

Wagner, Jenny; Becker, Michael; Lüdtke, Oliver; Trautwein, Ulrich
The first partnership experience and personality development. A propensity score matching study in young adulthood

Social Psychological and Personality Science 6 (2015) 4, S. 455-463



Quellenangabe/ Reference:

Wagner, Jenny; Becker, Michael; Lüdtke, Oliver; Trautwein, Ulrich: The first partnership experience and personality development. A propensity score matching study in young adulthood - In: *Social Psychological and Personality Science* 6 (2015) 4, S. 455-463 - URN: urn:nbn:de:0111-pedocs-125469 - DOI: 10.25656/01:12546

<https://nbn-resolving.org/urn:nbn:de:0111-pedocs-125469>

<https://doi.org/10.25656/01:12546>

Nutzungsbedingungen

Gewährt wird ein nicht exklusives, nicht übertragbares, persönliches und beschränktes Recht auf Nutzung dieses Dokuments. Dieses Dokument ist ausschließlich für den persönlichen, nicht-kommerziellen Gebrauch bestimmt. Die Nutzung stellt keine Übertragung des Eigentumsrechts an diesem Dokument dar und gilt vorbehaltlich der folgenden Einschränkungen: Auf sämtlichen Kopien dieses Dokuments müssen alle Urheberrechtshinweise und sonstigen Hinweise auf gesetzlichen Schutz beibehalten werden. Sie dürfen dieses Dokument nicht in irgendeiner Weise abändern, noch dürfen Sie dieses Dokument für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, aufführen, vertreiben oder anderweitig nutzen.

Mit der Verwendung dieses Dokuments erkennen Sie die Nutzungsbedingungen an.

Terms of use

We grant a non-exclusive, non-transferable, individual and limited right to using this document.

This document is solely intended for your personal, non-commercial use. Use of this document does not include any transfer of property rights and it is conditional to the following limitations: All of the copies of this documents must retain all copyright information and other information regarding legal protection. You are not allowed to alter this document in any way, to copy it for public or commercial purposes, to exhibit the document in public, to perform, distribute or otherwise use the document in public.

By using this particular document, you accept the above-stated conditions of use.

Kontakt / Contact:

peDOCS
DIPF | Leibniz-Institut für Bildungsforschung und Bildungsinformation
Informationszentrum (IZ) Bildung
E-Mail: pedocs@dipf.de
Internet: www.pedocs.de

The First Partnership Experience and Personality Development: A Propensity Score Matching Study in Young Adulthood

Social Psychological and

Personality Science

1-9

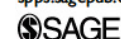
© The Author(s) 2015

Reprints and permission:

sagepub.com/journalsPermissions.nav

DOI: 10.1177/1948550614566092

spps.sagepub.com



Jenny Wagner^{1,2}, Michael Becker³, Oliver Lüdtke¹, and Ulrich Trautwein⁴

Abstract

Personality development in young adulthood has been associated with the experience of a number of new social roles. However, the causal interpretation of these findings is complicated by the fact that it is not possible to randomize young adults by their life experiences. To address this problem in the context of the first partnership experience, we applied propensity score matching to a sample of initially inexperienced singles and followed them across 4 years. Using matched samples, results indicated that the first partnership experience relatively robustly increased life satisfaction. The first partnership experience between the ages of 23 and 25 (but not in other ages) was also related to higher self-esteem, extraversion, and conscientiousness and to lower neuroticism. The discussion highlights the effect of the first partnership on the development of a mature personality and the potential for propensity score matching to make useful contributions to social and personality research.

Keywords

personality development, first partnership, longitudinal data, propensity score matching

Finding a romantic partner and maintaining a stable partnership are essential tasks of young adulthood. The experience of a stable partnership has repeatedly been found to be related to a more mature personality (Lehnart, Neyer, & Eccles, 2010; Neyer & Asendorpf, 2001; Neyer & Lehnart, 2007). However, one major problem encountered in research on personality development is the constraint of the lack of random assignment. That is, entering into a social role (or not) has to be regarded as self-selected. Thus, causal effects may be confounded by differences in background characteristics (Foster, 2010). However, recent methodological advancements (Rosenbaum & Rubin, 1983; Stuart & Green, 2008) provide opportunities for researchers to mitigate such problems. The objective of our study was to examine effects of the first partnership experience on personality development and psychological adaptation. To do so, we identified young adults ($N = 312$, age $M = 21.43$, $SD = 0.65$) who had not had a previous partnership experience at the first assessment of a three-wave longitudinal study (i.e., pretreatment¹). Participating in the study every 2 years, of these young adults, 105 started partnerships between T1 and T2 (referred to as “beginners,” cf. Figure 1), 71 started a partnership between T2 and T3 (referred to as “bloomers”), and 136 had no partnership across all three assessments (referred to as “singles”).

During the last decade, research has established evidence for ongoing mean-level change in personality (Caspi, Roberts, & Shiner, 2005; Caspi & Roberts, 2001; Lucas & Donnellan, 2011; McAdams & Olson, 2010; Roberts & Mroczek, 2008),

self-esteem but also measures of adaptation such as depression and life satisfaction (Luhmann, Hofmann, Eid, & Lucas, 2012) across the entire life span. The social investment principle (Roberts, Wood, & Smith, 2005) proposes that personality change to more maturity in young adults is primarily the result of investments in new social roles (Lodi-Smith & Roberts, 2007; Roberts, Caspi, & Moffitt, 2001). Making an investment in a stable social relationship is regarded as an important factor in the development of personality (Caspi, 1998). The first stable partnership represents a social role transition (Havighurst, 1972) that may be particularly important because it requires a person to (a) negotiate and integrate expectations with regard to oneself and one's romantic partner, (b) commit to the person and the relationship itself, and/or (c) increasingly plan for the future to eventually take on even more committed roles such as parenthood. Previous research on effects of transition into

¹ Educational-Psychological Research Methods, Leibniz Institute for Science Education, Kiel, Germany

² Humboldt-University, Berlin, Germany

³ German Institute for International Educational Research (DIPF), Frankfurt, Germany

⁴ University of Tübingen, Berlin, Germany

Corresponding Author:

Jenny Wagner, Educational-Psychological Research Methods, Leibniz Institute for Science Education (IPN), Olsenhausenstr. 62, 24118 Kiel, Germany.

Email: jwagner@ipn.uni-kiel.de

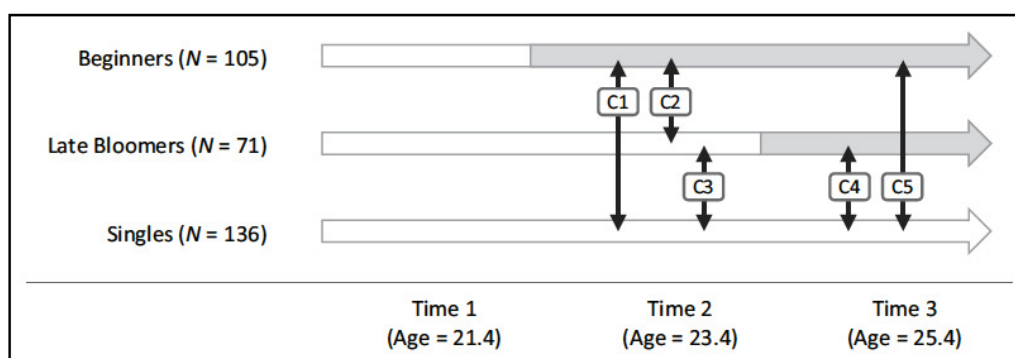


Figure 1. Sample structure and distribution of participants into three groups with different partnership experiences. At T1, all participants were in pretreatment.

a first partnership on personality development has supported the direction of an accelerated maturation, that is, neuroticism and shyness decrease, whereas extraversion, conscientiousness, and self-esteem increase (Neyer & Asendorpf, 2001; Neyer & Lehnart, 2007). Negative effects of the transition on depression, social anxiety, and impulsivity were shown, and positive effects on self-esteem were confirmed (Lehnart et al., 2010). Despite the various strengths that all of these studies have embodied (i.e., longitudinal data, the availability of diverse partnership experiences), they have also suffered from some limitations such as heterogeneity of age, small subgroups, and inferences that were complicated by the fact that often no additional background variables that could have potentially driven the effects were assessed and included in the analyses. To address such shortcomings, an extended replication that uses state-of-the-art statistical methods in a longitudinal setting and includes potentially important covariates (e.g., variables that potentially affect treatment assignment and outcomes but are not in the focus of the study) is needed (Gangestad & Scheyd, 2005).

Introduced in the early 1980s by Rosenbaum and Rubin (1983), propensity score matching (PSM) techniques have been applied to various fields to address the need to create treatment and control groups that are similar on background characteristics and, of particular importance, to create groups that would also be similar on outcomes if no treatment were applied (as in randomized experiments). Random assignment is the way to produce this precondition by design. However, this is not ethical or realistic in research on personality development through social role transitions. Thus, nonexperimental or quasi-experimental designs are conducted to test for differences in outcome variables. Because nonexperimental designs have the potential to confound treatment effects and outcome expectations before the treatment is being applied (i.e., differences in outcomes pretreatment; Foster, 2010), specific matching techniques can be applied to achieve similarity at least with regard to observed background characteristics and outcome variables.

Propensity scores (PSs) are used to integrate the information on all observed covariates into one measure and, thereby facilitating matching procedures between treatment and control groups. PSs then indicate the conditional probability of receiving the treatment of interest, and by doing so, they function as a

measure of distance (or similarity) between treatment and control groups. Importantly, matching procedures rely on the included covariates because estimates are able to adjust for only the observed covariates. In addition, it is important to consider the initial (or pretreatment) characteristics on the outcome variables to achieve unbiased treatment effect estimates (Steiner, Cook, Shadish, & Clark, 2010). Hence, this study's matching process included Big Five personality and adjustment variables of life satisfaction, depression, and self-esteem at the pretreatment measurement point as well as covariates that were expected to affect whether a person would enter into a partnership such as the self-concept of attractiveness. There are at least three benefits of PSM procedures compared with traditional statistical approaches, namely, (a) a lower complexity by including only the PS (vs. adjusting for a number of covariates in a regression analyses; possibly running into power or overfitting problems), (b) no dependence on a prespecified functional form (in traditional regression analyses typically assumed to be linear), and (c) an explicit test for group similarity; thus, assumptions are more assessable and transparent such as in testing the area of common support (cf. Online Appendix; but also Becker, Lüdtke, Trautwein, Köller, & Baumert, 2012; VanderWeele, 2006).

In sum, the aim of this study was to analyze the effect of the first partnership on personality development in young adulthood by comparing fully matched samples. We hypothesized that the experience of the first partnership would be related to lower neuroticism and depression and to higher extraversion, conscientiousness, self-esteem, and life satisfaction. To test our hypotheses, we applied PSM techniques and regression analyses to a three-wave longitudinal study of young adults. All participants had not had any previous partnership experience at the first assessment ($N = 312$). Our hypothesis of a causal effect of the first partnership experience on personality maturation was expected to hold for the comparison between singles and bloomers with beginners at T2 because beginners began their first partnership between T1 and T2 and for the comparison between singles and late bloomers at T3 because late bloomers began their first partnership between T2 and T3 (see Figure 1). A specific strength of our study's design is that we were also able to compare singles and late bloomers at T2. This could be

regarded as a control comparison: We expected no substantial differences in personality maturation because neither group had actually had a partnership experience between T1 and T2. Evidence of a treatment effect for this comparison would have to be interpreted as an indication that the model had failed to adjust for differences between the two groups (Morgan & Winship, 2007).

Method

Procedure

We used a sample from an ongoing German longitudinal study (Transformation of the Secondary School System and Academic Careers; TOSCA) that has a major focus on educational and psychological conditions during the transition out of school. The study began in 2002 and is now hosted by the University of Tuebingen (see Trautwein, Neumann, Nagy, Lüdtke, & Maaz, 2010).

After the first TOSCA assessment (February–May, 2002), the second assessment followed 2 years after graduation (February–May, 2004), and the third and fourth waves of data collection (February–May, 2006 and February–May, 2008, respectively) also followed in 2-year increments. For completing the questionnaires, participants were paid 10–15€ (about US\$13–18) each time they participated. This article was based on a subsample from the original study. First, precise assessments regarding partnership status and experiences were not part of the first TOSCA wave, thus, analyses on the subsample included only data from the TOSCA Waves 2–4. Second, only participants without any previous stable romantic relationship experience at the second TOSCA assessment were considered.

Participants

At the second TOSCA assessment, a total of 470 participants, out of the 2,473 TOSCA participants, reported that they had never been involved in a stable romantic partnership before. This selection of participants experiencing a first stable partnership in one's early 20s appears to be comparable to the ratio of other independent longitudinal German and U.S. samples of young adulthood (Neyer & Lehnart, 2007; Lehnart et al., 2010).² Of the 470 participants, only 312 individuals participated in the two following waves and provided valid information about partnership status and personality variables. Thus, the analyses were based on $N = 312$ young adults with an average age of 21.4 years ($SD = 0.66$; 48% female). All participants held an Abitur (equivalent to a high school diploma), and the majority were enrolled at some kind of university or college at T1 (79%).

For attrition analyses, we compared the 312 participants who provided data at all time points with those who provided data at fewer time points and were excluded from the analyses. Participants who continued their participation were similar to the dropouts in age ($d = .16$), gender, $\chi^2(1) = 0.06$, $p = .801$, the probability of being a student, $\chi^2(1) = 0.19$, $p = .664$, and their mean levels of neuroticism ($d = .06$), extraversion ($d =$

.09), openness ($d = .12$), agreeableness ($d = .14$), conscientiousness ($d = .13$), self-esteem ($d = .00$), depression ($d = .07$), and life satisfaction ($d = .08$) at T1. Thus, the existing differences between groups were marginal in effect size and indicated only small selectivity effects.

Measures

Relationship experience. Relationship experience was divided into three groups, namely, (a) "I have never had a stable romantic relationship," (b) "I am in a romantic relationship right now," and (c) "I am not in a stable romantic relationship right now but was in one/several before."

Big Five personality. Big Five personality was measured using the German version of the NEO Five-Factor Inventory (FFI; Costa & McCrae, 1992). Neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness were rated on a 4-point response scale ranging from 1 (*applies not at all*) to 4 (*applies completely*). Previous work has shown the reliability, validity, and comparability of the German NEO-FFI (Borkenau & Ostendorf, 1991; Lüdtke, Trautwein, Nagy, & Köller, 2004). Across all three waves, α reliabilities were satisfactory (neuroticism: α s between .82 and .90; extraversion: α s between .80 and .83; openness to experience: α s between .73 and .74; agreeableness: α s between .72 and .76; and conscientiousness: α s between .83 and .86).

Psychological adjustment. Psychological adjustment was assessed with three indicators, namely, self-esteem ("Overall, I have pretty positive feelings about myself") based on 4 items from the Self-Descriptive Questionnaire (SDQ; Marsh, 1992), life satisfaction ("I am satisfied with my present life") measured with 4 items (Pavot, Diener, & Suh, 1998; German version: Trautwein, 2004), and depression (During the last week, I felt lonely) assessed with 15 items from the General Depression Scale (Hautzinger & Bailer, 1993). All scales used a 4-point response scale ranging from 1 (*applies not at all/seldom*) to 4 (*applies completely/mostly*). Internal consistency was good with α s ranging from .81 to .85 for self-esteem, .85 to .88 for life satisfaction, and .88 to .90 for depression.

Covariates. The SDQ also assessed the *self-concept of relationships with the opposite sex* ("I am shy in dealing with individuals of the opposite sex") as well as the *self-concept of appearance* ("I am good-looking") with 4 items each using a 4-point response scale ranging from 1 (*applies not at all*) to 4 (*applies completely*). Across all three assessments used in this study, internal consistency was good with α s ranging from .83 to .87 for the self-concept of relationships with the opposite sex and from .81 to .83 for the self-concept of appearance. At the first assessment of this study, participants reported some demographic information such as age and gender as well as their height and weight for *body mass index* computations.

Table 1. Comparison of Singles ($n = 136$) Versus Beginners ($n = 105$) at T1: Univariate Findings Before and After Full Matching for All Covariates Used for the Matching Procedure.

	Before Matching			After Full Matching		
	<i>M</i> (Beginners)	<i>M</i> (Singles)	<i>d</i>	<i>M</i> (Beginners)	<i>M</i> (Singles)	<i>d</i>
Propensity score	0.11	-0.65	.864	0.11	0.08	.035
NEO-neuroticism	2.27	2.28	-.030	2.27	2.24	.072
NEO-extraversion	2.76	2.66	.245	2.76	2.73	.061
NEO-openness	2.83	2.81	.061	2.83	2.79	.108
NEO-agreeableness	3.01	3.08	-.188	3.01	3.01	.002
NEO-conscientiousness	3.00	3.02	-.040	3.00	3.04	-.089
Self-esteem	3.14	3.02	.245	3.14	3.22	-.146
Depression	1.75	1.73	.028	1.75	1.80	-.116
Life satisfaction	2.87	2.94	-.109	2.87	2.93	-.100
Self-concept: Opposite sex	2.82	2.49	.543	2.82	2.88	-.106
Self-concept: Appearance	2.92	2.67	.488	2.92	2.87	.092
BMI	22.31	23.27	-.303	22.31	22.47	-.050
Sex	0.48	0.50	-.047	0.48	0.50	-.047

Note. BMI = body mass index; d = Cohen's d standardized mean-level difference. Univariate findings for the two remaining comparisons are presented in the Online Supplementary Material.

Statistical Analyses

The basic idea of PSM is to mimic a randomized design by modeling the assignment process of the individuals to the different conditions or groups. We conducted five PSM analyses, one for each of the comparisons of interest. To avoid repetition, we will provide a detailed description of the procedure only for the first comparison of singles versus beginners, but the other comparisons followed the same procedure.

PSM analyses are conducted in three major steps, that is, first, logistic regression analysis estimated PSs regarding the treatment (i.e., entering into a partnership) including all essential covariates (i.e., covariates identified as having the potential to affect the likelihood of the first partnership experience) and the initial pretreatment scores on the variables used to measure the treatment outcome (e.g., life satisfaction; cf. also Table 1).³

Second, on the basis of estimated individual PSs, we applied a full-matching procedure (Stuart & Green, 2008). Full matching (as we applied it in our study) uses all individuals by composing matched subsets where each matched subset contains one individual from the treatment group (i.e., who had a first partnership experience) and one or multiple individuals from the control group (e.g., who remained single across time), or vice versa, one control unit is matched with one or more individuals from the treatment group (Ho, Imai, King, & Stuart, 2011). Importantly, each individual is included only into one matched set. Weighting is then used to address possible differences in the number of assigned individuals into subgroups. Weights represent the ratio of individuals from the control and treatment groups. All treatment units receive a weight of 1. Weights of control units depend on the number of similar treatment units, that is, the number of individuals in the matched subset. Thus, if a subset contains only one treated and one control individual, the weight for the control is also 1. If one treatment unit is in a matched set with three control units, each

control unit receives a weight of 1/3 (the treated individual has a weight of 1 since they always have a weight of 1). In contrast, if a matched set consists of two treatment units and one control unit, this control unit receives a weight of 2 (cf. Figure 2a for an illustration). Figure 2b illustrates the weights for the treatment and control units, where each point reflects one participant's weight (larger points mirror more weight) in the fully matched data. A substantial overlap of PSs between the two groups illustrates a good precondition for further analyses. The covariate balance, indicating the degree to which imbalance in the observed covariates has been reduced (Stuart & Green, 2008), is another important way to measure the effectiveness of the matching procedure. Table 1 illustrates mean levels and standardized differences in all variables of interest before and after the matching; a substantial reduction in bias resulted from the procedure. Similarly, standardized d s of all other variables were largely reduced to below .10 (cf. also Figure 3).⁴

Third, weighted regression analyses with the matched data set (using the final weights from full matching, as shown in Figure 2) were applied to estimate the effect of having a first partnership experience on personality. To adjust for possible remaining biases in the covariates for the matched groups, multiple regression analyses additionally controlled for all variables included in the matching procedure (Ho, Imai, King, & Stuart, 2007). All analyses were conducted using R version 2.13.1 and the respective packages Matchit (Ho et al., 2011) and Zelig (Imai, King, & Lau, 2013).

Results

We tested the average treatment effect on the treated in the five comparisons consisting of (1) singles versus beginners at T2, (2) bloomers versus beginners at T2, (3) singles versus late bloomers at T2, (4) singles versus late bloomers at T3, and

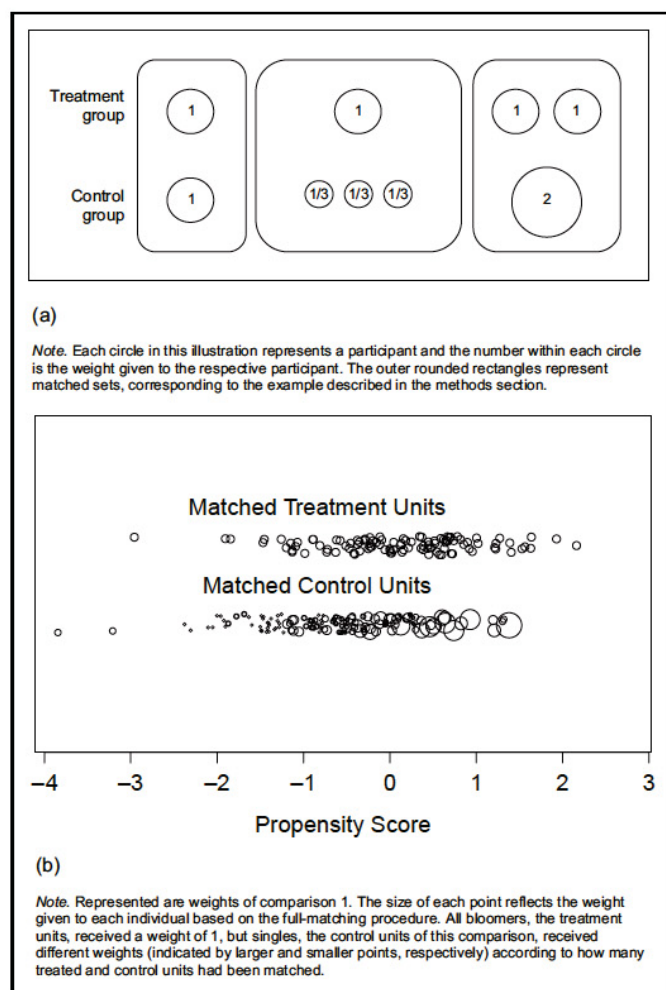


Figure 2. Illustration of the fully matched data set with (a) representing an illustration of the weights used to balance out the matched subsets and with (b) showing a jitter plot of the propensity scores for the final data set of the first comparison.

(5) singles versus beginners at T3. Results are summarized in Table 2.

Comparison 1: Singles Versus Beginners at T2

Using the matched samples that controlled for observed baseline differences, we conducted a series of regression analyses predicting personality and adjustment variables from (a) the treatment variable (beginner = 1) and (b) all covariates. The additional inclusion of the covariates controlled for any potential bias in covariates that remained after full matching.

The left side of Table 2 illustrates that in line with our hypotheses, beginners showed higher life satisfaction than singles at the second assessment. However, further hypothesized effects were not supported. Despite having had a first stable relationship experience, beginners were similar to singles at the second assessment in all Big Five traits, self-esteem, and depression. Results, regarding self-esteem, pointed in the hypothesized direction and came close to achieving a small

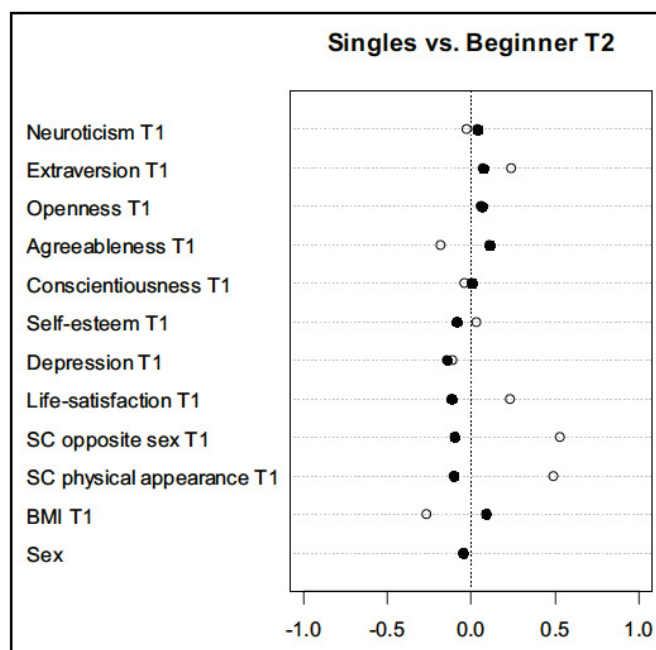


Figure 3. Standardized mean-level differences on variables before (open) and after (solid) the matching procedure for singles versus beginners at T2. Variables are from the measurement point that preceded the measurement point of interest (i.e., T1 in this comparison).

effect. To facilitate the interpretation of the life satisfaction effect, Cohen's d was computed using the standard deviation of the reference group of singles at T1. The matched beginners showed a small to medium average increase in life satisfaction ($d = 0.35$). Importantly, such an increase in life satisfaction was established after matching and controlling for the essential covariates in the regression analyses. A sensitivity analysis⁵ (Foster, 2010; VanderWeele & Arah, 2011) was conducted to assess the robustness of this effect in the presence of possible unobserved confounders. We found that with a moderate-sized effect on life satisfaction, a difference of more than 1 SD ($0.35/0.3 = 1.17$) in the possible unobserved confounder would need to exist between the treatment and the control groups to eliminate the previously established effect. However, we would like to point out that only one unobserved confounder is considered in the sensitivity analysis and one could imagine the existence of two or more variables that are related to the partnership experience and also affect the outcome. In this case, smaller differences would be sufficient to eliminate the treatment effect. Together, the first analyses yielded only a partial replication of previous results.

Comparison 2: Late Bloomers Versus Beginners at T2

This set of regression analyses supported the previous findings. Despite the fact that beginners experience their first partnership, substantial effects were found only with respect to life satisfaction ($d = 0.35$) and in this case also with respect to

Table 2. Predicting Personality Development by Means of the Nonexistence of a First Partnership.

	Singles vs. Beginners			Late Bloomers vs. Beginners			Singles vs. Late Bloomers			Singles vs. Late Bloomers			Singles vs. Beginners		
	Comparison 1			Comparison 2			Comparison 3			Comparison 4			Comparison 5		
	Est.	(SE)	<i>d</i> ^a	Est.	(SE)	<i>d</i> ^a	Est.	(SE)	<i>d</i> ^a	Est.	(SE)	<i>d</i> ^a	Est.	(SE)	<i>d</i> ^a
Personality															
Neuroticism	0.02	(0.05)	0.04	-0.04	(0.05)	-0.08	-0.02	(0.06)	-0.04	-0.16	(0.05)	-0.33	0.03	(0.05)	0.06
Extraversion	0.04	(0.04)	0.09	-0.02	(0.04)	-0.05	0.09	(0.04)	0.20	0.09	(0.04)	0.20	0.07	(0.04)	0.16
Openness	-0.03	(0.04)	-0.07	-0.02	(0.04)	-0.05	0.05	(0.04)	0.11	0.03	(0.04)	0.07	-0.05	(0.03)	-0.11
Agreeableness	-0.03	(0.03)	-0.09	-0.06	(0.04)	-0.17	0.03	(0.03)	0.09	0.05	(0.03)	0.14	0.04	(0.03)	0.11
Conscientiousness	-0.04	(0.04)	-0.09	-0.04	(0.05)	-0.09	0.01	(0.04)	0.02	0.14	(0.05)	0.33	0.10	(0.05)	0.23
Self-esteem	0.10	(0.06)	0.18	0.15	(0.07)	0.27	0.02	(0.06)	0.04	0.26	(0.06)	0.47	0.02	(0.07)	0.04
Depression	-0.07	(0.06)	-0.14	-0.02	(0.06)	-0.04	-0.23	(0.06)	-0.46	0.04	(0.06)	0.08	0.03	(0.06)	0.06
Life satisfaction	0.19	(0.08)	0.35	0.19	(0.08)	0.35	-0.01	(0.09)	-0.02	0.19	(0.09)	0.35	0.06	(0.06)	0.11

Note. Est. = Estimate; SE = standard error. All models covaried the outcome of the previous measurement occasion and all covariates that were used in the matching procedure. Bold numbers are significant at $p < .05$. ^aThe effect size d represents the difference in means divided by the standard deviation for singles (reference group).

self-esteem ($d = 0.27$). This largely supports the findings of comparison 1.

Comparison 3: Singles Versus Late Bloomers at T2

For this comparison, no differences in personality development were expected because of the lack of treatment in both groups (control comparison). Results show that this hypothesis is only partially supported. Unexpectedly, two substantial differences in extraversion ($d = 0.20$) and depression ($d = -0.46$) occurred between the two groups, both of which were still single at T2. Those who were more extraverted and less depressed at T2 appeared to be more likely to have a stable partnership by T3, that is, to be denoted as late bloomer. This finding is particularly surprising because it occurred even after matching the participants on these covariates and additionally adjusting for any potential remaining differences in the regression analyses. This may make readers wonder if there is a possible misspecification in our model because the two groups should be similar at this point in their developmental path. We will address this point further in the discussion.

Comparison 4: Singles Versus Late Bloomers at T3

Predicting outcome variables at T3, these analyses were based on PS calculated with covariates and outcome variables at T2. The results indicated a substantial small- to medium-sized positive effect of the first partnership experience on life satisfaction ($d = 0.35$). Additionally, this comparison between singles and late bloomers with their first partnership experience between the ages of 23 and 25 provided evidence for the expected increases in self-esteem, extraversion, and conscientiousness and a decrease in neuroticism. With these results, we were able to support previous findings with regard to first partnership effects not only on the adjustment measure of life satisfaction but also as indicated by personality maturation with

regard to more stable characteristics. Using the standard deviation of the reference group to estimate effect sizes for the treatment effect, the first partnership experience had a substantial medium-sized effect on self-esteem ($d = 0.47$) as well as small effects on neuroticism ($d = 0.33$), extraversion ($d = 0.20$), and conscientiousness ($d = 0.33$).

Comparison 5: Singles Versus Beginners at T3

This last comparison again used T2 data for matching and thus should illustrate lasting effects between beginners and stable singles.⁶ Results indicate no such long-term differences. Only one small effect indicated higher conscientiousness for beginners in contrast to stable singles ($d = 0.23$).

Discussion

The aim of this study was to test the effects of a person's first partnership experience on personality development. Applying PSM techniques to a three-wave longitudinal data set, we found effects of the first partnership experience on life satisfaction, and, in some conditions, on self-esteem, neuroticism, extraversion, and conscientiousness. Despite the inconsistency in our results across the five comparisons, we would still propose that the first stable partnership experience is somehow linked to developmental maturation. In sum, our results only partially replicated the findings of previous studies but extended the findings to psychological adjustment measures and supported the causal interpretation of effects based on the use of PSM techniques.

Young adulthood is generally related to the development of a more mature personality (McAdams & Olson, 2010) that is often ascribed to (successfully) experiencing new social roles (Roberts et al., 2005). As a major milestone, the first partnership experience should be viewed as an entrance into a new developmental cycle that later results in the formation of one's

own family. By applying the specific longitudinal design of our study, which followed initially single young adults, we were able to only partially support the effect of the first partnership experience on psychological adjustment and on personality development. Result patterns support the tendency of romantic partnerships to have a positive effect on one's view of oneself and one's life (Murray, Bellavia, Feeney, Holmes, & Rose, 2001). Unexpectedly, the findings on personality were not established in the group of beginners who had their first partnership experience between the ages of 21 and 23 but only in late bloomers who established their first partnership between the ages of 23 and 25. One possible explanation for these differences in results could be the age-graded investment in social roles. It might be that dating experiences in the late teens and early 20s are less likely to reach the commitment level of marriage and parenthood, whereas by the mid-20s, expectations and investigations into romantic partnerships change. Another possibility is that being a "late bloomer" might carry a different psychological meaning. Thus, experiencing a first partnership by one's mid-20s could have stronger effects on one's personality. Providing a sound test of such effects of timing would require more time points, a practice that should be implemented in further studies. Additionally, the calculation of standard errors for statistical inference has to be regarded a critical issue in the PSM literature (Stuart, 2010). To take the uncertainty in the matching procedure into account, we applied bootstrapping to the entire process of matching and regression analysis (see Austin & Small, 2014). Using 1,000 bootstrap samples, the effects for life satisfaction and self-esteem were confirmed. However, the confidence intervals for the effects on personality all included zero and indicated that these effects need to be interpreted very cautiously.

A key feature of our study design was the Control Comparison 3 between singles and late bloomers, when the late bloomers were still in the pretreatment phase. This very strong but seldom applied test provided some evidence for the presence of unobserved covariates that may drive the effect of the first partnership. Most personality traits, self-esteem, and life satisfaction were highly similar before any of the individuals experienced their first partnership. However, two substantial effects—extraversion and depression—disrupted this pattern. As a first possible explanation, these findings might indicate a selection effect before the actual experience (Lüdtke, Roberts, Trautwein, & Nagy, 2011). Young adults with higher extraversion and lower depression appear more likely to enter into a romantic relationship. A second possible explanation could be that the matching variables that we applied did not effectively remove selection bias. Because the conclusions drawn from PSM depend heavily on the measurement of causally relevant covariates, a replication of our findings with a similar study that includes a larger sample and set of covariates is needed. Certainly, the results of this comparison limit the causal interpretability of the findings.

In sum, the findings of our study partially replicate and extend previous studies on personality maturation in the light of the first partnership experience. By doing so, they provide

evidence for the changeability of personality throughout early adulthood and emphasize the function of life transitions and social role investments for developmental trajectories. At the same time, patterns were not consistent throughout comparisons. This possibly highlights that further sources of personality development exist and should be investigated. Our results emphasize the applicability of PSM to longitudinal data sets, thus, further research should apply similar methodological approaches to advance confidence in the causal links between social roles and personality development across the life span.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Notes

1. In this study, treatment refers to the experience of a first stable partnership.
2. As expected, compared with Transformation of the Secondary School System and Academic Careers (TOSCA) participants who had a previous partnership, the participants without the experience were substantially more neurotic ($d = 0.23$), less extraverted ($d = 0.48$), less conscientious ($d = 0.14$), had lower life satisfaction ($d = 0.33$), lower self-esteem ($d = 0.33$), and were more depressed ($d = 0.20$). However, the two groups were similar in openness ($d = 0.01$) and agreeableness ($d = 0.01$).
3. This means that regarding comparisons 1–3, the matching procedure used covariates and outcomes from T1; whereas, for comparisons 4–5, we used covariates and outcomes from T2.
4. Information with respect to four other types of matching procedures on comparison 1 and a more thorough explanation of the full-matching procedure can be found in the Online Supplementary Material.
5. Further information on sensitivity analyses can be found in the Online Supplementary Material.
6. Using T1 variables to match singles and beginners to test personality effects at T3, the results remained the same with only conscientiousness showing a substantial effect.

Supplemental Material

The online data supplements are available at <http://spps.sagepub.com/supplemental>.

References

- Austin, P. C., & Small, D. S. (2014). The use of bootstrapping when using propensity-score matching without replacement: A simulation study. *Statistics in Medicine*, 33, 4306–4319. doi:10.1002/sim.6276
- Becker, M., Lüdtke, O., Trautwein, U., Köller, O., & Baumert, J. (2012). The differential effects of school tracking on psychometric intelligence: Do academic-track schools make students smarter?

- Journal of Educational Psychology*, 104, 682–699. doi:10.1037/a0027608
- Borkenau, P., & Ostendorf, F. (1991). Ein Fragebogen zur Erfassung fünf robuster Persönlichkeitsfaktoren. *Diagnostica*, 37, 29–41.
- Caspi, A. (1998). Personality development across the life course. In W. Damon & N. Eisenberg (Eds.), *Handbook of child psychology. Vol. 3: Social, emotional, and personality development* (pp. 311–388). New York, NY: John Wiley.
- Caspi, A., & Roberts, B. W. (2001). Personality development across the life course: The argument for change and continuity. *Psychological Inquiry*, 12, 49–66.
- Caspi, A., Roberts, B. W., & Shiner, R. L. (2005). Personality development: Stability and change. *Annual Review of Psychology*, 56, 453–484.
- Costa, P. T., & McCrae, R. R. (1992). Normal personality assessment in clinical practice: The neo personality inventory. *Psychological Assessment*, 4, 5–13. doi:10.1037/1040-3590.4.1.5
- Foster, E. M. (2010). Causal inference and developmental psychology. *Developmental Psychology*, 46, 1454–1480. doi:10.1037/a0020204
- Gangestad, S. W., & Scheyd, G. J. (2005). The evolution of human physical attractiveness. *Annual Review of Anthropology*, 34, 523–548.
- Hautzinger, M., & Bailer, M. (1993). *Allgemeine Depressions-Skala*. Weinheim, Germany: Beltz.
- Havighurst, R. J. (1972). *Developmental tasks and education* (3rd ed.). New York, NY: Davis McKay.
- Ho, D., Imai, K., King, G., & Stuart, E. A. (2007). Matching as non-parametric preprocessing for reducing model dependence in parametric causal inference. *Political Analysis*, 15, 199–236.
- Ho, D., Imai, K., King, G., & Stuart, E. A. (2011). MatchIt: Nonparametric preprocessing for parametric causal inference. *Journal of Statistical Software*, 42, 1–28.
- Imai, K., King, G., & Lau, O. (2013). *Zelig: Everyone's statistical software*. Retrieved from <http://gking.harvard.edu/zelig/>.
- Lehnart, J., Neyer, F. J., & Eccles, J. (2010). Long-term effects of social investment: The case of partnering in young adulthood. *Journal of Personality*, 78, 639–669. doi:10.1111/j.1467-6494.2010.00629.x
- Lodi-Smith, J., & Roberts, B. W. (2007). Social investment and personality: A meta-analysis of the relationship of personality traits to investment in work, family, religion, and volunteerism. *Personality and Social Psychology Review*, 11, 1–19.
- Lucas, R. E., & Donnellan, M. B. (2011). Personality development across the life span: Longitudinal analyses with a national sample from Germany. *Journal of Personality and Social Psychology*, 101, 847–861. doi:10.1037/a0024298
- Lüdtke, O., Roberts, B. W., Trautwein, U., & Nagy, G. (2011). A random walk down university avenue: Life paths, life events, and personality trait change at the transition to university life. *Journal of Personality and Social Psychology*, 101, 620–637.
- Lüdtke, O., Trautwein, U., Nagy, G., & Köller, O. (2004). Eine Validierungsstudie zum NEO-FFI in einer Stichprobe junger Erwachsener: Effekte des itemformats, faktorielle validität und zusammenhänge mit schulleistungsindikatoren. *Diagnostica*, 50, 134–144.
- Luhmann, M., Hofmann, W., Eid, M., & Lucas, R. E. (2012). Subjective well-being and adaptation to life events: A meta-analysis. *Journal of Personality and Social Psychology*, 3, 592–615.
- Marsh, H. W. (1992). Content specificity of relations between academic achievement and academic self-concept. *Journal of Educational Psychology*, 84, 35–42. doi:10.1037/0022-0663.84.1.35
- McAdams, D. P., & Olson, B. (2010). Personality development: Continuity and change over the life course. *Annual Review of Psychology*, 61, 517–542.
- Morgan, S. L., & Winship, C. (2007). *Counterfactuals and causal inference: Methods and principles for social research*. New York, NY: Cambridge University Press.
- Murray, S. L., Bellavia, G., Feeney, B., Holmes, J. G., & Rose, P. (2001). The contingencies of interpersonal acceptance: When romantic relationships function as a self-affirmational resource. *Motivation and Emotion*, 25, 163–189.
- Neyer, F. J., & Asendorpf, J. B. (2001). Personality-relationship transaction in young adulthood. *Journal of Personality and Social Psychology*, 81, 1190–1204.
- Neyer, F. J., & Lehnart, J. (2007). Relationships matter in personality development: Evidence from an 8-year longitudinal study across young adulthood. *Journal of Personality*, 75, 535–568.
- Pavot, W., Diener, E., & Suh, E. (1998). The temporal satisfaction with life scale. *Journal of Personality Assessment*, 70, 340–354.
- Roberts, B. W., Caspi, A., & Moffitt, T. E. (2001). The kids are alright: Growth and stability in personality development from adolescence to adulthood. *Journal of Personality and Social Psychology*, 81, 670–683.
- Roberts, B. W., & Mroczek, D. (2008). Personality trait change in adulthood. *Current Directions in Psychological Science*, 17, 31–35.
- Roberts, B. W., Wood, D., & Smith, J. L. (2005). Evaluating Five Factor Theory and social investment perspectives on personality trait development. *Journal of Research in Personality*, 39(1), 166–184.
- Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70, 41–55. doi:10.1093/biomet/70.1.41
- Schwanzer, A. D., Trautwein, U., Lüdtke, O., & Sydow, H. (2005). Entwicklung eines instruments zur Erfassung des selbstkonzepts junger erwachsener. *Diagnostica*, 51, 183–194. doi:10.1026/0012-1924.51.4.183
- Steiner, P. M., Cook, T. D., Shadish, W. R., & Clark, H. M., (2010). The importance of covariate selection in controlling for selection bias in observational studies. *Psychological Methods*, 15, 250–267.
- Stuart, E. A. (2010). Matching methods for causal inference: A review and a look forward. *Statistical Science*, 29(1), 1–21. doi:10.1214/09-STS313
- Stuart, E. A., & Green, K. M. (2008). Using full matching to estimate causal effects in nonexperimental studies: Examining the relationship between adolescent marijuana use and adult outcomes. *Developmental Psychology*, 44, 395–406.

- Trautwein, U. (2004). Die temporalen Facetten der Lebenszufriedenheit: Eine deutsche Adaptation der Skala von Pavot, Diener und Suh (1998). *Diagnostica*, 50, 182–192.
- Trautwein, U., Neumann, M., Nagy, G., Lüdtke, O., & Maaz, K. (Eds.). (2010). *Schulleistungen von Abiturienten: Die neu geordnete gymnasiale Oberstufe auf dem Prüfstand* [School achievement of high school students: Testing the new upper school structure]. Wiesbaden, Germany: VS Verlag für Sozialwissenschaften.
- VanderWeele, T. (2006). The use of propensity score methods in psychiatric research. *International Journal of Methods in Psychiatric Research*, 15, 95–103. doi:10.1002/mpr.183
- Vanderweele, T. J., & Arah, O. A. (2011). Bias formulas for sensitivity analysis of unmeasured confounding for general outcomes, treatments, and confounders. *Epidemiology*, 22, 42–52. doi:10.1097/EDE.0b013e3181f74493

Author Biographies

Jenny Wagner is a research scientist at the Leibniz Institute for Science and Mathematics Education, Kiel, Germany, and associated researcher at Humboldt-University, Berlin, Germany.

Michael Becker is a research scientist at the German Institute for International Educational Research (DIPF), Frankfurt, Germany.

Oliver Lüdtke is a full professor of Educational Measurement at Leibniz Institute for Science and Mathematics Education, Kiel, Germany.

Ulrich Trautwein is a full professor and head of the Center for Educational Science and Psychology, University of Tübingen, Tübingen, Germany.