = primary school completed, 3 = secondary school completed, 4 = high school completed, 5 = college/preuniversity/university completed, 6 = postgraduate degree completed), current work status, number of days worked per week, and number of hours worked per day, and income. In additional to these demographic variables, we controlled for the number of episodes spent alone, spent with people in each

social category, and the proportion of episodes spent socializing. To examine the role of activity type, we controlled for activity diversity, as well as the number of episodes spent on activities within each of 23 categories. These covariates were included in our SCA (*SI Appendix*, Table S8; see *SI Appendix* for specification details).

Study 4. The data used in Study 4 were collected as part of a project investigating people's experiences of emotions in everyday life (40). People volunteered to participate by downloading a free francophone mobile application "58 seconds," which was dedicated to measuring user's psychological experiences through daily questionnaires randomly presented throughout the day. The application received more than 60,000 users, and half a million completed questionnaires. Participants received weekly feedback on their aggregated levels of emotions. Participants could customize their experience, selecting which days of the week and within what time periods they wished to receive questionnaire requests (default = 7 d/wk from 9 AM to 10 PM), as well as how many daily questionnaire requests they wish to receive (default = 4, minimum = 1, maximum = 12). Each day, an algorithm randomly selected when to send the questionnaires within the selected time periods, with a minimum of 1 h between each request. At each of these times, participants would be notified on their mobile phone of the questionnaire request, and were given the option to complete the questionnaire, snooze it (i.e., delay request by 9 min), or reject it. In the current research, we focused on a subset of the questions collected as part of this larger study. The research was part of the "58s" project investigating the everyday life of European adults, approved by The Ethics Committee of Esade Business School, Spain (#005/2019), and all participants provided informed consent.

The French mobile application always asked users to report their subjective well-being prior to asking them to report about their social interactions and activities. Each time they were prompted to report on their social activity, they were asked to report who they were interacting with, reporting "yes" or "no" for each of 14 nonmutually exclusive choices: clients, colleagues/classmates, acquaintance, friend, best friend, father, mother, brother, sister, kids, romantic partner, other family, stranger, or other. At the person level, social portfolio diversity was calculated as follows: 1) dividing the number of times an individual interacted with someone in a specified social category across all questionnaire responses by the total number of people they interacted with across all categories and all questionnaire responses, which gave us p_i; 2) multiplying this proportion by its natural log ($p_i \times \ln p_i$); 3) repeating this for each of the 14 social categories; and 4) summing all of the ($p_i \times \ln p_i$) products and multiplied the total by −1. At the week level, social portfolio diversity was calculated as follows: 1) dividing the number of times an individual interacted with someone in a specified social category in a given week by the total number of people they interacted with across all categories that week, which gave us p_i; 2) multiplying this proportion by its natural log ($p_i \times \ln p_i$); 3) repeating this for each of the 14 social categories; and 4) summing all of the ($p_i \times \ln p_i$) products and multiplied the total by −1.

Respondents in the French-Experience Sampling Dataset also periodically reported what activity they were engaging at the time of the questionnaire prompt. They selected from a list of 25 categories: 1) Working, 2) Commuting, 3) Cooking, 4) Cleaning, 5) Shopping, 6) Waiting, 7) Childcare, 8) Playing, 9) Helping, 10) Resting, 11) Thinking, 12) Selfcare, 13) Talking, 14) Eating, 15) Drinking, 16) Using Social Media, 17) On the Phone, 18) On the Internet, 19) Watching TV, 20) Listening to Music, 21) Cultural Activity, 22) Sports, 23) Nature, 24) Leisure, and 25) Other Activity. Activity diversity was calculated as described above, assessing the number of instances for each activity category rather than each social category.

SCA. The French experience-sampling dataset included basic demographic characteristics including participants' age, and gender (0 = male, 1 = female). We calculated a binary variable to represent whether participants had children (yes/no), whether they had a romantic partner (yes/no), and whether they were working (yes/no) based on whether or not they had ever reported socializing with someone in each of these categories in one of their questionnaire responses. In addition to these demographic covariates, we also controlled for the number of episodes spent alone, spent with each social category, and the proportion of episodes spent socializing. To examine the role of activity type, we controlled for activity diversity, as well as the number of episodes spent on activities within each of 25 categories. These covariates were included in our SCA (*SI Appendix*, Table S8; see *SI Appendix* for specification details).

Data, Materials, and Software Availability. Anonymized survey data for Study 1 are available on the Open Science Framework (https://osf.io/b8fd4/?view_only=537447f40f3047cba7d140ed1b07b318) (74). Previously published data for Studies 2 and 3 are available online (Study 2: https://www.bls.gov/tus/#data (75); Study 3: https://apps.who.int/healthinfo/systems/surveydata/index.php/catalog/sage) (76).

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