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Predictors of Physical Activity Patterns Across Adulthood: A Growth Curve Analysis

Margaret L. Kern[1], Chandra A. Reynolds[1], and Howard S. Friedman[1]

Abstract

Activity level is a core but understudied individual difference. Understanding patterns of physical activity over long periods may be key to understanding why some individuals develop healthy lifestyles. The present study transformed qualitative information from the Terman Life Cycle Study to examine patterns of leisure time physical activity across four decades (1936-1972). Activities were converted into metabolic equivalent (MET) ratings, and then activity patterns, individual variation, and child and adult personality predictors of differing trajectories were examined using growth curve modeling. For overall activity, a quadratic model fit best, with decelerating decline as people aged. Males were consistently more active than females. Much individual variation was present, but childhood energy and sociability, and adult extraversion and neuroticism predicted average activity levels and change. Results suggest that physical activity needs to be understood within the context of the individual's personality and long-term trajectory, not merely current motivations.

Keywords

life-span patterns, physical activity, personality, sex differences, growth curve analyses

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Since Darwin's cousin Francis Galton began the scientific study of individual differences in the 1880s, many leading personality psychologists have studied behavioral and physical as well as cognitive aspects of individuals—what Galton termed "measuring man in his entirety" (Galton, 1884, p. 179). For example, James McKeen Cattell, who founded psychological testing in the United States, included extensive health and activity measures in his studies. Gordon Allport (1950) was likewise interested in gait, expression, and other "visceral" aspects of personality. The pioneering Stanford psychologist Lewis M. Terman viewed individual differences as having at least four basic components: mental or intellectual, trait, interpersonal, and physical. For each of these, Terman pioneered specific measures, such as the Stanford–Binet Intelligence Test, the first measures of masculinity–femininity and marital quality, and assessments of childhood energy levels. The present study focuses on this last component—physical activity.

As Allport, Cattell, and Terman knew, the human body is designed to move. If muscles are underused, atrophy occurs and movement becomes difficult or distorted. Such decline occurs through aging processes, illness, or inactive lifestyles. Little is known, however, about the relations between personality traits and physical activity patterns across adulthood. The issue is an important one in practical terms because physical activity has numerous key correlates, including better physical functioning, improved mental well-being, and reduced risk of chronic illness (U.S. Department of Health and Human Services, 2008).

Federal recommendations in the United States suggest that for the average adult, significant health benefits accrue from engaging in at least 150 min of moderate-intensity activity or 75 min of vigorous-intensity exercise per week. Yet many fail to meet even the minimal recommendations, and the question of how people will successfully initiate and maintain an active lifestyle remains challenging. Both the scientific and lay communities are inundated with suggestions, recommendations, and training programs, with the greatest emphasis on starting to exercise. Yet if activity is successfully motivated and begun, will it be maintained? A life-span perspective suggests that individual histories, habitual patterns of behaviors, and personality will influence subsequent behaviors (Aldwin, Spiro, & Park, 2006; Baltes, Lindenberger, & Staudinger, 2006;

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Crossnoe & Elder, 2002; Hampson & Friedman, 2008; Schultz & Heckhausen, 1996). We call this a *life-span epidemiological personality approach* (Friedman & Kern, 2010).

It may be the accumulated pattern of activity over time that is most relevant to consequential outcomes, including heart disease, cancer, depression, and mortality risk (DiPietro, 2001; Paffenbarger, Hyde, Wing, & Hsieh, 1986; Pedersen & Saltin, 2006). Yet the causal links and directions are unclear. Physical activity has social, health, and well-being benefits, but individuals who are sociable, healthy, and happy may be more able and motivated to engage in active pursuits. Most likely, physical health, mental well-being, and physical activity affect one another in multiple ways. Adaptive and maladaptive development occurs across the life span within the context of individual biological and psychosocial restraints (Baltes & Smith, 2004). By studying long-term patterns of activity, we can better understand why different individuals adopt particular behavioral patterns; in turn, this understanding could lead to the design of targeted long-term experimental interventions and better informed programs to promote positive, enduring change.

Large-scale cross-sectional analyses and several small-scale tracking studies (using rank order correlations) suggest that physical activity levels are fairly stable through childhood and adolescence and then decline over time, with the greatest decrease occurring in the teenage years (Anderssen, Wold, & Torsheim, 2005; Boreham et al., 2004; Caspersen, Pereira, & Curran, 2000; Janz, Burns, & Levy, 2005; McMurray, Harrell, Bangdiwala, & Hu, 2003; Telama et al., 2005; Trudeau, Laurencelle, & Shephard, 2004). Although using a rank order method is informative, individuals vary in the trajectories they follow. The lower cross-time correlations that occur in adolescent-to-adult samples include individual variation that is obscured through the statistical techniques used (Mroczek, Almeida, Spiro, & Pafford, 2006). Newer statistical techniques offer a method for directly examining individual differences within the broader context of group-level effects. The present study used multilevel techniques within a life-span framework to examine long-term patterns of physical activity across four decades and child and adult personality predictors of individual variation in these patterns.

Antecedents and Correlates of Physical Activity

Sex is the best predictor of activity-level differences, with boys and men being more active than girls and women (Sallis, 2000; Trost, Owen, Bauman, Sallis, & Brown, 2002). Motivation, intentions to be active, and self-efficacy are also important factors influencing behavior (Ryan & Deci, 2000). Higher levels of activity have been associated with higher levels of extraversion and conscientiousness and lower levels of neuroticism (Rhodes & Smith, 2006), but little is known about long-term trajectories (DiPietro, 2001; Li et al., 2005, MacKinnon & Luecken, 2008). No study to our knowledge has combined childhood and adult factors to predict patterns of activity (i.e., level and change) across adulthood.

Archival Data: The Terman Life Cycle Study

Archival studies provide a way to study processes over long periods; by developing existing data in new ways, we can address life-span questions that are impossible in shorter term studies (Block, 1993; Elder, Pavalko, & Clipp, 1993; Martin & Friedman, 2000; Tomlinson-Keasey, 1993). Such archival work is challenging, involving an extensive knowledge of the data, assessments of validity for newly created scales, techniques for dealing with missing data, and the flexibility to recast existing information to address new questions. *Recasting* refers to a process of restructuring existing data to create new measures of a construct, and it entails taking a theoretical model and empirically shaping the data to answer specific research questions (Elder et al., 1993). In the present study, we recast qualitative information from the Terman Life Cycle Study to examine patterns of leisure time physical activity across four decades.

Terman's study began in 1922 as over 1,500 bright children (with IQs of 135 or greater) were recruited and then followed throughout their lives. Our work in developing the Terman data has demonstrated that we can learn much about lifelong pathways by refining available information and tracing lives over time (Kern & Friedman, 2010). Although not all participants completed every measure, we can use the extant information to understand the sample as a whole and to explore individual variation within the sample.

The Terman Life Cycle Study has multiple strengths, including limited attrition and a good range of variability on non-intelligence-relevant traits. However, there is reasonable concern about the generality of a high-IQ sample. We therefore have examined the impact of selection due to intelligence and educational attainment (Reynolds, McArdle, Kern, & Friedman, 2007). We examined the effect of selection on means and covariance of variables measured longitudinally across eight decades using the Pearson–Aitken–Lawley correction. Although adult cognitive traits, as expected, showed a large effect, health-related variables, including physical activity, showed minimal selection effects due to childhood IQ or educational attainment (see the Method section for more details). In fact, the results we uncover here may actually become larger when considered in less select samples; this was true for our studies of conscientiousness (Kern & Friedman, 2008).

In any longitudinal study, it is also possible that differential attrition occurred, such that individuals who completed the later assessments differed in some way from those who completed fewer assessments or dropped out of the study. Analyses by Sears and others (e.g., Holahan & Sears, 1995; Schwartz et al., 1995; Sears, 1984) have found little impact of attrition on demographic characteristics or health variables in the Terman data. Nevertheless, we directly address attrition in the current analyses, as described in the Method section. We also note that although participants were assessed prospectively, a causal chain of inference cannot be fully established using these types of longitudinal data and analyses.

In an initial study, we explored whether there was any measurable stability of activity from childhood through old age (Friedman et al., 2008). In 1922, parents and teachers rated how active and energetic the children were, and the participants (and their parents) indicated how much the participants enjoyed physically active pastimes (combined into a "childhood energy" scale). From 1936 through 1972, participants reported the various activities they engaged in, and we coded these into three activity levels (low, moderate, or vigorous). Interestingly, childhood energy was significantly related to active hobby reports across the life span, suggesting that an individual's early characteristics are relevant to future physical activity levels. Although encouraging, that study used a very rough measure of physical activity, simple cross-time correlations, and did not consider the role of personality. As the archives offer considerably more information, we undertook the present study to develop the available qualitative resources to study long-term activity *patterns* by using an in-depth assessment of leisure time activities, growth curve modeling techniques to consider individual variation, examination of childhood and adult personality predictors of different trajectories, and sex-related differences.

The present study had four objectives: (a) to recast the Terman data to examine activity patterns over time, through an extensive quantitative analysis of qualitative data provided by the participants across a 36-year period; (b) to determine an overall average pattern of physical activity level and change; (c) to examine variation, especially child and adult personality predictors of individual variation; and (d) to consider sex-related differences in activity patterns and variation.

Method

Participants

In 1922, teachers across California were asked to identify the youngest and most intelligent children in their classes (Terman et al., 1925). The children were tested using the Stanford–Binet Intelligence Test and were included in the study if they had an IQ of 135 or greater. Others were added through 1928, yielding a total sample of 1,528 (856 males, 672 females). Participants were then followed throughout their lives, completing written assessments every 5 to 10 years. In 1936, 1940, 1950, 1960, and 1972, participants reported their leisure time physical activities (see later discussion); 536 individuals (284 males, 252 females) completed all five occasions, 376 (212 males, 164 females) completed four occasions, 228 (146 males, 82 females) completed three occasions, 158 (92 males, 66 females) completed two occasions, and 111 (64 males, 47 females) completed one occasion. Rather than exclude the individuals with partial information, maximum likelihood estimation allows inclusion of all available data; the number of waves can vary by individual as long as each individual contributes at least one measurement occasion and enough participants contribute a sufficient number of reports to adequately estimate a growth process (McArdle, 2004; Singer & Willett, 2003). Individuals were excluded if they did not have at least one activity score ($N = 119$), leaving a final sample of 1,409 participants (798 males, 611 females).

To address possible attrition issues, we compared individuals who completed four or five assessments with those who completed three or fewer. Those with more reports were more conscientious as children, $t(1,323) = 2.83$, $p = .005$, and as adults, $t(1,212) = 3.22$, $p = .0013$; were better mentally adjusted in 1940, $t(1,335) = 2.37$, $p = .02$; and had a higher childhood IQ, $t(1,407) = 3.55$, $p = .0004$, than those who completed fewer assessments. There were no other differences between the two groups.

We compared the 119 individuals excluded from the study (with no physical activity reports between 1936 and 1972) with the 1,409 individuals with at least one activity report. Not surprisingly, the largest difference was that those excluded died at an earlier age (46.0 years vs. 75.7 years), including 42 individuals who died before the first major 1936 follow-up assessment and therefore had no opportunity to complete the activity measures. Those excluded came from a slightly lower socioeconomic status (SES), $t(1,205) = -2.28$, $r = -.12$, $p = .02$. For individuals who remained alive through the 1936 assessment (but did not report activity information), excluded individuals completed fewer years of education, $t(1,369) = -3.37$, $r = -.43$, $p = .0008$; reported lower levels of adult conscientiousness, $t(1,231) = -2.95$, $r = -.32$, $p = .003$; and were less mentally adjusted in adulthood, $t(1,363) = -5.01$, $r = -.43$ $p < .0001$. The two groups did not differ significantly on any other variable that we tested (including IQ, sex, baseline health in 1922, childhood activity, birth weight, age of puberty, child and adult personality, adult self-rated health, body mass index [BMI], and alcohol use).

As indicated in the Introduction, we have examined the impact of selection due to intelligence and education (Reynolds et al., 2007). We cite relevant analyses here that demonstrate the limited selection effect selection for the variables under consideration in the present analyses. In brief, we applied the Pearson–Aitken–Lawley correction to examine the effect of selection on means, as well as multivariate associations among the activity measures (Aitken, 1934; Lawley, 1943-1944; Pearson, 1902; see also application by Lindenberger, Singer, & Baltes, 2002). The correction procedure required knowledge of the actual population means, variances, and covariances among the traits on which selection took place (i.e., childhood IQ and educational attainment). For intelligence, we made use of well-known characteristics of the Stanford–Binet IQ measures ($M = 100$, $SD = 15$). To attain population values for educational attainment and its covariance with IQ, we used the sample statistics for educational attainment and a measure of verbal ability from the General Social Surveys, 1972-2006 (Davis, Smith, & Marsden, 2007) for the same birth cohorts as the Terman sample. For Terman males, the selection analyses suggested that average physical activity levels were slightly lower (mean effect size difference [M_{Esd}] = –0.18) than would be expected in the general population, whereas for Terman females, average physical activity levels were slightly higher ($M_{Esd} = 0.19$). Covariances and variances demonstrated minimal differences before and after correction for selection. These analyses imply that in these data, longitudinal analyses of covariance structures can proceed without adjustment for selection. Although the Terman cohort, like any archival cohort study, necessarily has certain limits on generality, we have confirmed that it is well suited for a study of lifelong activity. Furthermore, it may be the only study with such comprehensive lifelong data available.

Leisure Time Physical Activity: Recasting the Data

The original questionnaires are housed at Stanford University, with much uncoded qualitative information held in the archives. In 1936, 1940, 1950, 1960, and 1972, participants reported "avocational activities and hobbies in recent years (such as sports, music, art, writing, aviation, photography, collections, gardening, woodwork, etc.)" in free-response format. Originally, the first four responses were coded into broad categories of leisure-time activity (e.g., sports, outdoor activities, art, reading). After considering the additional information in the archives and our specific research questions, we decided to recast the data and to expand analyses to all available responses written on the hard copies of the questionnaires. Multiple trips were made to the Stanford archives and all participant responses to the activity questions were recorded as written. Three trained undergraduates coded responses into 182 categories, which were then rated for energy intensity.

Metabolic equivalent (MET) ratings are commonly used to gauge the energy expended by an individual (Ainsworth et al., 2000). One MET is equivalent to the energy a normal adult uses while sitting quietly doing nothing, and standard ratings range from 0.9 (sleeping) to 18.0 (running at a 5½ min per mile pace) METs. Three trained graduate students rated the 182 activity categories on the MET scale (average interrater reliability r = .91; complete agreement was then achieved through discussion). Low-intensity activities (less than 3.0 METs) included cooking, music, playing cards, reading, socializing, and typing. Moderate-intensity activities (3.0 to 5.9 METs) included boating, carpentry, gardening, and golf. Vigorous-intensity activities (6.0 or more METs) included backpacking, biking, handball, running, skiing, and tennis. Finally, we computed the average MET value reported for each year; these averages were used as the main variables in the growth analyses.

Predictor and Control Variables

Our main predictors were measures of child and adult personality. In addition, to control for health and psychosocial aspects, we included sex, childhood intelligence (IQ), SES, physical development, and physical and mental health. Missing data reduced the number included in some analyses, as noted later.

Childhood personality. In the initial 1922 assessment, parents and teachers rated the children on 25 personality traits. Through factor analysis, six personality dimensions have previously been identified (Friedman et al., 1993): Cheerfulness (α = .52), Conscientiousness (α = .76), Energy (α = .43), Motivation/Self-Esteem (α = .71), Sociability (α = .65), and Permanency of Moods (single item). Childhood personality information was available for 1,325 participants (750 males, 575 females).

Adult personality. In 1940, participants completed the Bernreuter Personality Inventory (Bernreuter, 1933) and 14 other self-rated personality traits. Scales corresponding to four of the NEO Personality Inventory–Revised (NEO PI-R) dimensions were created and validated (Martin & Friedman, 2000): Agreeableness (α = .72), Conscientiousness (α = .65), Neuroticism (α = .85), and Extraversion (α = .65). Adult personality information was available for 1,214 participants (683 males, 531 females).

Childhood IQ. Due to the select nature of the sample, we included IQ as a control, but following our prior analyses, we did not expect it to be related to physical activity levels or change (Reynolds et al., 2007). At the 1922 baseline assessment, all participants completed the Stanford–Binet Intelligence Test and several additional tests; Terman and his colleagues determined an overall best estimated childhood IQ. Data were available for all 1,409 participants.

Childhood SES. In 1922, parents reported their own highest grade level completed, additional schooling experiences, and current occupation. Occupation was coded according to the census categories of the time, ranging from unskilled to professional levels. As many women did not work outside the home, if the mother was a homemaker, the father's occupation was used to represent the mother's occupation. The parental education and occupation levels were standardized and summed to create a composite SES score (α = .86). SES data were available for 1,114 participants (557 males, 557 females).

Birth weight and pubertal age. Children develop physically at different rates, and this may be relevant to how active they become. Birth weight and pubertal age were included as markers of early physical development. In 1922, parents reported the birth weight. Although these were retrospective reports, the weight is often recorded at time of birth (e.g., baby diaries) and is likely reasonably objective. In 1922 and 1928, parents reported the age of menstruation (for females) or voice change (for males); these were used as markers of pubertal age. Birth weight information was available for 1,215 participants (685 males, 530 females) and puberty information was available for 1,040 participants (492 males, 548 females).

Adult health and adjustment. In 1940, participants self-reported their height and weight. BMI was calculated using Quetelet's formula (BMI = kg/m^2). Obesity was uncommon in this sample. Participants reported their own health in recent years; we categorized physical health on a 4-point scale (1 = *very poor or poor health*, 4 = *very good health*). Participants reported whether they had experienced any nervousness, worry, or other difficulties in recent years, and the nature of these difficulties. Terman and his colleagues used a combination of these reports, case histories, and knowledge from personal correspondence to classify each participant's mental adjustment (1 = *serious maladjustment*, 2 = *some maladjustment*, 3 = *well adjusted*). In addition, participants reported their normal alcohol use. Alcohol abuse may serve as a proxy for mental maladjustment. Participants were categorized on a 3-point scale (1 = *no or minimal alcohol use*, 2 = *moderate alcohol use*, 3 = *high alcohol use/alcohol is a serious problem*). Data were available for 1,220 participants (679 males, 541 females) for BMI, 1,230 participants (686 males, 544 females) for physical health, 1,337 participants (752 males, 585 females) for mental adjustment, and 1,227 participants (685 males, 542 females) for alcohol use.

Data Analytic Procedure

Multilevel modeling techniques were used to model physical activity level and change over time and to examine personality predictors of interindividual differences. In this framework, individual growth trajectories are estimated, producing fixed and random effects (Singer & Willet, 2003). Fixed effects characterize the overall average trajectory for the sample, whereas random effects characterize individual variation around this trajectory.

First, as an initial survey of the data, individual activity reports were plotted for sets of randomly selected participants (see Figure 1). The plots suggested a gradual downward trend, but there was a surprising degree of individual variation. This variation is what we were interested in observing and predicting. Second, using the full data, a taxonomy of models was fit to the data in a step-up fashion to determine the best base model by fitting an unconditional means (no-growth) model, in which the best fitting average trajectory is constant (i.e., not increasing or decreasing); an unconditional linear growth model, in which the best fitting average trajectory increases or decreases linearly over time; and an unconditional quadratic model, in which the best fitting average trajectory follows a nonlinear pattern. Third, predictor and control variables were added to the model, individually and multivariately.

Based on prior cross-sectional research (e.g., Caspersen et al., 2000), we expected that as people aged, they would display a decelerating decline in activity (i.e., a quadratic model). The following equation represents the basic quadratic growth model with one predictor included:

$$\begin{aligned} Y_{ij} = {} & \gamma_{00} + (\gamma_{01} * W_i) + (\gamma_{10} * age_{ij}) + \\ & (\gamma_{11} * W_i * age_{ij}) + (\gamma_{20} * age_{ij}^2) + \\ & (\gamma_{21} * W_i * age_{ij}^2) + [\zeta_{0i} + (\zeta_{1i} * age_{ij}) + \\ & (\zeta_{2i} * age_{ij}^2) + \varepsilon_{ij}], \end{aligned} \tag{1}$$

where W_i refers to individual i's value on the predictor (e.g., extraversion) centered on the sample mean; age_{ij} refers to the ith individual's age at each jth measurement occasion centered on the average age in 1940 (29 years); age_{ij}^2 refers to the centered age squared; γ_{00} refers to the average MET value at age 29 at the mean level of the predictor; γ_{10} refers to the instantaneous linear change in MET values at age 29; γ_{20} refers to the quadratic shift or curvature of the MET trajectory across age; γ_{01} refers to the shift in the intercept due to predictor W; γ_{11} refers to the shift in the linear effect due to predictor W; γ_{21} refers to the shift in the quadratic parameter due to predictor W; ζ_{0i}, ζ_{1i}, and ζ_{2i} are the individual deviations from the fixed intercept, linear, and quadratic terms; and ε_{ij} is the occasion-specific residual term. The variances of these deviations are the random effects and represent individual variation in growth trajectories.

Individual predictors included childhood personality (energy, conscientiousness, sociability, motivation, cheerfulness, permanency of moods) and adult personality (extraversion, neuroticism, conscientiousness, agreeableness). Personality variables were entered individually and then simultaneously, such that the individual effect of each predictor on activity patterns is evident, controlling for the effects of the other predictors in the model (i.e., the other childhood or adult personality variables). Control variables (childhood IQ, SES, birth weight, age of puberty, adult BMI, self-rated health, mental adjustment, and alcohol use) were tested individually, and then significant predictors were included in the personality models.

When adding predictors, missing data change the number of data points included in the model. Therefore, as predictors were added to the model, a new baseline model was fit each time that included only the participants with nonmissing data on the included predictors, such that the fit indices were comparable with the baseline model. To aid interpretation, age was centered on the average age in 1940 (29 years old), and all predictor variables were centered on their respective grand means. Thus, in the context of the quadratic change model, the fixed level (intercept) effect refers to the average MET value at age 29, and the fixed linear (slope) effect indicates the linear rate of change in activity at age 29. The quadratic parameter reflects the curvature in the trajectory of MET values across age. Model fit was assessed primarily through comparison of deviance statistics, with each nested model compared to the prior model. Differences in deviances can be assessed via the chi-square distribution, with degrees of freedom equal to the change in degrees of freedom between models. A significant chi-square denotes that the model fits better than the previous model and should be retained. However, chi-square can be susceptible to sample size; therefore, we also considered the parsimony-adjusted fit indices Akaike's information criteria (AIC) and Baysesian information criteria (BIC), where smaller values indicate a better fit. Finally, we calculated the intraclass correlation coefficient using the baseline means model between-person variance and within-person variance estimates, as well as pseudo R^2s for the linear and predictor models, which offer a rough indication of the importance of including additional

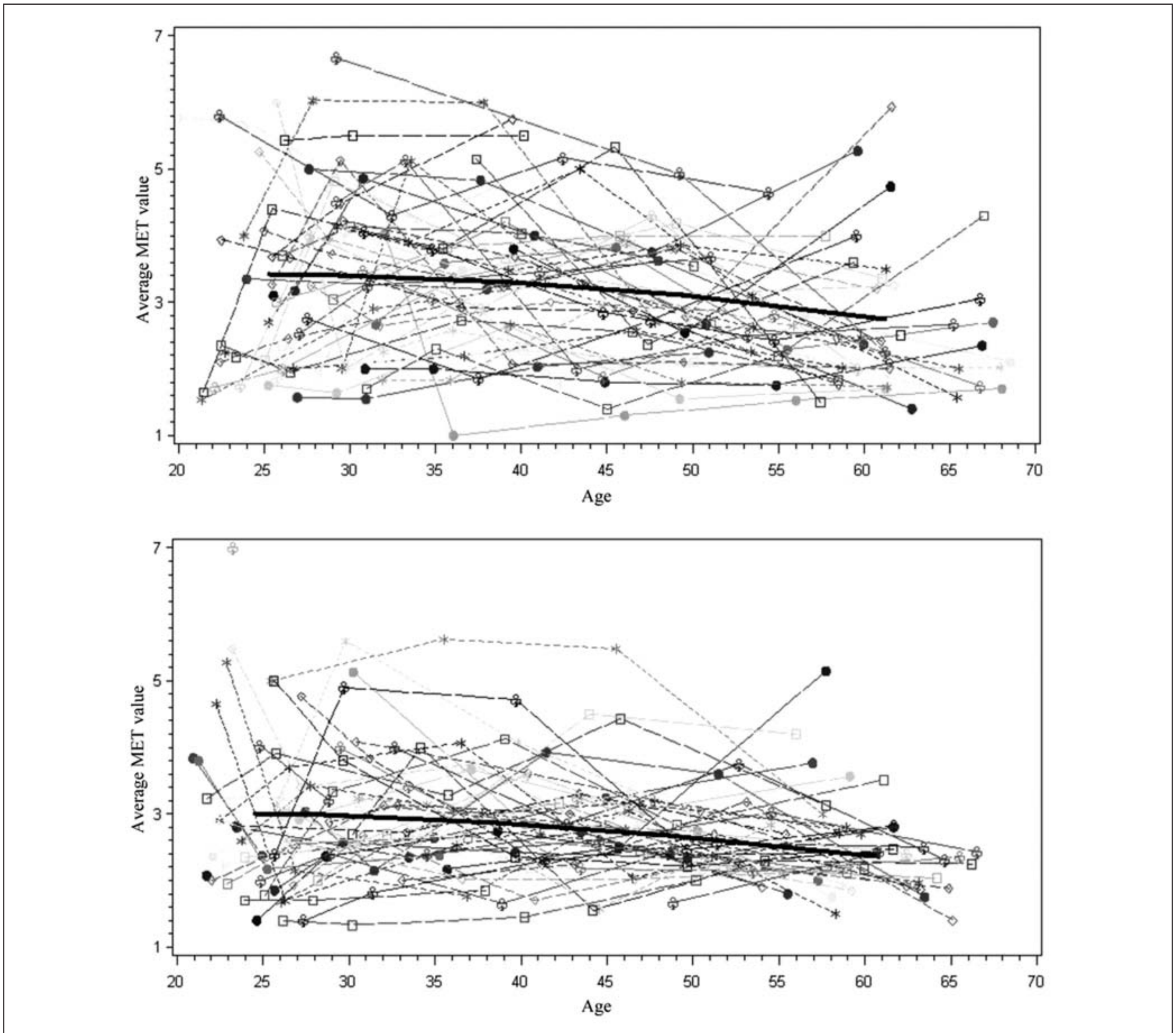

Figure 1. Sample plots of physical activity patterns over age for two random samples of 50 males (top) and 50 females (bottom), with the average trajectory across the full sample (N = 1,409) superimposed (bold line)
MET = metabolic equivalent. Copyright © 2009 Margaret L. Kern, reprinted by permission.

variables in the model (Singer & Willett, 2003). All analyses were performed using SAS software, version 9.2, with the PROC MIXED procedure.

Results

Descriptives and Correlations

Physical activity is reported in average MET values. On average, the sample was 25 years old (SD = 3.65 years) at the first activity assessment (1936) and 61 years old at the last activity assessment (1972), and participants reported a moderate to low level of activity (ranging from 3.29 METs in 1940 to 2.53 METs in 1972). Table 1 reports the means, standard deviations, and interyear correlations for the five activity variables.

Growth Curve Modeling

Establishing the baseline model. Preliminary plots of the data revealed both intra- and interindividual variation (see Figure 1). Table 2 summarizes the baseline models for the full sample. First, we established a baseline no-growth model (Table 2, Model A), and computed an intraclass correlation coefficient of 0.30, indicating that about 30% of the variance in activity

Table 1. Physical Activity Variable Descriptives and Inter-Year Correlations

	1936 activity		1940 activity		1950 activity		1960 activity		1972 activity	
M (*SD*)	3.18	(1.56)	3.29	(1.34)	3.10	(1.10)	2.94	(1.00)	2.53	(0.95)
Males	3.37	(1.68)	3.45	(1.40)	3.29	(1.20)	3.13	(1.09)	2.71	(1.13)
Females	2.91	(1.33)	3.08	(1.22)	2.85	(0.88)	2.72	(0.83)	2.34	(0.66)
1936 activity	1.00	(1,079)	0.49	(533)	0.31	(533)	0.22	(533)	0.16	(533)
Males	1.00	(618)	0.51	(282)	0.33	(282)	0.20	(282)	0.13	(282)
Females	1.00	(461)	0.42	(251)	0.18	(251)	0.18	(251)	0.14	(251)
1940 activity	0.44	(882)	1.00	(1,084)	0.36	(533)	0.29	(533)	0.13	(533)
Males	0.43	(506)	1.00	(617)	0.34	(282)	0.23	(282)	0.06	(282)
Females	0.43	(376)	1.00	(467)	0.32	(251)	0.31	(251)	0.15	(251)
1950 activity	0.32	(920)	0.39	(948)	1.00	(1,173)	0.44	(533)	0.25	(533)
Males	0.34	(527)	0.37	(542)	1.00	(666)	0.42	(282)	0.20	(282)
Females	0.22	(393)	0.35	(406)	1.00	(507)	0.40	(251)	0.24	(251)
1960 activity	0.24	(869)	0.30	(895)	0.47	(1,001)	1.00	(1,104)	0.29	(533)
Males	0.24	(478)	0.26	(491)	0.48	(547)	1.00	(602)	0.24	(282)
Females	0.17	(391)	0.31	(404)	0.36	(454)	1.00	(502)	0.31	(251)
1972 activity	0.15	(671)	0.20	(695)	0.26	(763)	0.33	(782)	1.00	(845)
Males	0.14	(348)	0.18	(370)	0.23	(405)	0.32	(412)	1.00	(446)
Females	0.08	(323)	0.15	(323)	0.21	(358)	0.25	(370)	1.00	(399)

Values above the diagonal refer to Pearson *r* correlations for individuals with all five measurement occasions on the physical activity variables (*N* = 533). Values below the diagonal refer to Pearson *r* correlations, using pairwise deletion, with the corresponding *N* in parentheses.

level is due to between-individual variance. Second, we fit an unconditional linear growth model (i.e., the linear effect of age; Table 2, Model B), which resulted in a vast improvement over the unconditional means model, $\Delta\chi^2(3) = 546.3$, $p < .0001$; 19.9% of the within-person variance was explained by including age in the model. Third, we fit an unconditional quadratic model (i.e., the quadratic effect of age; Table 2, Model C), which resulted in an improvement of model fit, $\Delta\chi^2(3) = 91.9$, $p < .0001$; 7.9% of the within-person variance was explained by including the quadratic term. Although the average quadratic change was nonzero, the variance of the random quadratic effect (ζ_{2i}) was nonsignificant ($p = .99$); therefore, no between-person predictors of quadratic change in physical activity were included in subsequent conditional models. Thus, when predictors were subsequently added to the model, variables could predict the initial level of activity (at age 29) and the linear decline as people age, but not quadratic variation.

Testing for sex differences. As expected, males were more active than females at each assessment: 1936: $t(1,077) = 4.86$, $r = .15$; 1940: $t(1,082) = 4.58$, $r = .14$; 1950: $t(1,171) = 7.05$, $r = .20$; 1960: $t(1,102) = 6.96$, $r = .21$; and 1972: $t(843) = 5.82$, $r = .18$; all *p*s < .0001. The baseline quadratic model was similar for males and females. Sex was a significant predictor of level but not linear slope, and there was no Age × Sex interaction. For the predictors, there was a significant interaction between sex and cheerfulness, such that males who were rated low on cheerfulness were more active at age 29 than males rated high on cheerfulness, whereas females rated low on cheerfulness were less active at age 29 than women rated high on cheerfulness. No other sex–predictor interactions were evident. As different predictors may be relevant for males and females, analyses were performed separately by sex.

Individual predictors. Although the age variables explained some of the variation within individuals, significant variance across individuals remained. Tables 3 and 4 (for males and females, respectively) summarize model estimations for each predictor and control variable entered individually, and Figure 2 plots average trajectories for an individual high and low on the significant predictors.

For males, child energy, child sociability, adult neuroticism, and adult extraversion significantly predicted both MET activity level and linear change at age 29. Males who were rated as higher on energy or sociability as children and who were more extraverted or less neurotic as adults reported higher levels of activity at age 29, but the trajectory evidenced a steeper decline at age 29, such that by age 61, they displayed fairly similar levels of activity as males who were less energetic, less sociable, less extraverted, or more neurotic. Birth weight, self-rated health, BMI, and mental adjustment predicted the level effect. Males who weighed more at birth, weighed more as adults, rated themselves higher on physical health in early adulthood, or were better mentally adjusted were also more active at age 29.

Females who were rated as more energetic or sociable as children were more active at age 29. Neuroticism marginally predicted less activity. Puberty predicted the activity-level effect, such that women who reached puberty at a later age were more active at age 29. Adult self-rated health and mental adjustment predicted both the level and linear effects, such that women with good health or mental adjustment were more active at age 29 but declined more after age 29, such that by

Table 2. Summary of Baseline Growth Curve Models (N = 1,409; 798 males, 611 females)

Model	Means Only		Linear		Quadratic	
Fixed effects						
Average intercept	3.04	(0.02)	3.24	(0.03)	3.23	(0.03)
Males	3.22	(0.03)	3.42	(0.05)	3.41	(0.05)
Females	2.80	(0.03)	2.99	(0.04)	2.98	(0.04)
Linear	—		–0.02	(0.001)	–0.01	(0.003)
Males	—		–0.02	(0.002)	–0.01	(0.004)
Females	—		–0.02	(0.002)	–0.01	(0.004)
Quadratic	—		—		–0.0004	(0.0001)
Males	—		—		–0.0005	(0.0001)
Females	—		—		–0.0004	(0.0001)
Random effects						
Intercept variance	0.47	(0.03)	0.93	(0.05)	0.98	(0.03)
Males	0.55	(0.05)	1.09	(0.09)	1.06	(0.04)
Females	0.26	(0.03)	0.79	(0.04)	0.82	(0.04)
Intercept-linear covariance	—		–0.02	(0.002)	–0.04	(0.003)
Males	—		–0.03	(0.003)	–0.04	(0.005)
Females	—		–0.02	(0.002)	–0.04	(0.005)
Linear variance	—		0.001	(0.000)	0.04	(0.004)
Males	—		0.001	(0.000)	0.04	(0.006)
Females	—		0.000	(0.003)	0.04	(0.005)
Intercept-quadratic covariance	—		—		0.001	(0.0001)
Males	—		—		0.001	(0.0001)
Females	—		—		0.001	(0.0001)
Linear-quadratic covariance	—		—		–0.001	(0.0001)
Males	—		—		–0.001	(0.0002)
Females	—		—		–0.001	(0.0002)
Quadratic variance	—		—		0.000	(0.0001)
Males	—		—		0.000	(0.0004)
Females	—		—		0.000	(0.0001)
Residual variance	1.09	(0.03)	0.87	(0.02)	0.80	(0.02)
Males	1.29	(0.04)	1.03	(0.04)	0.97	(0.04)
Females	0.84	(0.03)	0.66	(0.02)	0.57	(0.02)
Goodness-of-fit						
Deviance (χ^2)	16,763		16,217		16,125	
Males	9,850		9,575		9,533	
Females	6,684		6,353		6,295	
AIC	16,769		16,229		16,145	
Males	9,856		9,587		9,553	
Females	6,690		6,365		6,315	
BIC	16,785		16,261		16,198	
Males	9,870		9,615		9,600	
Females	6,704		6,392		6,359	
$\Delta\chi^2$	—		546***		91***	
Males	—		275***		42***	
Females	—		331***		59***	

Standard errors are given in parentheses. AIC = Akaike's information criteria; BIC = Baysesian information criteria.
***$p < .001$.

age 61, they displayed fairly similar levels of activity as females who were less healthy or less adjusted.

Including multiple predictors. We then simultaneously included multiple predictors to determine the individual effect of one predictor on the activity growth curve, holding the other variables in the model constant, and to control for baseline characteristics. Five combined models were estimated: (a) the six child personality variables (cheerfulness, conscientiousness, sociability, energy, motivation, and permanency of mood), (b) the four adult personality variables (agreeableness, conscientiousness, extraversion, and neuroticism), (c) the child personality variables controlling for significant child

Table 3. Summary of Significant Between-Person Predictors, Males

					Predictor		Pseudo R^2			
Predictor	N	Intercept	Linear	Quadratic	Intercept	Linear	Intercept	Linear	$\Delta\chi^2$	Conclusion
Child personality										
Energy	750	3.43	−0.006	−0.0005	0.09***	−0.006†	0.02	0.01	24.3	Intercept & marginal linear
		(0.05)	(0.005)	(0.0001)	(0.02)	(0.005)				
Sociability	750	3.46	−0.007	−0.0005	0.05***	−0.007***	0.02	0.01	23.7	Intercept & linear
		(0.05)	(0.005)	(0.0001)	(0.01)	(0.005)				
Conscientiousness	750	3.42	−0.007	−0.0004	0.001	−0.0003	—	—	0.8	Nonsignificant
		(0.05)	(0.005)	(0.0001)	(0.01)	(0.0004)				
Cheerfulness	750	3.42	−0.006	−0.0005	0.01	−0.0008	—	—	1.2	Nonsignificant
		(0.05)	(0.005)	(0.0001)	(0.02)	(0.0007)				
Motivation	750	3.42	−0.006	−0.0005	−0.00	0.0000	—	—	0.4	Nonsignificant
		(0.05)	(0.005)	(0.0001)	(0.01)	(0.0004)				
Permanency of mood	750	3.42	−0.006	−0.0004	0.02	−0.001	—	—	0.8	Nonsignificant
		(0.05)	(0.005)	(0.0001)	(0.03)	(0.001)				
Adult personality										
Extraversion	683	3.39	−0.003	−0.0006	0.28***	−0.009**	0.02	0.02	15.4	Intercept & linear
		(0.05)	(0.005)	(0.0001)	(0.07)	(0.003)				
Neuroticism	683	3.35	−0.003	−0.0005	−0.37***	0.011***	0.02	0.02	23.7	Intercept & linear
		(0.05)	(0.005)	(0.0001)	(0.08)	(0.003)				
Conscientiousness	683	3.37	−0.004	−0.0005	0.12	−0.004	—	—	2.8	Nonsignificant
		(0.05)	(0.005)	(0.0001)	(0.07)	(0.003)				
Agreeableness	683	3.38	−0.004	−0.0005	−0.04	−0.0006	—	—	0.7	Nonsignificant
		(0.05)	(0.005)	(0.0001)	(0.08)	(0.003)				
Control variables										
Childhood IQ	798	3.42	−0.006	−0.0005	−0.001†	0.0001	—	—	3.5	Marginal intercept
		(0.05)	(0.004)	(0.0001)	(0.004)	(0.0002)				
Child SES	557	3.42	−0.007	−0.0005	−0.03	0.0004	—	—	3.1	Nonsignificant
		(0.06)	(0.005)	(0.0002)	(0.02)	(0.0007)				
Birth weight	685	3.39	−0.007	−0.0004	0.09**	−0.0009	0.01	—	10.7	Intercept
		(0.05)	(0.005)	(0.0001)	(0.03)	(0.001)				
Age of puberty	492	3.41	−0.009	−0.0004	−0.00	0.001	—	—	1.1	Nonsignificant
		(0.08)	(0.006)	(0.0002)	(0.05)	(0.002)				
Adult self-rated health	686	3.40	−0.005	−0.0005	0.20**	−0.003	0.006	—	10.6	Intercept
		(0.05)	(0.005)	(0.0001)	(0.07)	(0.003)				
Adult mental adjustment	752	3.41	−0.006	−0.0005	0.24**	−0.003	0.004	—	8.2	Intercept
		(0.05)	(0.004)	(0.0001)	(0.09)	(0.004)				
Adult alcohol use	685	3.39	−0.005	−0.0005	0.18*	−0.005	0.003	—	3.9	Marginal intercept
		(0.05)	(0.005)	(0.0001)	(0.09)	(0.005)				
Adult body mass index	679	3.38	−0.005	−0.0005	0.05**	−0.001	0.01	—	8.4	Intercept
		(0.05)	(0.005)	(0.0001)	(0.02)	(0.0008)				

Standard errors are given in parentheses. The pseudo R^2 represents the variance explained by the predictor, compared to the baseline model. The $\Delta\chi^2$ is based on the baseline quadratic model, adjusted to the number of participants that reported the predictor. SES = socioeconomic status.
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

control variables (birth weight, age of puberty), (d) the adult personality variables controlling for significant adult control variables (health, BMI, mental adjustment), and (e) a final model that included all significant child and adult personality and control variables. Results were consistent with the individual predictors, and including the control variables did not significantly alter personality–activity relationships. For males, childhood energy predicted the level effect, and childhood

Table 4. Summary of Significant Between-Person Predictors, Females

Predictor	N	Intercept	Linear	Quadratic	Predictor Intercept	Predictor Linear	Pseudo R^2 Intercept	Pseudo R^2 Linear	$\Delta\chi^2$	Conclusion
Child personality										
Energy	575	2.98 (0.04)	−0.008 (0.004)	−0.0004 (0.0001)	0.04** (0.02)	−0.0004 (0.0007)	0.01	—	12.1	Intercept
Sociability	575	2.97 (0.04)	−0.008 (0.004)	−0.0004 (0.0001)	0.02* (0.01)	−0.0004 (0.0004)	0.004	—	5.7	Intercept
Conscientiousness	575	2.99 (0.04)	−0.008 (0.004)	−0.0004 (0.0001)	−0.00 (0.01)	0.0004 (0.0004)	—	—	1.9	Nonsignificant
Cheerfulness	575	2.99 (0.04)	−0.008 (0.004)	−0.0004 (0.0001)	0.01 (0.02)	0.0002 (0.0007)	—	—	2.5	Nonsignificant
Motivation	575	2.99 (0.04)	−0.009 (0.004)	−0.0004 (0.0001)	−0.01 (0.01)	0.0002 (0.0004)	—	—	0.6	Nonsignificant
Permanency of mood	575	2.99 (0.04)	−0.008 (0.004)	−0.0004 (0.0001)	−0.02 (0.03)	0.0010 (0.0011)	—	—	0.8	Nonsignificant
Adult personality										
Extraversion	531	2.96 (0.04)	−0.006 (0.004)	−0.0004 (0.0001)	0.14* (0.07)	−0.004 (0.003)	0.01	—	4.3	Intercept
Neuroticism	531	2.98 (0.04)	−0.007 (0.004)	−0.0004 (0.0001)	−0.14* (0.07)	0.003 (0.003)	0.004	—	4.5	Intercept
Conscientiousness	531	2.97 (0.04)	−0.006 (0.004)	−0.0004 (0.0001)	0.02 (0.07)	0.001 (0.003)	—	—	1.3	Nonsignificant
Agreeableness	531	2.98 (0.04)	−0.006 (0.004)	−0.0004 (0.0001)	−0.04 (0.07)	0.0008 (0.003)	—	—	0.3	Non–significant
Control variable										
Childhood IQ	611	2.98 (0.04)	−0.008 (0.004)	−0.0004 (0.0001)	0.00 (0.00)	−0.0002 (0.0002)	—	—	1.0	Nonsignificant
Child SES	557	2.98 (0.04)	−0.007 (0.004)	−0.0004 (0.0001)	0.02 (0.01)	−0.0004 (0.0006)	—	—	3.3	Nonsignificant
Birth weight	530	2.99 (0.04)	−0.008 (0.004)	−0.0004 (0.0001)	0.02 (0.03)	−0.0005 (0.002)	—	—	0.7	Nonsignificant
Age of puberty	548	3.04 (0.05)	−0.009 (0.005)	−0.0004 (0.0001)	0.06* (0.04)	−0.0006 (0.001)	0.003	—	4.9	Intercept
Adult self-rated health	544	3.00 (0.04)	−0.007 (0.004)	−0.0004 (0.0001)	0.23*** (0.05)	−0.006** (0.002)	0.03	0.003	20.4	Intercept & linear
Adult mental adjustment	585	2.98 (0.04)	−0.008 (0.004)	−0.0004 (0.0001)	0.23** (0.08)	−0.007† (0.003)	0.01	0.002	8.1	Intercept & marginal linear
Adult alcohol use	542	2.99 (0.05)	−0.007 (0.004)	−0.0004 (0.0001)	0.02 (0.09)	−0.0004 (0.004)	—	—	0.0	Nonsignificant
Adult body mass index	541	2.97 (0.04)	−0.006 (0.004)	−0.0004 (0.0001)	−0.02 (0.02)	0.0005 (0.0006)	—	—	1.8	Nonsignificant

Standard errors are given in parentheses. The pseudo R^2 represents the variance explained by the predictor, compared to the baseline model. The $\Delta\chi^2$ is based on the baseline quadratic model, adjusted to the number of participants that reported the predictor. SES = socioeconomic status.
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

sociability and adult neuroticism and extraversion predicted both the level and slope effects. Including the control variables, birth weight significantly predicted the level effect. In the final combined model, child energy and sociability, adult neuroticism and extraversion, and birth weight accounted for 6.1% of the intercept variance and 5.2% of the linear variance. For females, childhood energy predicted the level effect; no other child or adult personality variables were significant. When the control variables were included, age of puberty predicted the level effect, and adult self-rated health predicted both the level and slope effects. In the final combined model, child energy, age of puberty, and adult self-rated health accounted for 4.6% of the intercept variance and 1.1% of the linear variance. In each case, significant individual variation remained.

In a supplemental analysis, we removed 35 individuals (30 males, 5 females) who reported very high MET ratings (greater than 3 *SD* above the mean) on one or more of the activity variables across time. These individuals were more likely

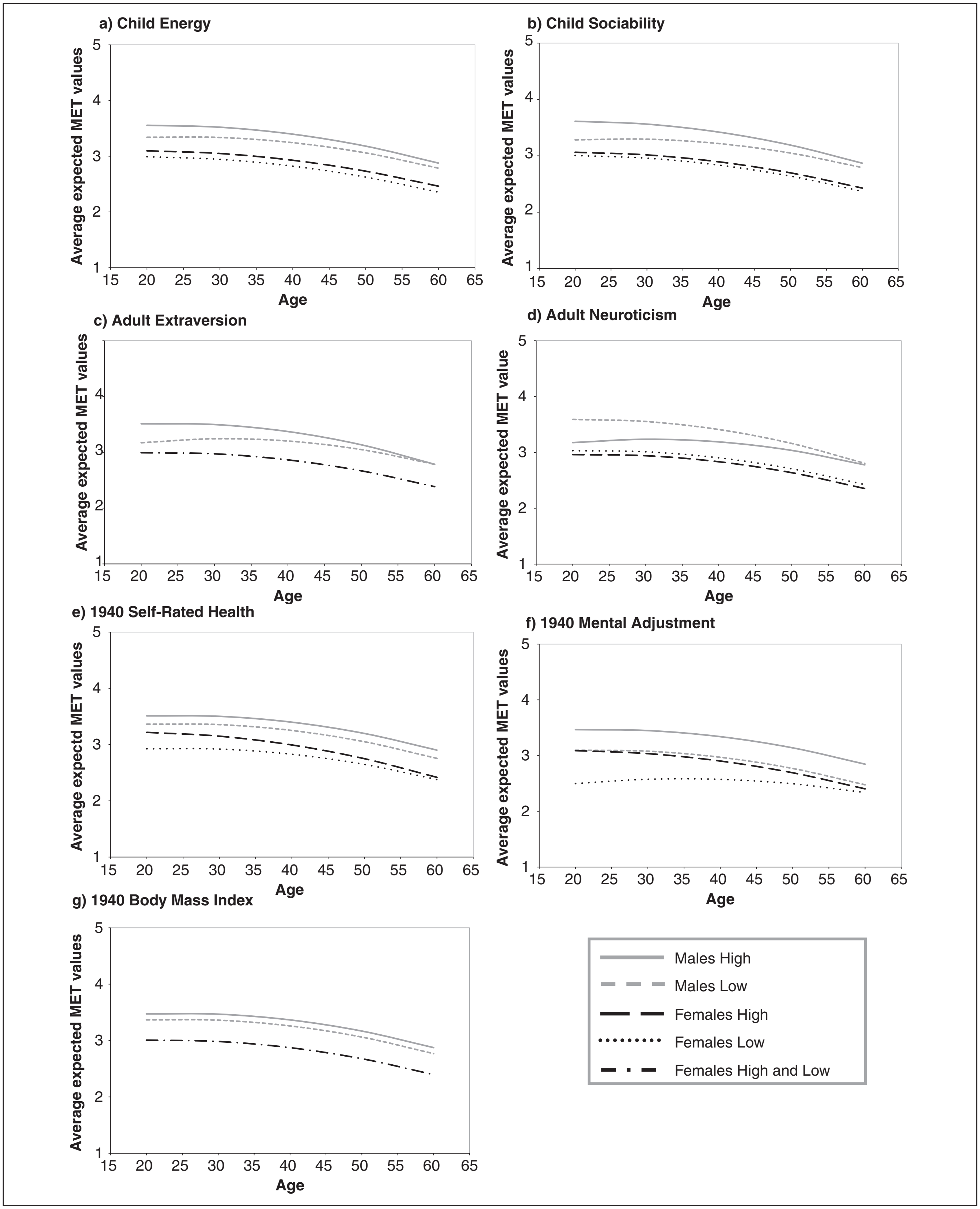

Figure 2. Expected trajectories of physical activity for seven significant predictor variables for an individual low on the variable (1 *SD* below the mean) and an individual high on the variable (1 *SD* above the mean), separately by sex

MET = metabolic equivalent. Copyright © 2009 Margaret L. Kern, reprinted by permission.

to be males, less neurotic, and less agreeable, and they reached puberty at a later age. Excluding these high-activity individuals from the growth curve analyses, the average MET activity level at age 29 was 3.17 versus 3.23, and the linear effect was –0.005 versus –0.007. The pattern of results remained essentially unchanged. These results support the main analyses and suggest that the relations reported are not merely driven by a few extreme individuals.

Discussion

Although the study of individual differences in fitness and activity has a long history in psychology, the issue has been neglected in modern research until relatively recently. Recent developments in public health highlight the importance of understanding individual variations in health-relevant characteristics. The present study recast data from an archival sample to examine average patterns of physical activity and personality predictors of individual variation in these patterns across many decades. There was a general pattern of decelerating decline with age. Both qualitatively and quantitatively, however, there were substantial intra- and interindividual variation in the types and intensity of activities reported, with some people decreasing, some maintaining, and some increasing their activity level over the years (see Figure 1). For example, at age 57, one participant wrote, "leader—service club, river trips, raft & canoe, kayaking," whereas another participant wrote, "Only sleep, food, and drink have been important. Nothing else makes an impression one way or the other." Importantly, personality factors assessed concurrently and much earlier in life predicted both the level of activity and change.

Using cross-sectional data from two large surveys, Caspersen et al. (2000) examined sex and age-related patterns of physical activity across the life span. They found that over time inactivity increased, moderate activity remained fairly stable with some decline, and vigorous activity declined from adolescence, through early and middle adulthood, and into older age. Although informative, the findings were limited by the cross-sectional nature of the data. Importantly, our results supported these cross-sectional patterns. There was a general pattern of decline across age, although the decline was relatively small (decreasing less than 1 MET). That our results reflect the patterns that would be predicted based on cross-sectional and short-term longitudinal studies lends credence both to the cross-sectional findings and to the validity of our findings.

By using longitudinal data, we were able to examine variation in activity trajectories and individual predictors of this variation, measured prospectively. Some variation could be explained by personality characteristics. In particular, child energy and sociability, and adult extraversion and neuroticism predicted different levels and patterns of activity, even after controlling for key psychosocial and health-related variables. Tracking studies (by others) across shorter periods—one or two decades—have suggested that child activity, levels of energy, and social experiences with sports are among the strongest predictors of later activity (Barnekow-Bergkvist, Hedberg, Janlert, & Jansson, 1998; Glenmark, Hedberg, & Jansson, 1994; Tammelin, 2005; Telama, Yang, Laakso, & Viikari, 1997). Our findings support this, now over a longer period from childhood through adulthood: Higher levels of childhood energy and sociability, rated by parents and teachers in 1922, predicted higher levels of activity at age 29 for both males and females. The energy variable reflects Thomas and Chess's (1977) active temperament and the activity facet of extraversion. The sociability trait reflects the social facet of extraversion (including items such as "fondness of large groups" and "preference for social activities at parties"), suggesting a social pathway linking early personality and physical activity. Early characteristics may pull individuals toward environments that are supportive of an active lifestyle (Friedman, 2000). Future research should consider how such characteristics unfold within different social environments.

Adult personality also predicted both levels and changes in activity, especially for males. Prior studies suggest that active individuals are more extraverted, more conscientious, and less neurotic (Rhodes & Smith, 2006). Our results confirmed that lower neuroticism and higher extraversion were independently related to higher levels of activity. Conscientiousness was not a significant predictor of activity. Conscientiousness has been linked to better health outcomes, including lower mortality risk (Kern & Friedman, 2008), but this is not necessarily through health behaviors such as physical activity (Bogg & Roberts, 2004; Friedman et al., 1995). Lower level traits, such as the activity and sociability dimensions of extraversion, and interactions between different traits may be more predictive of both levels and changes in activity (Cloninger, 2005; Rhodes, Courneya, & Jones, 2002). Personality is an important factor to consider in understanding activity patterns as people age.

As sex differences are generally found in physical activity research (e.g., Talbot, Fleg, & Metter, 2003), we examined males and females separately. Males were more active than females across the five measurement occasions. Women may face more barriers for exercise, both in terms of sociocultural norms (e.g., in the 1940-1960 period, it was more acceptable for men to engage in sports and active pastimes) and in terms of family responsibilities. Future studies should continue to examine sex differences in activity levels and change, especially within the social context of implicit and explicit gender-related norms.

Other psychosocial characteristics, including birth weight for males, pubertal age for females, and health and well-being for both genders, were also relevant to activity patterns. Individual differences across physical and mental domains should be considered when designing interventions. For example, early health factors may affect a person's initial tendency to be active or inactive. Some individuals tolerate activity well, whereas others are naturally more prone to injury and will opt for more sedentary pastimes. Importantly, including these physical and mental variables did not affect the personality–activity links.

With a longitudinal study of a single cohort, care should be taken in generalizing results to other groups, periods, and places. The sample is mostly European American and from a middle-class background. Although this homogeneity presents some limitations, it also presents some important benefits. Comparisons can be made within the group without being confounded by characteristics such as lack of access to or understanding of health care; furthermore, the participants had access to a wide range of leisure-time physical activities. Although the sample is highly intelligent, studies with this sample have shown a large degree of psychosocial variability (Friedman et al., 1995; Schwartz et al., 1995; Tucker et al., 1997), and prior findings in this sample on personality and health and longevity have been confirmed in follow-up studies by others, including meta-analyses and representative national samples (Goodwin & Friedman, 2006; Kern & Friedman, 2008; Martin, Friedman, & Schwartz, 2007). Furthermore, analyses examining the effect of selection based on IQ and total years of education have shown minimal effects on health, well-being, and physical activity variables (Reynolds et al., 2007). Notably, the sample is more representative than many well-known longitudinal studies of doctors, nurses, or heart disease patients.

As is the case with any longitudinal study, it is possible or even likely that cohort effects play a role. For example, an active lifestyle for women of this generation may have involved staying at home and caring for the family, whereas for men it may have included more sports-related activities. Federally recommended guidelines on activity were nonexistent. The sample as a whole was relatively inactive, averaging between 2.5 and 3.3 METs across the years (3.0 to 5.9 METs are considered moderate activity). Care should be taken in generalizing the results. Nevertheless, the results fit well with and extend other cross-sectional and shorter term studies.

Measuring physical activity is challenging, and there is no gold standard (Treuth, 2002; Welk, 2002). Although our results are consistent with the general parameters of previous studies (Caspersen et al., 2000; Sallis, 2000), we were not able to determine precisely how often individuals engaged in these physical activities or the intensity involved. Studies should continue to examine long-term patterns, especially individual variation in these patterns, with other samples and other methods of measuring physical activity.

Although our analyses considered correlates and antecedents of physical activity, it is important to note that growth curve analyses cannot determine causal relations between the variables. It is likely that personality, social factors, health behaviors such as physical activity, and health-related variables influence one another in a complex web of multidirectional relations. In addition, from a public health perspective, physical activity trajectories matter to the extent that differences relate to health and well-being outcomes. The present study examined predictors of different trajectories; an important next step is to examine health outcomes associated with different trajectories.

Our study suggests that patterns of activity over time are important and that individuals vary significantly in the trajectories they display. Future studies might examine whether the level of activity, the change in activity, or the combination of the two is most relevant for important health and well-being outcomes; consider the extent to which personality factors contribute; and investigate how personality unfolds within different social contexts to affect activity patterns and health outcomes across the life span. It is not sufficient to know where a person is; understanding individual trajectories within the context of personality, past experiences, and current situations is imperative.

Authors' Note

The data are derived from the Terman Life Cycle Study, begun by Lewis M. Terman. This article is part of a larger multiyear project and includes updates to our prior work. Previous work from this project is cited where appropriate, and overlapping findings should be noted when conducting meta-analyses or other reviews. Changes in *N*s from paper to paper reflect differing periods, exclusionary variables, and data updates. The current investigators bear full responsibility for all data refinements, new scales, analyses, and interpretations presented here.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the authorship and/or publication of this article.

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