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Self-Control Development in Adolescence Predicts Love and Work in Adulthood

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Abstract

This longitudinal study over a 23-year time span examined predictive associations between self-control development in adolescence and love and work outcomes in adulthood. Participants were 1,527 adults aged 35 years (48.3% female). The predictor variable self-control was measured yearly at the ages of 12 to 16 years. Adult outcome variables were measured at the age of 35 years. Three important results stand out. First, the measure of adolescent self-control functioned equivalently across the adolescent years. Second, adolescents showed a mean-level increase in self-control across the adolescent years and significant individual differences in level and change of self-control. Finally, individual differences in change in adolescent self-control predicted better intimate relationships in terms of higher relationship satisfaction and lower conflict; and more satisfaction and engagement in work-life in adulthood independent of the initial levels of self-control in early adolescence. These findings demonstrate that developmental self-regulatory processes reveal long-term consequences in important life domains beyond the adolescent years.

Keywords

self-control; conscientiousness; adolescent development; adult outcomes; love and work

Self-control has been defined as the ability for "advancing abstract, distal motives over concrete, proximal motives when the two motives directly conflict" (Fujita, 2011, p. 352).[1] It enables people to reach long-term goals (like sticking to a diet or passing difficult exams)

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[1]According to traditional definitions of self-control it is the ability to suppress impulsive actions, emotions, and desires in favor of desired alternatives. Recent research, however, has suggested that on the trait level, self-control might include a broader range of processes than mere inhibition of impulses (e.g., strategies or automatic tendencies to avoid temptation) that facilitate long-term goal

despite the presence of short-term desires and distractions (Chapman, Hampson, & Clarkin, 2014; Duckworth, 2011; Krueger, Caspi, Moffitt, White, & Stouthamer-Loeber, 1996). Hence, if people frequently fail to reach their goals, this is likely caused by low self-control. Accordingly, self-control is related to various positive outcomes. For example, empirical evidence suggests that high self-control is related to better academic success and work performance, better interpersonal functioning, greater well-being and adjustment, better health behaviors and health outcomes, and longevity (Bogg & Roberts, 2004; Hill & Roberts, 2011; Moffitt et al., 2011; Tangney, Baumeister, & Boone, 2004; Turiano, Chapman, Gruenewald, & Mroczek, 2015; see de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012 for a meta-analytic review). In contrast, low self-control was linked to various problematic behaviors like overeating, substance abuse, criminality, and impulsive buying (Baumeister & Heatherton, 1996). They can have disastrous consequences for an individual and cause high costs for the society. It is known that interindividual differences in self-control emerge early in life predicting outcomes into late adulthood (Roberts, Walton, & Bogg, 2005). For example, Friedman et al. (1993) showed that teacher ratings of impulse control in schoolchildren in the 1920s predicted how long those children ultimately lived in their adult lifespans. In a similar vein, the delay-of-gratification task (Mischel, Shoda, & Peake, 1988) has shown long-term prediction of later self-control. It captures young children's capacity to reach a distant goal (e.g., get two marshmallows later) and to keep the desire to eat a smaller treat (e.g., one marshmallow) in check. Some children eat the small treat almost immediately, whereas others manage to wait up to 25 min (Mischel, Shoda, & Rodriguez, 1989). These differences in self-control were still evident 40 years later predicting self-control performance on tasks requiring suppression of responses to emotionally appealing stimuli (Casey et al., 2011; see Watts, Duncan, & Quan, 2018, for a recent conceptual replication).

Individuals may differ from each other in how good or bad they are in self-control, and these variations may show predictive associations with important life outcomes. Indeed, recent research suggests that individual differences in self-reported or parent-reported self-control in childhood and adolescence predict a variety of important positive life outcomes in adulthood such as better education and employment but also negative outcomes such as unemployment or crime and deviance (Daly, Delaney, Egan, & Baumeister, 2015; Fergusson, Boden, & Horwood, 2013). For example, a recent study shows that children with low self-control have increased risks of later crime, poor health, educational and occupational underachievement, and limited economic prospects as adults (Moffitt et al., 2011). These effects were partially mediated by problematic behaviors and outcomes evident in adolescence (e.g., smoking, school drop-out, or teenage parenthood). Hence, low self-control during childhood and adolescence affects later life outcomes by self-control struggles that bear direct negative long-term consequences. However, problematic adolescent behavior did not fully mediate the link between childhood self-control and later life outcomes. Moreover, within the sample of participants who did not show any problematic teenage behaviors, childhood self-control still predicted adult outcomes. These findings

striving (Duckworth, Gendler, & Gross, 2016; Gillebaart & De Ridder, 2015). Given that the present research is focused on trait levels of self-control, we therefore adopted a broader definition.

suggest that individual differences in self-control emerging in childhood may persist into adulthood and therefore result in consequences across different life domains.

Individuals may also differ from each other in how they change for the better or the worse in self-control across time. Hence, individual differences in self-control development may also show predictive associations with positive or negative life outcomes. Thus far, most longitudinal research has focused on mean levels of self-control in children, adolescents, and adults as predictors of later outcomes. However, research documents that self-control is malleable, can change in childhood, adolescence, and adulthood, and that individuals differ in self-control change through the adolescent years and other periods of the life span (Monahan, Steinberg, Cauffman, & Mulvey, 2009; Roberts, Walton, & Viechtbauer, 2006; Steinberg et al., 2008). Variations in change in traits such as sociability, neuroticism and hostility have been linked to later outcomes, such as drug use (Hampson, Tildesley, Andrews, Luyckx, & Mroczek, 2010) and mortality risk (Mroczek & Spiro, 2007). Even if level of self-control (at a given point in the life span) predicts later outcomes, is it also the case that change in self-control independently predicts outcomes? As of yet, very little attention has been paid to the question of whether individual differences in developmental *change* in self-control has long-term consequences on outcome variables over and above the mean level of self-control (for a notable exception, see Converse, Beverage, Vaghef, & Moore, 2018). The present study thus examined the long-term predictive influence of self-control development in adolescence on outcomes with respect to two important social roles in adulthood: love and work. Social relationships including romantic relationships and the workplace reflect two primary social contexts for individual experiences in adult life.

Why would we expect change, over and above level, to predict outcomes? The reason is that the association between any predictor and outcome is rarely static, and can vary over the course of the life span. A prominent and well-known example from epidemiology is the rate of fetal growth and later life coronary artery disease (Barker, 1995). It is rate of growth of the fetus within the womb that predicts key outcome decades later, rather than any of a number of static indicators that could be measured on a fetus. Change is the critical predictor in this case. Moreover, it is a good example of the kind of life span effect that we hypothesize as well. Change many years or decades earlier is predictive of outcomes that occur much later. In another example, we know that there is an association between high cholesterol and heart disease risk. If the predictor (high cholesterol) remains at elevated levels the downstream outcome remains likely. However, if the predictor changes, that is if cholesterol is lowered by some means (lifestyle, medication), then the outcome should also change. We apply the same theoretical reasoning here. If self-control increases, it should influence downstream love and work outcomes, over and above initial level of self-control. We hold that the predictor-outcome association is dynamic, not static, and it may not be just level of a given personality trait, but its direction and rate of change that may be related to important health outcomes. Indeed, some prior work has shown that rate of change in personality adds important predictive value over and above simple level of the trait (Mroczek & Spiro, 2007).

Self-Control Development in Adolescence

Research documents that self-control constantly improves from childhood through adolescence to adulthood. This was demonstrated with laboratory measures of cognitive control like the Simon task or the go/no-go task (e.g., Casey, Thomas, Davidson, Kunz, & Franzen, 2002). But it was also evident from self-report measures of impulsivity (Steinberg et al., 2008). This natural or normative improvement in self-control capacity across adolescence has been linked to maturation of prefrontal brain regions (Blakemore & Mills, 2014; Casey & Caudle, 2013; Steinberg et al., 2008). However, individuals differ with regard to their developmental trajectories, a key tenet of life span developmental theory (Baltes, 1987). Moffitt et al. (2011) explored rank-order stability of self-control indices from childhood to young adulthood. They showed that some children substantially changed in their rank-order. Moreover, those who improved in their self-control relative to their peers had better outcomes when they were in their 30s.

There might be various causes for individual differences in self-control development. Environmental factors shape the development of self-control capacity in interplay with genetic factors (e.g., Deater-Deckard, 2014). On the one hand, parent's deregulated behavior, as well as stressors, like a chaotic household environment have been shown to pose a risk to the positive development of self-control capacities (Dumas et al., 2005). On the other hand, self-control training activities and the participation in programs promoting self-control may boost children's and adolescent's self-control (Brier, 2015). For example, research shows that children's self-control can be improved when they participate in trainings or leisure activities (e.g., martial arts) that challenge their self-regulation (Diamond, 2012). Also, experimental research suggests that regularly practicing self-control (e.g., by squeezing a handgrip twice a day) may improve self-control (e.g., Finkel, DeWall, Slotter, Oaten, & Foshee, 2009; Muraven, 2010; Oaten & Cheng, 2006; see Friese, Frankenbach, Job, & Loschelder, 2017; Pandey et al., 2018 for meta-analytic reviews). Further, educational programs including the exercise and promotion of executive functions were shown to be effective in enhancing self-regulation in the long-turn (Blair & Diamond, 2008).

Moreover, adolescence is as phase of enhanced and typically new demands on self-regulation (e.g., Steinberg, 2008; Wigfield, Eccles, Mac Iver, Reuman, & Midgley, 1991). On the one hand, the school transition to upper school puts greater emphasis on achievement, competition, and social comparison in academic self-regulation (Eccles et al., 1993) that might affect domain-specific self-representations (Schaffhuser, Allemand, & Schwarz, 2017). On the other hand, the physiological changes (hormonal and neurological) linked to pubertal maturation pose additional demands on self-regulation through emotional instability and enhanced sensitivity to rewards and sensations (Steinberg et al., 2008). Accordingly, there is a well-documented normative decline in school engagement, and grades in early adolescence as well as an increase in antisocial and risky behavior (e.g., Eccles, 2004; Harter, 1998; Simmons & Blyth, 1987; Watt, 2004; Wigfield et al., 1991; Wigfield, Eccles, & Pintrich, 1996). Previously developed competencies in self-control might not be sufficient to meet the new demands in this phase. New strategies and competencies have to be developed which might not be sufficiently determined by previous

self-control abilities. Therefore, we assume that given the changes in self-control demands, adolescence is a crucial phase for self-control development. Given wide individual variation in external demands as well as internal physiological changes, we further expect this to give rise to wide individual variation in developmental self-control trajectories in adolescence.

The main focus of the present research was to test whether such individual differences in the development of self-control from early adolescence through late adolescence would be equally important in predicting outcomes in adulthood over the mean levels of self-control. We propose that not only individual differences in how good or bad individuals are in self-control will have beneficial or detrimental effects later in life, but also in how they change for the better or the worse across time. This would imply that individuals with low self-control in early adolescence can reduce their risk for negative life outcomes if they increase to moderate levels in self-control. In contrast, high self-control in early adolescence may reduce its beneficial effects later in life if individuals change for the worse through adolescence.

The Present Study

The goal of this study over a 23-year time span was to examine predictive associations between self-control development across adolescence and important love and work outcomes in adulthood. We had three specific research questions:

1. Does the measure of self-control function equivalently across the adolescent years? Only if items of the self-control questionnaire do not change connotation or contribution to the latent construct of self-control across time, changes in self-control can be unambiguously interpreted as a reflection of a developmental process. For example, individuals in their late adolescence may understand the meaning of the items assessing self-control in a qualitatively different way. After all, the situations in which they need self-control are different now as compared with their early adolescence. Therefore, the first step is to ensure that the measure functions equivalently across measurement occasions by testing for longitudinal measurement invariance of the measure (e.g., Allemand, Zimprich, & Hertzog, 2007; Meredith & Horn, 2001). This is particularly important in this study for two main reasons. First, adolescence is a transitional period with manifold changes and challenges that may have an impact on the qualitative understanding of the self-control items. Second, because the focus was on level and change of adolescent self-control as predictors of outcomes in adulthood, it is crucial to have a measure that functions in equivalent ways across time.

2. How does self-control develop across the adolescent years? Based on prior work (e.g., Duckworth & Steinberg, 2015; King, Fleming, Monahan, & Catalano, 2011; Steinberg et al., 2008), we expected an average linear improvement in self-control across adolescence. In addition to an average developmental trend, we expected that individuals would differ in the degree and direction of self-control development. They may start with different initial levels in early adolescence but they also may show different developmental trajectories and/or rates of change across time (Roberts & Mroczek, 2008). Such differences in the development of

individual characteristics have been observed in adolescents (Hampson et al., 2010), middle-aged adults (Allemand, Schaffhuser, & Martin, 2015), and older adults (Mroczek & Spiro, 2003).

3. Does self-control development across the adolescent years predict adult love and work outcomes? Previous research suggests that the ability to control and direct behavior strategically is crucial for success in intimate relationships and work-life. Various processes can explain why self-control should promote relationship stability and satisfaction. Self-control enables people to inhibit destructive responses (engage in accommodation) to a partner's potential destructive behavior (Finkel & Campbell, 2001). Further, low self-control has been shown to be an important predictor of intimate partner violence (Finkel et al., 2009) as well as sexually impulsive behavior (Gailliot & Baumeister, 2007). In this study, we tested the hypothesis that individual differences in (a) how good or bad adolescents are in self-control, and (b) how they change for the better or the worse across time in adolescence will have beneficial or detrimental effects for their love-life in adulthood. In other words, we expect high levels of self-control in adolescence and an increase in self-control across the adolescent years to be related to better intimate relationships, as indicated by high relationship satisfaction, low conflict, and better communication skills in relationships.

Self-control enables people to overcome immediate personal desires and impulses in the service of behaviors that serve long-term interests or group-related interests. Both is required in most educational and occupational settings. Therefore, it is not surprising that low self-control was related to procrastination, absenteeism, low performance, lower occupational success, and unemployment (Daly et al., 2015; Duckworth & Seligman, 2005; Fergusson et al., 2013; Moffitt et al., 2011; Tangney et al., 2004). In this study, we tested the hypothesis that individual differences in (a) how good or bad adolescents are in self-control, and (b) how they change for the better or the worse across time in adolescence will have beneficial or detrimental effects for their work-life in adulthood. In other words, we expect high levels of self-control in adolescence and an increase in self-control across the adolescent years to be related to how efficacious and engaged people are in their work-life in adulthood.

Method

Participants and Procedure

The present study used publicly available archival data and was conducted in accordance with ethical principles promulgated by the Ethics Committee of the Faculty of Arts and Social Sciences of the University of Zurich. We used data from the German LifE study[2] (*L*ebensverläufe von der späten Kindheit *i*ns *f*ortgeschrittene *E*rwachsenenalter [Pathways from Late Childhood to Adulthood]; Fend, Georg, Berger, Grob, & Lauterbach, 2002; Lauterbach, Fend, & Gläßer, 2016). Adolescents (N = 2,054) were assessed five times: at the

[2]Previous articles have used data from the LifE-Study (Allemand, Steiger, & Fend, 2015; Grunenfelder-Steiger, Fend, & Allemand, 2015; Grunenfelder-Steiger, Harris, & Fend, 2016; Steiger, Allemand, Robins, & Fend, 2014) and one paper examined three outcome variables examined here. More specifically, this article examined how the development of empathy in adolescence is related to relationship satisfaction, conflicts in relationships, and communication skills in adulthood (Allemand et al., 2015).

age of 12 years (T1: 1979); 13 years (T2: 1980; *n* = 2,047); 14 years (T3: 1981; *n* = 2,003); 15 years (T4: 1982; *n* = 1,952); and 16 years (T5: 1983; *n* = 1,790). Follow-up assessments were conducted when participants were 35-years-old (T6: 2002) and 45-years-old (T7: 2012). Because data from the second follow-up (T7) are not yet publicly available, we focused on the first follow-up assessment (T6). This adult follow-up assessment was completed by 74% (*N* = 1,527; 48.3% female) of the initial study participants. For this study, we focused on these 1,527 participants because we were interested in linking adolescent variables with adult outcome variables. As the highest level of education, 4.5% participants indicated the compulsory school years (primary and secondary school: 9 years in total) only, 50.1% had completed an apprenticeship after school, 22.5% had completed a technical or professional school and 22.1% had a college or university degree. Further, 59.2% were married, 32.8% were single, and 7.9% were either divorced or widowed. Additional demographic information of participants at the age of 35 years is depicted in Table 1.

The goal of the data collection in the LifE study was to include adolescent participants who represented the full range of socioeconomic status in the general West Germany population in the late 70s. The adolescent participants were mainly of German origin and were close to representative of the Western German population (see Fend, Berger, & Grob, 2009; Lauterbach et al., 2016 for details). Some differences between the remaining adult sample and the youth sample emerged two decades later (T6). For example, a smaller number of participants originated from lower socioeconomic status, from metropolitan regions and lower educational background compared with a representative German population survey conducted in the same year of 2002 (Fend et al., 2009). With respect to self-control, attrition analysis has shown that individuals who participated in the follow-up study at age 35 did not significantly differ in their level of self-control at T1 from those individuals who dropped out of the study.

Adolescent Predictor Measure

Self-control.—Self-control was measured (T1 to T5) with eight items that were broadly asking participants' ability to stick to their goals (Fend, 1994; Fend & Prester, 1986). Example items are "I often start new things and don't manage to finish them," "I feel that I have a quite weak will," and "I often give up at the first sign of difficulty." Participants rated each item on a dichotomous response scale (1 = *not true for me*, 2 = *true for me*). The items were reverse coded so that higher scores reflect higher standing on the construct. The reliability estimates (Kuder–Richardson KR-20) ranged from .73 to .80 for the five measurement occasions.

Convergent validity of the measure.—To examine the convergent validity of the measure of self-control, we conducted a cross-sectional study in a sample of undergraduate students (*N* = 245) ranging in age from 18 to 45 years (*M* = 21.86, *SD* = 3.63; four participants did not report their age). In addition to the measure of self-control (α = .78) we included the 13-item version (α = .77) of the Self-Control Scale (SCS; Tangney et al., 2004) and the nine-item conscientiousness scale (α = .82) from the Big Five Inventory (BFI; John, Naumann, & Soto, 2008). Participants indicated on a 5-point Likert-type scale (1 = *disagree strongly* to 5 = *agree strongly*) how they agree with each statement of the three measures,

whereas a dichotomous response format was used in the longitudinal study. The results demonstrated convergent validity for the self-control scale. More specifically, it significantly and strongly correlated with the SCS, $r = .74$, $p < .01$; and the conscientiousness scale, $r = .66$, $p < .01$; whereas the SCS and the conscientiousness scale were also strongly interrelated, $r = .75$, $p < .01$.

Adult Love Outcome Measures

Relationship satisfaction.—Six items referring to appreciation and intimacy in romantic relationships were used as a measure of relationship satisfaction (Furman & Buhrmester, 1985). Example items are “In our relationship, I can tell my partner everything that worries me” and “My partner likes me the way I am.” Participants indicated on a 6-point-scale (1 = *never* to 6 = *always*) how often these statements were true for them. The reliability estimate was $\alpha = .86$.

Conflict in relationships.—Conflict in relationships were measured with three items (Schneewind & Ruppert, 1992). Example items are “In our marriage/relationship there are tensions and fights” and “In our marriage/relationship small things end up in big fights.” The participants indicated on a 6-point scale (1 = *never* to 6 = *always*) how they perceived conflict frequency in their marriage or relationship ($\alpha = .83$).

Communication skills in relationships.—Five items measured communication skills that are important in conflict situations (i.e., active listening, I-messages, joint solution, metacommunication, and self-reflection; Fend et al., 2002). Example items are “It is important to me to precisely understand what my partner wants to say” and “I try to find a solution which is also acceptable to my partner.” Participants indicated on a 6-point scale (1 = *never* to 6 = *always*) how they typically respond to conflict situations in their marriage or relationship ($\alpha = .85$).

Adult Work Outcome Measures

Occupational self-efficacy.—Occupational self-efficacy beliefs were measured with three items (von Collani & Schyns, 1999). Examples items are “I feel that I can meet most occupational requirements” and “I succeed in solving very difficult tasks at my work.” The participants responded to each item using a 6-point scale (1 = *does not apply at all* to 6 = *applies fully*; $\alpha = .77$).

Achievement motivation.—Achievement motivation were measured with three items covering effort, persistence, and ambition. The items were adapted from a measure that assesses achievement motivation in school context (Fend & Prester, 1986). Example items are “I’m always highly committed to my job” and “It is very important for me to be successful in my job.” The participants responded to each item using a 6-point scale (1 = *does not apply at all* to 6 = *applies fully*; $\alpha = .74$).

Willingness to further training and development.—Willingness to further training and development were measured with four items (Fend et al., 2002). Example items are “It is very important for me to always learn something new in my job” and “I just can’t manage

to learn on weekends or in the evening for my job" (reverse coded). The participants responded to each item using a 6-point scale (1 = *does not apply at all* to 6 = *applies fully*; α = .75).

Control Variables

To evaluate the extent to which the associations between adolescent self-control and love and work outcomes in adulthood are robust to potential confounds, such as parental socioeconomic status (SES) or adolescent intelligence (e.g., Fergusson et al., 2013; Moffitt et al., 2011; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007), we included these two control variables. SES in terms of the social class of the parents of the adolescent participants (Kleining & Moore, 1968) ranged from 1 (*underclass*) to 7 (*upper class*), M = 3.90 (SD = 0.98). A self-report measure of verbal intelligence was used three times in adolescence (T2 to T4) to measure reading comprehension (Thorndike, 1973). Seventeen pairs of words were listed and participants were asked to rate whether each pair of words reflects the same (e.g., vague–precise) or the opposite (e.g., classic–modern). The correct answers were summed up to make a total score. A higher score reflects better reading comprehension. The means ranged from 14.62 (SD = 1.95) to 15.94 (SD = 2.21) across the measurement occasions.

Research has shown that controlling for conduct problems in childhood reduced the magnitude of the associations between self-control in childhood and life outcomes in adulthood (Fergusson et al., 2013). Therefore, we controlled for potential correlated effects of adolescent conduct problems. These were operationalized as aggressive behaviors and norm violations. Seven items were used during adolescence (T1 to T5) to measure the frequency of aggressive behaviors and norm violations at school toward classmates and teachers (e.g., to intentionally make the teacher angry, to mock other classmates; Fend & Prester, 1986). Participants indicated on a 6-point scale (1 = *never* to 6 = *always*) how frequently they show these behaviors. The means ranged from 1.62 (SD = 0.54) to 1.85 (SD = 0.65). The reliability estimates ranged from as = .75 to .79 for the five measurement occasions.

Statistical Analyses

Longitudinal measurement invariance.—To investigate the three specific research questions, we used longitudinal structural equation modeling (SEM; Grimm, Ram, & Estabrook, 2017; Jackson & Allemand, 2014). Our longitudinal measurement model consisted of five correlated latent self-control factors (T1 to T5) with eight manifest indicators (dichotomous items) per measurement occasion. To examine whether the measure of self-control behaves equivalently across the five measurement occasions in adolescence (T1 to T5), we tested for longitudinal measurement invariance (MI). Tests of longitudinal MI typically include fitting confirmatory factor models with increasingly severe restrictions on the following three measurement parameters across time: factor loadings, intercepts or thresholds (continuous or categorical variables), and residual variances (Meredith & Horn, 2001; Widaman, Ferrer, & Conger, 2010). However, tests of longitudinal MI with categorical data slightly differ from MI tests with continuous data (Muthén & Muthén, 1998 –2017; Schroeders & Wilhelm, 2011; see Allemand et al., 2015 for an example). We performed the

longitudinal MI tests in three steps (cf. Schroeders & Wilhelm, 2011, p. 860): First, we constrained manifest indicators (dichotomous items) to load on the same factor across time. This step tests the least restrictive model (M1: configural invariance). Second, we simultaneously constrained factor loadings and thresholds to be equal across time (M2: strong invariance). Testing MI with categorical variables requires constraining factor loadings and thresholds simultaneously because item characteristic curves are based on both parameters (cf. Schroeders & Wilhelm, 2011, p. 860). Third, we constrained all parameters to be equal across time with residual variances being fixed at 1 across time. This step tests the most restrictive model (M3: strict invariance). We fixed the factor loading for the first item of the self-control at 1 to scale the latent variables. Furthermore, we specified correlated residual variances across time. The longitudinal MI tests served as prerequisites for the next series of models.

Second-order latent growth curve models.—To examine how self-control develops across the five measurement occasions in adolescence, we estimated a second-order latent growth curve model with eight manifest indicators (dichotomous items) per measurement occasion (Duncan, Duncan, & Strycker, 2006; Geiser, Keller, & Lockhart, 2013; Grimm et al., 2017). For all five lower-order factors (latent self-control at T1 to T5), the means (intercepts) were fixed at 0 across all measurement occasions. For the higher-order models, we specified an intercept (level) factor and a slope (change or shape) factor. To have descriptive information how self-control develops across adolescence, we tested three competing models: First, we tested an intercept-only model (M4). This no-growth model served as a baseline model. Second, we tested a linear growth curve model (M5). This model was informed by previous work suggesting a linear improvement of self-control across adolescence (e.g., Duckworth & Steinberg, 2015; King et al., 2011). We fixed the slope factor loadings to 0, 1, 2, 3, and 4, corresponding to linear growth. Because we were primarily interested in understanding the effects of self-control development at the beginning (and not the end) of the assessed growth process in adolescence, we placed the origin of time at the initial assessment (Biesanz, Deeb-Sossa, Papadakis, Bollen, & Curran, 2004). Third, we tested a latent basis growth curve model (M6; Meredith & Tisak, 1990). This nonlinear growth curve model allows to capture a variety of nonlinear change patterns because it does not have a specific functional form (e.g., quadratic or cubic growth). In this model, we fixed the first shape factor loading to 0 to estimate the intercept and the second loading to 1 to identify the metric of the shape factor, and freely estimated the third through fifth loadings. In addition to average estimates of intercept and slope or shape of self-control, we were particularly interested in individual differences in these estimates. Individual differences in the levels of self-control in early adolescence would be reflected in significant variance in the intercept, whereas individual differences in self-control development across adolescence (differences in the rate and pattern of change) would be represented in significant variance in self-control slope/shape.

Prediction of adult outcome variables.—To investigate the predictive associations between self-control development in adolescence and self-reported love and work outcomes in adulthood, we simultaneously used self-control intercept and slope as predictors of these outcome variables. We modeled the outcome measures with three or more continuous items

as latent constructs. We first examined the predictive associations without covariates and then evaluate the extent to which the associations are robust to potential confounds. In so doing, gender and social class were included as time-invariant covariates, whereas adolescent verbal intelligence and adolescent conduct problems were included as time-varying covariates. The covariates were standardized prior to the inclusion into the models.

We performed all analyses using Mplus 8 (Muthén & Muthén, 1998 –2017). We used the Theta parameterization and weighted least squares estimates (WLSMV) with robust standard errors and a mean- and variance-adjusted chi-square test statistic (χ^2), due to the categorical nature of the main variable (i.e., self-control). We report the comparative fit index (CFI) and the root mean square error of approximation (RMSEA) as criteria for model fit. Values of the CFI > .95 and values of the RMSEA < .06 reflect a well-fitting model (Hu & Bentler, 1999). We used the adjusted chi-square difference test ($\Delta\chi^2$) in Mplus (DIFFTEST) and changes in the values of the CFI and RMSEA (ΔCFI and ΔRMSEA) to compare nested models. Because the chi-square difference test is dependent of sample size, changes in CFI and RMSEA were found to be superior in comparing nested models (Hu & Bentler, 1999). We used a change in CFI of >0.01 between nested models as the main criterion to judge significant model differences (Cheung & Rensvold, 1999). We used (non-) overlap in the RMSEA point estimates and 90% CIs between nested models, as well as the fit of each successive model, as additional criteria for model comparisons (MacCallum, Browne, & Sugawara, 1996). Given that the RMSEA is virtually independent of sample size, the comparison of RMSEA CIs provides an effective, alternative method of assessing relative model fit of nested models.

Results

Does the Measure of Self-Control Function Equivalently Across the Adolescent Years?

Table 1 presents descriptive statistics and zero-order correlations among the study variables. To examine whether the measure of self-control behaves equivalently across the five measurement occasions in adolescence (T1 to T5), we started with the least restrictive model (M1: configural invariance) and constrained manifest indicators (dichotomous items) to load on the same factor across time. This model did achieve a good model fit as judged by CFI and RMSEA (see Table 2). Second, we simultaneously constrained factor loadings and thresholds to be equal across time (M2: strong invariance; see Schroeders & Wilhelm, 2011). This more restrictive model also achieved an acceptable model fit (see Table 2). The model comparison with the chi-square difference test suggested a statistical significant difference between the models. However, the change in the CFI of .004 and the substantial overlap of the RMSEA 90% CIs reflected a trivial difference in model fit. These results suggest strong invariance across time with respect to the self-control assessment. Finally, we constrained all measurement parameters to be equal across time with residual variances are fixed at 1 across time (M3: strict invariance). This most restrictive model showed acceptable model fits (see Table 2). According to the model comparison with the chi-square difference test, this model showed a statistically significant reduction in model fit. However, both CFI values were identical and there was a substantial overlap of the RMSEA 90% CIs. Therefore, one may

conclude that strict invariance holds and adequately captures the data. In summary, the results indicate that the measure of self-control behaved equivalently across adolescence.

How Does Self-Control Develop Across the Adolescent Years?

To examine how self-control develops across the five measurement occasions in adolescence (T1 to T5), we first estimated the latent year-to-year stability correlations and examined the means across time based on the most restrictive model (M3). The latent year-to-year stability correlations were .72 (age 12 to 13), .72 (age 13 to 14), .68 (age 14 to 15), and .80 (age 15 to 16), with all correlations being significant ($p < .01$). Figure 1 presents the latent mean-level estimates of self-control across time with the first measurement occasion (T1) as reference point, that is, T2 to T5 are relatively scaled to T1. The results suggest relatively high stability in self-control in terms of year-to-year correlations and change in terms of a mean-level increase across adolescence.

To have a more precise understanding of the mean-level change in self-control across the adolescent years, we estimated three second-order latent growth curve models based on the model of strict measurement invariance (M3). According to the results (see Table 2), the intercept-only model (M4), the linear growth model (M5), and the nonlinear growth model (M6) achieved acceptable model fits. However, based on the CFI and RMSEA values the linear growth model and the nonlinear growth model described the data better than the intercept-only model (see Table 2). Next, we compared the linear and nonlinear growth models. Although the chi-square difference was statistically significant, the change in CFI of .001 and the substantial overlap of the RMSEA 90% CIs reflected a trivial difference in model fit. Therefore, we decided to report the findings from the linear growth model, because it is simpler in interpretation with respect to the predictive effects of self-control development.

The unstandardized mean estimates for the linear growth model (M5) were as follows: intercept ($M = 0.23$, $p < .01$, $SE = 0.05$, 95% CI [0.13, 0.34]) and slope ($M = 0.16$, $p < .01$, $SE = 0.02$, 95% CI [0.12, 0.19]). The intercept did significantly covary with the slope ($Cov = -0.08$, $p < .05$, $SE = 0.04$, 95% CI [−0.15, −0.01]). In terms of effect size, the correlation represents a small effect ($r = -0.20$, $p < .05$, 95% CI [−0.35, −0.05]). Moreover, we found evidence for individual differences in level and change of self-control across adolescence in terms of significant variances in the intercept ($Var = 1.48$, $p < .01$, $SE = 0.19$, 95% CI [1.12, 1.85]) and slope ($Var = 0.10$, $p < .01$, $SE = 0.02$, 95% CI [0.06, 0.13]). In summary, the average positive developmental trend suggests an increase in self-control across the adolescent years, albeit with individual differences in level and change.

Does Self-Control Development in Adolescence Predict Adult Love Outcomes?

The next set of analyses referred to the predictive associations between self-control development in adolescence and adult love outcomes in adulthood. First, we estimated models that simultaneously include self-control intercept and slope as predictors of each of the outcome variables without covariates. These models ($\chi^2 = 1158.55$ to 1413.76, dfs = 754 to 963, ps < .01; CFIs = .978 to .980; RMSEAs = .017 to .019) fitted the data well. Then we reran each predictive model including gender and SES as time-invariant covariates and

verbal intelligence and conduct problems as time-varying covariates to evaluate the extent to which the associations are robust to potential confounds. These models, too, showed acceptable model fits (χ^2 = 1783.21 to 2162.03, *df*s = 1150 to 1409, *p*s < .01; CFIs = .967 to .972; RMSEAs = .018 to .020).

Table 3 presents the findings of these models without and with covariates. The associations of interest were relatively robust to potential confounds. The results have shown that individual differences in self-control level in early adolescence was related to relationship satisfaction, conflicts in relationships, and communication skills at the age of 35 years. Having more self-control in early adolescence was predictive for higher relationship satisfaction, less conflicts in relationships, and better self-reported communication skills. Moreover, participants who were in a current relationship at the age of 35 years tended to show higher levels of self-control in adolescence compared with those who were not in a current relationship. In addition, and most importantly, the results have demonstrated that change in self-control (slope) and level (intercept) were independently related to love outcomes in adulthood (see Table 3). Specifically, self-control slope predicted higher relationship satisfaction and self-reported communication skills and lower relationship conflicts in adulthood. In other words, those participants who had larger increases in self-control across the adolescent years tended to report better love outcomes and social strategies in adulthood compared with those who decreased in self-control during adolescence. Changes in self-control were not significantly related to relationship status at the age of 35 years. Likewise, the reported total number of relationships of more than 6 months since the age of 16 years was not related to intercept and slope of self-control. In summary, individual differences not only in initial level but also in change of self-control across adolescence were associated with love outcomes two decades later. As such, self-control change demonstrated incremental validity when predicting outcomes of romantic relationships.

Does Self-Control Development in Adolescence Predict Adult Work Outcomes?

In the final set of analyses, we estimated models that simultaneously include self-control intercept and slope as predictors of each of the work-related outcome variables. The models without covariates (χ^2 = 1154.61 to 1296.94, *df*s = 754 to 876, *p*s < .01; CFIs = .979 to .981; RMSEAs = .018 to .019) showed acceptable model fits. In a second step we reran all models including covariates. These models also fitted the data well (χ^2 = 1779.15 to 1976.74, *df*s = 1150 to 1302, *p*s < .01; CFIs = .971 to .972; RMSEAs = .018 to .019).

Table 4 presents the findings of these models without and with covariates. Again, the associations of interest were relatively robust to potential confounds. The results have shown that individual differences in self-control level and change were prospectively related to occupational self-efficacy, achievement motivation, and willingness to further training/development at the age of 35 years. Those participants who had higher levels in early adolescence and larger increases in self-control across the adolescent years tended to report better work outcomes in adulthood compared with those who had lower levels and decreased in self-control in adolescence. Participants with higher self-control levels also reported a larger number of weekly working hours and they tended to attend occupational courses at

the age of 35 years more frequently. Finally, (never) receiving welfare social benefits was related to intercept and slope of self-control. In other words, those participants who had higher scores and who increased in self-control across the adolescent years were far less likely to receive social welfare benefits. Self-control development was not related to the experience of unemployment. In summary, individual differences in level and change of self-control across adolescence were both independently related to work outcomes in adulthood. Put differently, self-control change demonstrated incremental validity when predicting outcomes of the workplace.

Discussion

Adolescence is an important developmental period that offer many challenges, new demands, and experiences to expand self-regulatory skills and abilities that may help individuals to avoid risky behaviors and to exert control over impulsive drives in the interest of long-term goals (Blakemore & Mills, 2014; Steinberg, 2008). At the same time, individual variation in internal and external challenges and demands give rise to wide individual variation in self-control development that may have long-term consequences for the individual. The primary aim of the study was to test whether individual differences in self-control development during adolescence predict love and work outcomes in adulthood. Using prospective data over a 23-year time span collected from a large sample, we found that self-control and its development during adolescence matter for individual differences in the domains of work and intimate relationships in adulthood.

Theoretically, these findings are important because they demonstrated that change was a predictor of later outcomes, and not just level of a variable at some prior wave. This is consistent with other life span work that has pointed to the importance of dynamic variables including a rate of growth or change in predicting later life outcomes such as Barker's (1995) work on fetal origins of heart disease or Mroczek and Spiro's (2007) finding that greater increases in neuroticism predict mortality risk. In the present study, the outcome did not occur in late life but rather at midlife, but the theoretical argument remains the same. Predictors are often not static, but can be changing and dynamic. This change itself should be related to outcomes, either over and above level, or in some cases in place of it. As we note below, patterns of development and growth can themselves be important indicators of later development and later outcomes. This is an important theoretical point, and we have provided empirical evidence for it here.

Three important findings emerged from the present research. First, the self-report measure of self-control behaved equivalently across the adolescent years, implying that the present results are not confounded with differences in the measurement process. Participants did understand the meaning of the items assessing self-control in a qualitatively equivalent way across adolescence. The issue of whether developmental trends reflect actual trends or are measurement artifacts has been prominently examined and discussed in personality development research (Allemand et al., 2007; Nye, Allemand, Gosling, Potter, & Roberts, 2016). It has, as of yet, received little attention in self-control research.

Second, we examined self-control development across the adolescent years. We found an average positive developmental trend in self-control in adolescence at the mean-level, implying that adolescents tended to become more self-controlled as they moved through the adolescent years. This result confirms previous research (King et al., 2011; Steinberg et al., 2008) and also parallels findings from large cross-sectional studies showing positive age trends in conscientiousness including facets (e.g., self-discipline) from early adolescence to early adulthood (Soto, 2016; Soto, John, Gosling, & Potter, 2011). Prior work demonstrated a close link between self-control and conscientiousness (e.g., Tangney et al., 2004). This increase in the ability to control impulses and delay gratification in the service of longer-term goals can be seen as the product of psychological and brain maturation (King et al., 2011; Steinberg et al., 2008). Further, the results from the year-to-year stability correlations suggest relatively high levels of stability in self-control in adolescence, when estimating stability correlations between latent constructs. This implies that within the observed normative increase in self-control individual differences tend to be persistent across time. Although most adolescents tended to maintain their relative standing on self-control relative to others across time, this does not imply that no reliable individual differences in self-control change did exist. Some individuals might have been deviated from the average developmental trend. Indeed, we found clear evidence for reliable individual differences in self-control development. Self-control change (and stability) is an individual-differences variable that reflects an important additional perspective to the traditional mean-level perspective (cf. Allemand et al., 2007; Roberts & Mroczek, 2008). Regarding self-control development, adolescents demonstrated unique patterns of development. We assume that these patterns are the results of individual variation in specific life experiences, internal and external demands, and developmental challenges. Several factors such as parental stress and chaotic family life (Dumas et al., 2005) or participation in school programs and activities promoting self-control (Brier, 2015) may explain, in part, individual differences in self-control development. An interesting avenue for future research would be to examine factors that are related to differential patterns of adolescent self-control development and to link these patterns with adult outcomes.

Third, once the existence of reliable individual differences in self-control development has been established, the compelling question arises whether change in self-control across the adolescent years is consequential for adult love and work outcomes. In line with our expectations and previous research, we found that individual differences in the *level* of self-control are crucial for success in the domains of love and work for individuals. More specifically, participants high in self-control in their early adolescence were more likely to be in a relationship at the age of 35 years, they were more satisfied with their intimate relationship in adulthood, they reported less frequent conflicts in their marriage or relationship, and they used more constructive communication skills in relational conflict situations. The results also demonstrate that high scores in self-control in early adolescence were associated with higher occupational self-efficacy and achievement motivation, and a higher willingness for further training/development at the age of 35 years. Moreover, participants high in self-control tended to report more weekly work time hours and attended more occupational courses in adulthood. Overall, these results replicate previous work showing long-term effects of self-control level in different domains of life including love

and work (e.g., Casey et al., 2011; Converse et al., 2018; Fergusson et al., 2013; Moffitt et al., 2011). The present results also parallel work showing that personality traits appear to be prospectively related to important life outcomes, such as health and longevity, marital success, and educational and occupational attainment (Roberts et al., 2007).

What may be the most fascinating about the present results is that individual differences not only in self-control level but also in self-control *change* across the adolescent years were independently predictive for success in the domains of love and work. On the one hand, increases in self-control from the ages 12 to 16 were associated with better intimate relationships, as indicated by high relationship satisfaction, low conflict, and better communication skills over and above the initial levels in early adolescence. On the other hand, becoming better at self-control across adolescence was associated with becoming more efficacious and engaged in work-life at the age of 35 independent of the levels of self-control early in adolescence. To date, individual differences in change estimates as predictors of outcome variables have been underrepresented in studies on self-control (e.g., Converse et al., 2018). The present novel findings clearly advance our understanding of the impressive predictive capability of self-control by further revealing that it is not just level but also change in self-control that has predictive power for life outcomes. Moreover, the present findings underscore the notion that self-control is malleable and that individual differences in change have long-term consequences. Individuals who increased in self-control across the adolescent years fair better on several important life outcomes, whereas individuals who decreased in self-control exhibited more problems in their love- and work-life. Our study significantly contributes to recent studies emphasizing that change (and stability) in personality itself is an important predictor of life outcomes such as mortality (Mroczek & Spiro, 2007), substance abuse (Hampson et al., 2010), self-rated health (Turiano et al., 2012), depression (Steiger et al., 2014), and social competencies (Allemand et al., 2015).

The present findings are not only interesting from a basic research perspective, but may also be informative with respect to an applied perspective. The fact that self-control does change across adolescence and that developmental changes that naturally occur with age may bring about positive outcomes in adulthood leads to an interesting avenue for future intervention work. Previous work has shown that intervention efforts such as regularly practicing self-control may improve self-control (e.g., Finkel et al., 2009; Friese et al., 2017). But typically, intervention studies focus on short-term outcomes rather than long-term effects of intended change. An interesting question would be to examine whether intended change as a result of intervention efforts may also show long-term effects.

Limitations

While the present study had some important strengths such as a large sample and a unique longitudinal design covering a time span of 23 years, it had limitations. For example, self-control and all outcomes were measured with self-reports. It would be valuable to supplement the assessment of self-control with other assessment methods such as observer-reports by parents and teachers. Moreover, any behavioral and/or objective verification of the outcomes is lacking which may reflect a general tendency of overestimating one's capacity for self-control and reporting about how well one performs in love and work. A second issue

is that short measures were used in the LifE study due to time and resources, limitations typically associated with large-scale longitudinal studies (e.g., Lucas & Donnellan, 2011). It would be valuable to include longer multidimensional measures in future studies. A third issue refers to the study design with multiple assessments of self-control only in adolescence but not in adulthood. It would be valuable to have additional measurement occasions in emerging adulthood and middle adulthood in order to chart the developmental pattern of self-control beyond the adolescent years. Future studies may also investigate whether earlier or later period of change in self-control are related to the outcomes using other statistical models such as latent state-trait models. Finally, it is possible that some third variables underlie both self-control development in adolescence and relationship and work success in adulthood. An obvious candidate is conscientiousness. Conscientiousness describes socially prescribed impulse control that facilitates task- and goal-directed behavior such as thinking before acting, delay gratification, following norms and rules, and planning, organizing, and prioritizing tasks (John & Srivastava, 1999). The ability to control and direct behavior strategically is obviously associated with conscientiousness (e.g., Tangney et al., 2004) and is sometimes conceptualized as a lower-order facet of conscientiousness (Roberts, Lejuez, Krueger, Richards, & Hill, 2014). Given the close link between self-control and conscientiousness it would be valuable to examine the development of both variables simultaneously. It is possible that self-control mediates the relationship between consciousness and love and work outcomes.

Future Directions

In this study, we reported initial evidence for the long-term predictive effects of self-control development in adolescence on love and work outcomes in adulthood. The present findings may provide interesting avenues for future research. We see five pressing areas for replication and extension. First, future studies should investigate predictive effects of self-control development in other periods of the life span (e.g., early adulthood, midlife, old age). For example, it would be interesting to know whether and to what degree individual differences in self-control development across middle adulthood predict important life outcomes such as health, wealth, and social relationships in old age. Second, future research is needed to test the boundaries of short-term and long-term predictive effects of self-control development. Third, the predictive effects of self-control development should be replicated with multiple assessment procedures (e.g., self-reports, observer reports). Fourth, the study of predictive effects of self-control development should be expanded to various adult outcomes (e.g., health, wealth, public safety), measured with different assessment methods. Finally, as this study focused on the predictive effects of the development of a single construct, future work is needed to simultaneously test multiple developmental change predictors of important life outcomes.

Conclusion

The present research advances our understanding of self-control development in adolescence in three important ways. First, it shows that the measurement process to assess self-control longitudinally across the adolescent years operates equivalently. Second, it suggests individual variation in self-control development despite an average developmental trend

toward better self-control with age. Finally, it highlights the fact that individual differences in developmental change in self-control across the adolescent years have long-term consequences for better functioning in intimate relationships and in work-life beyond the mean-levels of self-control in early adolescence. These findings contribute to a growing research literature, but much work remains to be done before we fully understand when, how, and why developmental change in self-control is consequential for the individual.

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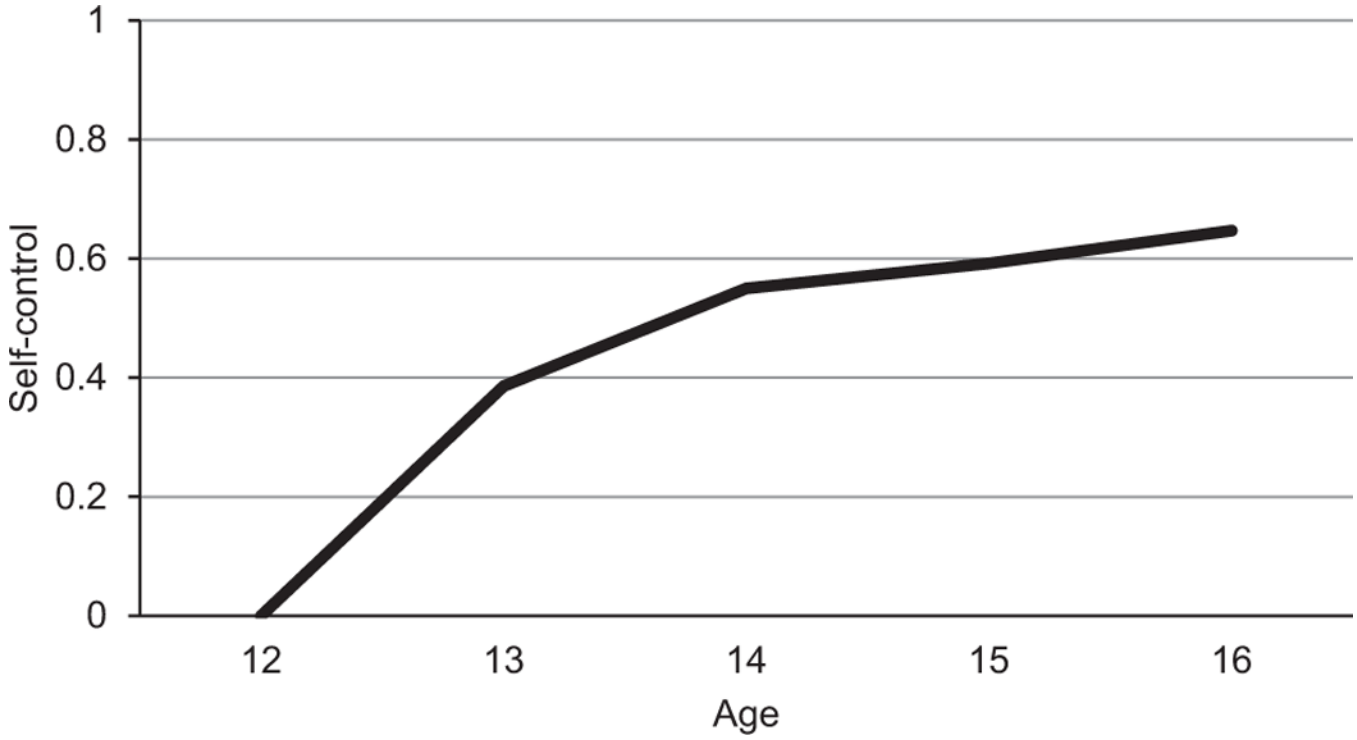

Figure 1.

Self-control development from age 12 to 16. Mean estimates are from the model of strict measurement invariance (M3). The initial measurement occasion at age 12 was used as a reference having a factor mean of zero, that is, factors means from age 13 to 16 reflect deviations from the reference.

Table 1

Descriptive Statistics and Correlations Among the Self-Control Variables and With Outcome Variables

Variables	Potential range	*M* or %	*SD*	1	2	3	4	5
1. Self-control age 12 (T1)	1–2	1.56	.28	—				
2. Self-control age 13 (T2)	1–2	1.62	.28	.55**	—			
3. Self-control age 14 (T3)	1–2	1.65	.27	.46**	.57**	—		
4. Self-control age 15 (T4)	1–2	1.65	.28	.35**	.51**	.53**	—	
5. Self-control age 16 (T5)	1–2	1.65	.29	.40**	.48**	.53**	.63**	—
6. Relationship satisfaction	1–6	4.77	.77	.06	.13**	.12**	.13**	.17**
7. Conflicts in relationship	1–6	2.44	.72	−.06	−.14**	−.14**	−.16**	−.15**
8. Communication skills in relationships	1–6	4.65	.84	.03	.02	.06	.05	.10**
9. Currently in a relationship[a]	—	85.2%	—	.06#	.04	.05	.06*	.09**
10. Number of relationships (>6 months) since age 16[b]	—	2.76	1.87	−.03	.02	−.06#	.03	.03
11. Occupational self-efficacy	1–6	4.59	.72	.14**	.19**	.17**	.23**	.28**
12. Achievement motivation	1–6	4.74	.73	.04	.11**	.09	.11**	.14**
13. Willingness to further training/development	1–6	4.36	.86	.04	.13**	.12**	.14**	.13**
14. Currently not employed[a]	—	13.7%	—	−.05	−.06*	−.03	−.11**	−.05
15. Weekly work time in hours[b]		34.28	19.24	.10**	.13**	.07*	.16**	.10**
16. Attended occupational courses[a]	—	63.3%	—	.05	.09**	.08**	.05	.08*
17. Never experienced unemployment[a]	—	67.6%	—	.06	.06	.02	.06	.04
18. Never received social welfare benefits[a]	—	90.2%	—	.06	.06	.05	.10**	.12**

[a] no = 0, yes = 1.

[b] the outcome variable was standardized for the correlation.

# $p < .06$.

* $p < .05$.

** $p < .01$.

Table 2

Longitudinal Measurement Invariance Models and Latent Growth Curve Models of Self-Control

Model	χ^2	*df*	CFI	RMSEA [90% CI]	$\Delta\chi^2$	Δ*df*	ΔModels
M1: Configural invariance	928.40*	650	.986	.017 [.014, .019]	—	—	—
M2: Strong invariance	1031.06*	674	.982	.019 [.016, .021]	117.21*	24	2–1
M3: Strict invariance	1066.07*	706	.982	.018 [.016, .020]	63.40*	32	3–2
M4: Intercept only	1444.99*	719	.964	.026 [.024, .028]	—	—	—
M5: Linear growth	1120.06*	716	.980	.019 [.017, .021]	75.71*	3	4–5
M6: Nonlinear growth[a]	1091.39*	713	.981	.019 [.016, .020]	15.48*	3	5–6

Note. M1 to M3 = longitudinal measurement invariance models; M4 to M6 = latent growth models;

[a]the nonlinear model was specified according to Meredith and Tisak (1990); χ^2: mean- and variance-adjusted chi-square test statistics (WLSMV estimator); CFI = comparative fit index; RMSEA = root mean square error of approximation; 90% CI = 90% confidence intervals for RMSEA; $\Delta\chi^2$ = adjusted chi-square difference test using the Mplus DIFFTEST; AModels = comparison of models.

*$p < .01$.

Table 3

Level and Linear Change of Self-Control Development as Predictors of Adult Love Outcomes

	Intercept as predictor			Slope as predictor		
Love outcomes in adulthood	***B* [95% CI]**	***SE***	**β**	***B* [95% CI]**	***SE***	**β**
Relationship satisfaction	.10 [.05, .14]	.03	.16**	.48 [.20, .76]	.14	.21**
With covariates	.11 [.06, .16]	.03	.18**	.53 [.23, .82]	.15	.22**
Conflicts in relationship	−.09 [−.13, −.05]	.02	−.18**	−.36 [−.59, −.14]	.12	−.19**
With covariates	−.10 [−.14, −.05]	.02	−.19**	−.38 [−.62, −.15]	.12	−.20**
Communication skills in relationships	.03 [−.01, .08]	.02	.06	.29 [<.01, .58]	.15	.13*
With covariates	.05 [.002, .10]	.03	.09*	.35 [.04, .65]	.16	.15*
Currently in a relationship[a]	.09 [.00, .17]	.05	.10#	.35 [−.14, .83]	.16	.11
With covariates	.10 [.01, .20]	.05	.13*	.40 [−.11, .90]	.10	.12
Number of relationships[b]	−.02 [−.08, .04]	.03	−.03	−.15 [−.48, .17]	.17	−.05
With covariates	−.04 [−.10, .02]	.03	−.05	−.23 [−.58, .11]	.18	−.07

Note. Gender and SES were time-invariant covariates; adolescent intelligence (T2 to T4) and adolescent conduct problems (T1 to T5) were time-varying covariates; the control variables were standardized prior to inclusion in the models;

[a] no = 0, yes = 1;

[b] the outcome variable was standardized; *SE* = standard error; the association between intercept and slope without covariates = *Cov* [95% CI] = −.08 [−.15, −.01], *SE* = .04, *r* = −.20, $p < .05$; and with covariates = *Cov* [95% CI] = −.08 [−.15, −.01], *SE* = .04, *r* = −.21, $p < .05$.

# $p < .06$.

* $p < .05$.

** $p < .01$.

Table 4

Level and Linear Change of Self-Control Development as Predictors of Adult Work Outcomes

	Intercept as predictor			Slope as predictor		
Work outcomes in adulthood	***B* [95% CI]**	***SE***	**β**	***B* [95% CI]**	***SE***	**β**
Occupational self-efficacy	.17 [.12, .23]	.03	.26**	.63 [.51, 1.13]	.16	.32**
With covariates	.15 [.10, .20]	.03	.23**	.79 [.47, 1.10]	.16	.30**
Achievement motivation	.06 [.02, .10]	.02	.12**	.40 [.17, .64]	.12	.20**
With covariates	.06 [.02, .10]	.02	.11**	.40 [.16, .65]	.13	.20**
Willingness to further training/ development	.10 [.04, .15]	.03	.15**	.55 [.24, .87]	.16	.21**
With covariates	.09 [.04, .15]	.03	.14**	.54 [.21, .87]	.17	.21**
Currently not employed[a]	−.11 [−.20, −.02]	.05	−.13**	−.28 [−.76, .21]	.25	−.09
With covariates	−.05 [−.16, .05]	.05	−.06	−.15 [−.71, .40]	.28	−.04
Weekly work time in hours[b]	.13 [.07, .19]	.03	.16**	.26 [−.05, .58]	.16	.08
With covariates	.06 [.01, .11]	.03	.07*	.09 [−.18, .37]	.14	.03
Attended occupational courses[a]	.10 [.03, .17]	.04	.12**	.18 [−.23, .58]	.21	.06
With covariates	.09 [.01, 017]	.04	.11*	.13 [−.30, .56]	.21	.04
Never experienced unemployment[a]	.08 [−.01, .15]	.04	.09	.01 [−.43, .45]	.22	<.01
With covariates	.07 [−.001, .15]	.04	.09	.01 [−.45, .46]	.23	<.01
Never received social welfare benefits[a]	.12 [.01, .22]	.05	.16*	.75 [.13, 1.38]	.32	.23*
With covariates	.11 [−.001, .22]	.06	.13#	.77 [.11, 1.43]	.34	.23*

Note. Gender and SES were time-invariant covariates; adolescent intelligence (T2 to T4) and adolescent conduct problems (T1 to T5) were time-varying covariates; the control variables were standardized prior to inclusion in the models;

[a] no = 0, yes = 1

[b] the outcome variable was standardized; *SE*: standard error; the association between intercept and slope without covariates = *Cov* [95% CI] = −.08 [−.15, −.01], *SE* = .04, *r* = −.20, $p < .05$; and with covariates = *Cov* [95% CI] = −.08 [−.15, −.01], *SE* = .04, *r* = −.21, $p < .05$.

# $p < .06$.

* $p < .05$.

** $p < .01$.