


School or Work? The Choice May Change Your Personality

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Abstract

According to the social-investment principle, entering new environments is associated with new social roles that influence people's behaviors. In this study, we examined whether young adults' personality development is differentially related to their choice of either an academic or a vocational pathway (i.e., entering an academic-track school or beginning vocational training). The personality constructs of interest were Big Five personality traits and vocational-interest orientations. We used a longitudinal study design and propensity-score matching to create comparable groups before they entered one of the pathways and then tested the differences between these groups 6 years later. We expected the vocational pathway to reinforce more mature behavior and curtail investigative interest. Results indicated that choosing the vocational compared with the academic pathway was associated with higher conscientiousness and less interest in investigative, social, and enterprising activities.

Keywords

educational pathways, personality development, Big Five traits, vocational interests, propensity-score analysis

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Personality is widely accepted as both consistent and changeable throughout life (Roberts & Mroczek, 2008). Constructs such as the Big Five personality traits and vocational interests are moderately stable over relatively long periods of time (Low, Yoon, Roberts, & Rounds, 2005; Roberts & DelVecchio, 2000). In addition, personality traits tend to develop toward greater maturity in young adulthood, complementing this relative stability. Specifically, people tend to become more agreeable, conscientious, and emotionally stable with age (Roberts, Walton, & Viechtbauer, 2006). These normative patterns of change are most often attributed to common life experiences that shape people in similar ways (Bleidorn et al., 2013; Roberts, Wood, & Caspi, 2008).

Besides normative patterns of change, individual differences in personality development depend on specific life experiences such as relationship factors (Lehnart, Neyer, & Eccles, 2010), stressful life events (Luo & Roberts, 2015), and work experiences (Hudson & Roberts, 2016).

These and other studies have provided robust correlational evidence that life experiences are associated with personality change across the whole life course, from adolescence to young adulthood and into middle age (Van Aken, Denissen, Branje, Dubas, & Goossens, 2006) and old age (Hill, Payne, Jackson, Stine-Morrow, & Roberts, 2014). However, whether these life experiences really have a causal influence on personality change is unclear: Large-scale, long-term experimental studies are not possible because people cannot be randomly assigned to life experiences. More recently, *propensity-score matching* (PSM; e.g., Stuart, 2010) has been proposed as a way to control for a large number of potentially important

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covariates, thus mimicking random assignment as closely as possible when estimating the effects of life events (e.g., first partnership, living arrangements, military experiences) on personality traits in longitudinal settings (Jackson, Thoemmes, Jonkmann, Lüdtke, & Trautwein, 2012; Wagner, Becker, Lüdtke, & Trautwein, 2015).

Here, we used a longitudinal study design and PSM to test whether the important common life experience of choosing either a vocational or an academic pathway is associated with personality change. We created comparable groups before the life event occurred and then tested the differences between these two groups 6 years later. Our study is unique in its design, analytical approach, and explicit test of whether choice of pathway is related to individual differences in personality change.

A Neo-Socioanalytic Framework for Tracking Multiple Domains of Personality Change

To investigate whether the choice of educational pathway (academic vs. vocational) is associated with differential personality development, we adopted the neo-socioanalytic framework (Roberts & Nickel, 2017) to decide which constructs to track over time and to derive hypotheses. The neo-socioanalytic framework is a model of personality that informs both what types of dimensions are relatively unique domains of human functioning and the types of experiences that might be related to personality change. According to the model, personality has at least four major individual-difference domains: traits, motives, abilities, and narratives. Therefore, we focused on not only personality traits but also motives when examining personality development after either the academic or vocational pathway was chosen.

Personality traits are commonly defined as relatively enduring, automatic consistencies in feelings, thoughts, and actions across situations and over time. As noted above, traits have been the most common aspect of personality examined in longitudinal investigations of the role of life experience in personality development. Individuals' motives refer to what individuals desire or prefer. In particular, in this study, we examined the development of vocational-interest orientations, which reflect preferences for certain environments, activities, and people (Mount, Barrick, Scullen, & Rounds, 2005). The neo-socioanalytic framework assumes that these are independent individual-difference domains, a position supported by the relatively low correlations between personality traits and interests (average $r = .10$;¹ Mount et al., 2005) and the fact that vocational-interest orientations provide incremental validity in predicting a wide variety of outcomes (Stoll et al., 2017).

The neo-socioanalytic model also identifies the most common experiential unit of analysis that should impart

change in personality over time, namely, shifts in social roles. Consistent with this view, prior research has shown that role transitions such as entering the military (Jackson et al., 2012), engaging in a stable romantic relationship (Lehnart et al., 2010; Wagner et al., 2015), and divorce (Roberts, Helson, & Klohnen, 2002) are associated with personality trait change. The assumption is that with new roles come new behavioral expectations, which lead to personality change. In particular, the social-investment principle states that the transitions out of probationary adolescent roles into adult roles (e.g., starting a career) come with expectations to be more conscientious, agreeable, and emotionally stable (Bleidorn et al., 2013; Roberts et al., 2008). Whereas there is a reasonable amount of support for the social-investment principle as applied to personality traits (e.g., Bleidorn et al., 2013; Hudson & Roberts, 2016; van Scheppingen et al., 2016), no prior study has extended this idea to other personality domains (e.g., vocational-interest orientations).

The Present Study

In this study, we investigated how the transition into vocational or academic pathways is differently related to personality change. We compared the Big Five traits and vocational-interest orientations of two groups of students at the end of the intermediate track, which is at the end of Grade 10 in Germany (before they entered one of the pathways), and 6 years later. To control for potential selection effects, we used PSM. For the Big Five, we expected that people who decided to enter a vocational pathway would report being more conscientious, agreeable, and emotionally stable because of an earlier investment in the new roles of adulthood (e.g., being a reliable coworker and trainee) compared with students who continued school and entered a higher academic track. Predictions were more difficult to derive for vocational interests. Previous work has suggested that they are consistent and changeable throughout life as well (Rounds & Su, 2014). However, no study has systematically examined the effects of different educational pathways beyond initial education. We expected that staying in school versus entering vocational training would be associated with higher investigative interests because of more stimulating investigative activities, encouraging scientific competencies and rewarding people for the display of scientific values and attitudes (see Holland, 1997).

Method

School system

German states have different educational systems. The following information refers to the state of Baden-Württemberg,

where this study was conducted. Primary school comprises Grades 1 to 4, in which there is only one school track for all students. Students are approximately 6 years old when they start primary school, and they leave it at the age of 11 or 12 years. Teacher recommendations, which are based on school grades, and parents' preferences are the main influences that determine which secondary school track is chosen at the end of Grade 4. Secondary school comprises Grades 5 to 10 and consists of three tracks. The lowest track is called *Hauptschule*. Students in this school track usually finish school after Grade 9 or 10 and make further educational arrangements that will prepare them for the workforce. The intermediate school track is called *Realschule*, which ends after Grade 10. At the end of this track, students have two options. They can enter a vocational track that will prepare them for the workforce or—depending on their school grades—they might be able to enter an academic track for additional 3 years to attain the university entrance qualification. If intermediate-track students decide to enter the academic track, they must change schools because intermediate-track schools do not offer academic-track options. The highest track, the academic school track, is called *Gymnasium*. It prepares students to study at a university, and students in this track usually remain in their school for 3 more years after the end of Grade 10. For more information about the system, see the article by Maaz, Trautwein, Lüdtke, and Baumert (2008).

In this study, we focused on students in the intermediate track because their opportunity to choose between two different educational pathways (vocational vs. academic) is unique and provided us with the chance to investigate the relationship between choosing one of these paths and personality development. In more detail, the vocational track is characterized by full-time vocational schools or apprenticeships and prepares students for the workforce. By contrast, the academic track prepares students for higher education (university, specialized college, university of applied science, university of cooperative education) before they enter the workforce. Good school grades are a crucial entry criterion for selection into academic-track schools, whereas this is not the case for the vocational pathway. Performance is assessed according to a six-mark system (1 = *very good*, 2 = *good*, 3 = *satisfactory*, 4 = *sufficient*, 5 = *poor*, and 6 = *deficient*) adopted by the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany. Students need a satisfactory average of mathematics, German, and second-language grades (a school grade of 3), and single grades in these subjects must not be poor (a school grade of 5 or higher).

Sample and design

The current investigation is part of the German research project "Transformation of the Secondary School System and Academic Career: Grade 10" (TOSCA-10; see Trautwein, Nagy, & Maaz, 2011). TOSCA-10 is a longitudinal study that focuses on students' transition from school to higher education or work. In this study, students from a representative sample of 46 intermediate-track schools in Baden-Württemberg, Germany, were assessed twice: shortly before the end of Grade 10 (in 2006–2007) and 6 years later. Typically, two classes from each intermediate track were randomly selected for the TOSCA-10 study.

At the first measurement occasion, 2,095 students (age: $M = 16.7$ years, $SD = 0.62$; 50.8% men), most of whom were born in Germany, participated in this study and filled out the questionnaire in class. All of them agreed that their data could be used for scientific purposes. At the end of each questionnaire, students were asked to write down their address (including their e-mail address) if they would like to complete a future survey. Data collection was done by the IEA Data Processing Center in Hamburg, and all data were stored separately from the addresses.

At the second measurement occasion, updated contact information from 80% of the original sample was available. There were online and off-line long- and short-format versions of the questionnaire to ensure high response rates (see Table S1 in the Supplemental Material available online). All participants with contact information were mailed a survey, and 660 of the 2,095 original students agreed to participate. Thus, the return rate was 31.5% of the original sample and 39.4% of the sample with contact information. There were small to medium differences between the original sample and the continuers in age, school grades, ability-test scores, self-concept in mathematics, and self-reported behavior (risk behavior, norm violation). These differences indicate that the sample of continuers ($N = 660$) was younger, had better school grades, showed higher achievement test scores, and reported a higher self-concept in mathematics, lower risk behavior, and lower norm-violating behavior than students who dropped out. There were no meaningful group differences on the Big Five personality traits or vocational-interest measures (see Table S2 and Fig. S1 in the Supplemental Material).

In the second survey, participants reported what they had done during the prior 6 years. Among other things, they were asked whether they attended an academic-track school, the year they started, the year they finished, and whether they completed this track. On the basis of their answers to this questionnaire, we divided

students into two groups: the academic-track group or vocational-track group. The academic track refers to all academic-track schools (Grades 11–13) that prepare students for higher education, such as university and specialized college, before they enter the workforce. By contrast, the vocational track comprises full-time vocational schools or apprenticeships lasting approximately 3 years and prepares students for the workforce.

Educational pathway information was provided by 624 students (36 cases were excluded because of missing information about their education). However, students in this sample could have entered an academic track within the 1st year after graduating from Grade 10 or they could have started as late as 5 years later. For further analyses, specific conditions had to be fulfilled to obtain groups of students who had entered vocational or academic pathways, started at the same time, and completed their programs. The prerequisites for being included in one of the two groups were that the participant had to have started one of the two educational pathways within the first 2 years of intermediate-track graduation and had to have completed the chosen track or training. This resulted in a sample of 508 students (116 cases were excluded because they did not fulfill the requirements), with 224 students in the academic track and 284 students in the vocational track. This sample of 508 students constituted the basis for multiple imputations.

For the PSM analysis, we excluded students who had no opportunity to start higher secondary education but had to start vocational training. For this, we used the official-school-grade criterion to identify students with the opportunity to attend higher secondary education: To obtain higher secondary education, students needed satisfactory average grades across mathematics, German, and a second language. Also, students needed single grades that were better than poor in each of these subjects. The final sample consisted of 382 students, with 212 students in the academic track and 170 students in the vocational track. These exclusion conditions allowed for a clear interpretation of possible differences in personality change.

Because of the given sample size, study design, and planned analysis strategy, we computed the minimum detectable effect size (MDES) for our study. MDES is the minimum true effect size that can be detected by a particular study with a particular level of statistical precision and power. We computed this analysis using the *PowerUp!* package (Dong & Maynard, 2013) in the R programming environment (R Core Team, 2014). Given a power of .80, a total sample size of 382 students, and a Type I error rate of .05, MDES (*ds*) ranged from .20 to .27, depending on the amount of variance in the outcome explained by the covariates. If a completed study has enough power, the MDES should be less than

or equal to the minimum relevant effect size (MRES). From the literature, we could not derive the MRES for educational interventions on personality measures, but as in other areas, we assumed that a small effect ($d = 0.20$) would be relevant. Thus, the sample size that we obtained in our study had adequate power and could detect relevant effects. For more details, see Table S3 in the Supplemental Material.

Measures

Outcomes. We used the Big Five traits and vocational-interest orientations as dependent variables. All questionnaires were administered twice: at the end of Grade 10 and 6 years later. The means, standard deviations, rates of missing values, and Cronbach's alpha reliability indices of all variables are listed in Table S4 in the Supplemental Material. An overview of the descriptive statistics for the two groups (academic pathway vs. vocational pathway) is presented in Tables 1 and 2. Because of the high attrition rate between Measurement Occasions 1 and 2, we include an overview of the descriptive statistics for the samples of dropouts and continuers in the Supplemental Material (Table S2 and Fig. S1).

Big Five. The German short version of the Big Five Inventory was used (Rammstedt & John, 2005). Four scales consisted of four items each, and only openness consisted of five items. Responses were made on a 5-point Likert-type scale, ranging from -2 , *disagree*, to 2 , *agree* ($0 =$ *neither/nor*). Cronbach's alpha for these scales ranged from .51 to .78.

Vocational-interest orientations. Interest orientations were measured with the General Interest Structure Tests (Bergmann & Elder, 1992), an established German inventory based on Holland's realistic, investigative, artistic, social, enterprising, and conventional (RIASEC) model. Each of the six scales included 10 items representing specific activities or tasks that are characteristic for one of the six RIASEC dimensions, respectively. Participants indicated on a 5-point Likert-type scale, ranging from 1, *not interested*, to 5, *very interested*, how interested they were in each activity. Cronbach's alpha for these scales ranged from .83 to .90.

Covariates. An extensive set of covariates was included to reduce potentially biased effects of estimating whether students attended the vocational versus academic pathway on personality (see Thoemmes & Kim, 2011). We used demographic variables, general cognitive abilities, school achievement, self-concepts, risk behavior, norm violation in school, and life satisfaction as covariates, in addition to the pretest measures of all dependent variables. These covariates were chosen because they might

Table 1. Descriptive Statistics for Students on the Academic and Vocational Pathways at Grade 10

Variable	Academic pathway (<i>n</i> = 212)				Vocational pathway (<i>n</i> = 170)			
	<i>M</i>	<i>SD</i>	Minimum	Maximum	<i>M</i>	<i>SD</i>	Minimum	Maximum
Big Five								
Extraversion	0.52 [0.40, 0.64]	0.87	-1.75	2.00	0.69 [0.56, 0.82]	0.85	-1.25	2.00
Agreeableness	0.24 [0.15, 0.33]	0.66	-1.50	1.75	0.19 [0.09, 0.29]	0.65	-1.50	1.75
Conscientiousness	0.76 [0.68, 0.85]	0.62	-1.00	2.00	0.79 [0.68, 0.89]	0.68	-1.25	2.00
Neuroticism	-0.15 [-0.25, -0.05]	0.75	-2.00	1.75	-0.24 [-0.35, -0.12]	0.74	-2.00	1.50
Openness	0.56 [0.47, 0.65]	0.66	-1.20	2.00	0.53 [0.43, 0.63]	0.66	-1.00	2.00
Vocational-interest orientation								
Realistic	2.27 [2.16, 2.38]	0.81	1.00	4.80	2.50 [2.35, 2.64]	0.95	1.10	4.70
Investigative	2.71 [2.61, 2.82]	0.78	1.10	5.00	2.57 [2.45, 2.69]	0.80	1.00	4.80
Artistic	2.85 [2.74, 2.96]	0.80	1.20	4.80	2.71 [2.58, 2.83]	0.81	1.00	4.70
Social	3.14 [3.03, 3.25]	0.82	1.30	5.00	3.05 [2.92, 3.19]	0.87	1.10	5.00
Enterprising	3.19 [3.09, 3.29]	0.74	1.20	5.00	3.06 [2.94, 3.19]	0.81	1.40	4.90
Conventional	2.66 [2.56, 2.75]	0.70	1.10	4.60	2.69 [2.57, 2.81]	0.79	1.00	5.00

Note: Values in brackets are 95% confidence intervals.

be important for the selection of students into the academic or vocational pathway (see Maaz et al., 2008). For a complete overview of these covariates, including a detailed description, means, standard deviations, rates of missing values, Cronbach's alphas, and a correlation table, see Tables S5 and S6 in the Supplemental Material.

Analysis

We used PSM because of nonrandomized group allocation between the vocational and academic pathways and possible baseline differences between the two

groups. PSM is used in research contexts in which assigning people randomly to different conditions is not possible or ethically justifiable. PSM is used to equate groups on several variables that might have affected the outcomes of interest beyond the conditions of interest. We used PSM in the present study because group allocation between the vocational and academic pathways was not random, and baseline differences between the two groups occurred on the basis of individual selection processes. Thus, the aim of PSM was to identify a well-matched group of students who decided to attend the academic pathway and who had

Table 2. Descriptive Statistics for Students on the Academic and Vocational Pathways 6 Years After the First Measurement

Variable	Academic pathway (<i>n</i> = 212)				Vocational pathway (<i>n</i> = 170)			
	<i>M</i>	<i>SD</i>	Minimum	Maximum	<i>M</i>	<i>SD</i>	Minimum	Maximum
Big Five								
Extraversion	0.56 [0.43, 0.68]	0.93	-1.75	2.00	0.62 [0.48, 0.76]	0.90	-1.75	2.00
Agreeableness	0.16 [0.05, 0.27]	0.81	-1.75	2.00	0.23 [0.11, 0.35]	0.81	-2.00	1.75
Conscientiousness	0.89 [0.80, 0.99]	0.69	-1.50	2.00	1.00 [0.91, 1.09]	0.58	-1.00	2.00
Neuroticism	-0.11 [-0.23, 0.01]	0.89	-2.00	2.00	-0.10 [-0.23, 0.04]	0.88	-2.00	1.75
Openness	0.57 [0.48, 0.67]	0.69	-1.20	2.00	0.58 [0.47, 0.69]	0.70	-1.20	2.00
Vocational-interest orientation								
Realistic	2.21 [2.12, 2.31]	0.71	1.00	4.40	2.37 [2.23, 2.52]	0.93	1.00	4.90
Investigative	2.75 [2.65, 2.84]	0.69	1.10	4.70	2.55 [2.43, 2.67]	0.79	1.00	4.70
Artistic	2.58 [2.46, 2.69]	0.84	1.00	4.90	2.42 [2.31, 2.53]	0.73	1.10	4.20
Social	3.15 [3.04, 3.26]	0.82	1.00	4.90	2.90 [2.78, 3.02]	0.79	1.20	4.70
Enterprising	3.38 [3.28, 3.48]	0.75	1.00	5.00	3.00 [2.87, 3.02]	0.80	1.30	4.70
Conventional	2.93 [2.82, 3.03]	0.77	1.30	4.80	2.84 [2.72, 2.96]	0.79	1.22	4.90

Note: Values in brackets are 95% confidence intervals.

characteristics that were similar to those of the students who entered the vocational pathway at the end of Grade 10. Therefore, a propensity score that was based on all variables assessed at the end of Grade 10 was estimated before the participants entered either the vocational or the academic pathway. Students from the two groups were matched on the basis of the propensity score, and subsequently, the differences in the outcome variables between the matched students in the two pathways were estimated by means of multiple linear regression analyses with standard errors that were corrected for the multilevel structure of the data. For the whole propensity-score analysis, we followed Thoemmes and Kim's (2011) recommendations. A summary is provided in Table S7 in the Supplemental Material.

Complete data sets are necessary to apply PSM. Therefore, multiple imputation using chained equations was used to generate filled-in data sets, which were used for further analyses (Raghunathan, Lepkowski, van Hoewyk, & Solenberger, 2001; van Buuren, 2007). Cluster means of all variables were included as potential predictors in the imputation model to account for the multilevel structure of the data. On the basis of the sample consisting of all people in both groups ($N = 508$), we generated 20 imputed data sets using Mplus software (Version 7.1; Asparouhov & Muthén, 2010). We used the whole sample for which we had the information about the chosen pathway on the second measurement occasion for multiple imputation to be able to analyze the data with and without the school grades filter. Results showed a similar pattern between the samples with and without the students who did not fulfill the school grade criterion (for further information, see the Supplemental Material). Here, we present the results for the sample consisting only of participants who had the opportunity to freely choose between the pathways ($n = 382$).

After generating 20 imputed data sets, we estimated the propensity scores by means of a logistic regression in each of the 20 data sets separately. To this end, the binary treatment variable (1 = vocational pathway, 0 = academic pathway) was predicted by all variables measured at the beginning of the study that were potentially relevant for the decision to attend the academic versus vocational pathway and outcome prediction (see Rosenbaum, 1984). Class means (cluster means) of the family background variables were also used as predictors in this regression analysis to account for the multilevel structure of the data and potential context effects on students' decisions.

PSM was conducted using the *MatchIt* package in R (Ho, Imai, King, & Stuart, 2013), separately for each of the 20 imputed data sets (Cham & West, 2016). We

compared six matching procedures for their effectiveness in balancing covariate distributions and the propensity score: nearest neighbor matching 1:1, nearest neighbor matching 1: N (without caliper), nearest neighbor matching 1: N (caliper = 0.2), nearest neighbor matching 1: N (caliper = 0.1), full matching 1: N (unmatched academic pathway units were discarded), and full matching 1: N (both unmatched academic and vocational pathway units were discarded). For more details about the matching procedures, see the Supplemental Material. For all matching procedures, we compared the matching quality on the basis of the standardized mean differences between the vocational-training and academic-track groups for all variables that were used to estimate the propensity score (covariates) and the propensity score itself (see Thoemmes & Kim, 2011). All standardized mean differences are presented in Table S8 in the Supplemental Material.

Finally, we computed multiple linear regression analyses on the basis of the matched data, to estimate the average effect of entering the vocational compared with the academic pathway on personality. We used robust standard errors, which adjust for the dependencies inherent in multilevel data (here, students nested in classes and schools). The intraclass correlation coefficients of all outcome variables were smaller than .056 (see Table S9 in the Supplemental Material), but nevertheless, there was some variation in both the class and school levels that should be accounted for in the final regression analysis. These analyses were also implemented in the *survey* package in R (Lumley, 2016). To account for residual bias, we included all variables that had been used to estimate the propensity score as covariates in the regression model. This approach is assumed to be doubly robust (Schafer & Kang, 2008). Final parameter estimates and statistics were obtained by pooling coefficients and standard errors across the imputed data sets by means of Rubin's rules (Rubin, 1987).

Results

Propensity-score matching

To describe differences between the two groups at the end of Grade 10 and to compare the quality of the matching after nearest neighbor and full matching, we inspected averaged standardized mean differences across all imputed data sets. These results are displayed in Table S8. To evaluate baseline differences between students who entered the academic compared with the vocational pathway, we used the recommended thresholds of standardized mean differences (i.e., effect sizes) provided by What Works Clearinghouse (2014). The

thresholds are 0.05 for equivalent groups, 0.05 to 0.25 when statistical adjustment is required, and greater than 0.25 for nonequivalent groups. The largest differences ($d \geq 0.25$) occurred for family background, school achievement, and self-concept. Students who entered the vocational pathway, compared with students who chose the academic pathway, had parents with a lower educational background, had worse mathematics grades, showed lower German achievement-test scores, reported lower self-concepts in mathematics but a higher self-concept in technical skills, and were taught in classes with a lower educational background at the end of Grade 10. These findings indicate that the selection process for entering the vocational pathway is associated with family background, school achievement, and self-concept. Additional information about the propensity-score model is provided in Table S10 in the Supplemental Material.

PSM was implemented because of these baseline differences between the two groups. The quality of the matching results was different across all matching procedures. Only for full matching—the procedure we chose in the end—was the criterion of less than 0.25 absolute standardized mean differences between the groups fulfilled across all covariates and the propensity score. Across all imputed data sets, the final matched sample sizes ranged from 328 to 352 (for more details, see Table S11 in the Supplemental Material) because all observations with propensity scores outside the area of common support were discarded (units from both the vocational and academic pathways) to achieve baseline equivalence between the two groups. After the full matching procedure was applied, differences in the propensity-score distributions between the two groups were minimized. This is illustrated in Figures S2 and S3 in the Supplemental Material by means of kernel-density estimators applied to the propensity-score distributions in the vocational- compared with the academic-pathway group.

Estimating relative effects of different pathways on personality

The findings revealed statistically significant effects on Big Five traits and interest orientations. To estimate the size of these effects, we standardized each coefficient with the average standard deviation of the corresponding dependent variable across all imputed data sets (effect size in SD_y). Students who chose the vocational pathway compared with the academic pathway had higher scores on conscientiousness, $b = 0.15$, $SE = 0.09$, $t(838.59) = 1.69$, $p = .046$, effect size (ES) = 0.24. Six years after their intermediate-track graduation, young adults reported working harder and more thoroughly if they had chosen the vocational pathway than did

those who had chosen the academic pathway. We did not find support for our hypotheses that individuals on the vocational pathway would also increase in agreeableness and emotional stability.

For interest orientations, we found negative effects of vocational training on investigative interests, $b = -0.22$, $SE = 0.09$, $t(270.40) = -2.48$, $p = .007$, ES = -0.28 ; social interests, $b = -0.19$, $SE = 0.08$, $t(304.37) = -2.51$, $p = .013$, ES = -0.22 ; and enterprising interests, $b = -0.41$, $SE = 0.09$, $t(302.71) = -4.74$, $p < .001$, ES = -0.51 . Young adults who had chosen the vocational pathway compared with those who had chosen the academic pathway reported less interest in investigative activities such as conducting experiments in a laboratory or observing and analyzing things. Furthermore, people on the vocational compared with the academic pathway reported being less interested in social activities such as taking care of or teaching other people, and they reported less interest in enterprising operations such as leading a group at work or negotiating something with other people. The findings are summarized in Table 3. For more details about all regression coefficients, see Tables S12 to S22 in the Supplemental Material.

Sensitivity analysis

We additionally conducted a sensitivity analysis based on work by VanderWeele and Arah (2011) to assess the robustness of our findings in the presence of single, unobserved confounding variables (for more information, see Table S23 in the Supplemental Material). For this sensitivity analysis, we needed to determine the association between the unobserved confounder and the outcome variable as well as the relationship between the unobserved confounder and the treatment variable. We assumed that the relationship between the confounder and the outcome variable could be small ($d = 0.10$), medium ($d = 0.30$), or large ($d = 0.50$). Then, we calculated the difference in the possible confounder between the treatment and the control groups that would be necessary to eliminate the previously observed findings. Overall, large differences in an unobserved confounder between the students entering the academic pathway and students entering the vocational pathway as well as a strong relationship between the confounder and the outcome variable would be necessary to eliminate the previously reported findings (see Table S23). Even though single unobserved confounders might exist, strong relationships between this confounder and the outcomes as well as between the confounder and the choice of educational pathways would be necessary to diminish the observed results.

However, only one confounder could be considered in this analysis, and if there were several confounding variables that were related to the outcomes and educational

Table 3. Vocational-Path Effect (Pooled Across 20 Imputed Data Sets)

Dependent variable	Vocational path effect	SE	<i>t</i>	<i>df</i>	<i>p</i>	Effect size in <i>SD_Y</i>
Big Five						
Extraversion	-0.05 [-0.21, 0.10]	0.08	-0.68	334.57	.495	-0.07 [-0.25, 0.12]
Agreeableness	0.02 [-0.18, 0.22]	0.10	0.18	627.96	.430 ^a	0.02 [-0.22, 0.27]
Conscientiousness	0.15 [-0.02, 0.32]	0.09	1.69	838.59	.046 ^a	0.24 [-0.04, 0.53]
Neuroticism	0.00 [-0.20, 0.20]	0.10	0.00	186.60	.499 ^a	0.00 [-0.24, 0.24]
Openness	0.07 [-0.07, 0.20]	0.07	0.94	642.15	.346	0.09 [-0.10, 0.28]
Vocational-interest orientation						
Realistic	0.06 [-0.08, 0.20]	0.07	0.86	279.05	.388	0.07 [-0.09, 0.24]
Investigative	-0.22 [-0.39, -0.04]	0.09	-2.48	270.40	.007 ^a	-0.28 [-0.50, -0.06]
Artistic	-0.02 [-0.18, 0.13]	0.08	-0.30	747.10	.763	-0.03 [-0.23, 0.17]
Social	-0.19 [-0.35, -0.04]	0.08	-2.51	304.37	.013	-0.22 [-0.39, -0.05]
Enterprising	-0.41 [-0.58, -0.24]	0.09	-4.74	302.71	< .001	-0.51 [-0.72, -0.30]
Conventional	-0.09 [-0.28, 0.10]	0.10	-0.89	252.18	.374	-0.11 [-0.36, 0.14]

Note: Values in brackets are 95% confidence intervals (CIs). The effect of choosing the vocational pathway relative to the effect of choosing the academic pathway is represented by the multiple regression coefficient of the group variable (0 = academic pathway, 1 = vocational pathway). To estimate the size of this effect, we standardized this coefficient with the average standard deviation of the dependent variable across all imputed data sets (effect size in *SD_Y*). Lower and upper boundaries of the 95% CI of each effect size were calculated by dividing the boundaries of each regression coefficient by the average standard deviation of the dependent variable across all imputed data sets.

^aThis *p* value is one-tailed because the hypotheses were directional.

pathways, smaller differences would be sufficient to eliminate the vocational-pathway effects. This is a critical point, but we considered a broad set of covariates and all pretest measures of the outcome variables to minimize the probability of overlooking an important confounder.

Discussion

This study investigated whether the choice of educational pathway is associated with personality changes. Assuming that propensity-score techniques can control for a wide set of observed covariates, our results indicate that different school and work-related paths were differentially associated with adolescents' personality development. With a PSM approach, we showed that such differences go beyond selection effects and reflect potential socialization effects of different experiences found in each respective environment. Using a broader conceptualization of personality (see Roberts & Nickel, 2017), we investigated changes in interest orientations in addition to the Big Five. In particular, entering the vocational (vs. the academic) pathway was related to becoming more conscientious and being less interested in investigative, social, and enterprising activities. We believe there are two main reasons for these changes: new social roles and specific environmental characteristics that demand and reward specific attitudes and behaviors.

According to the social-investment principle (Roberts & Nickel, 2017; Roberts et al., 2008), entering new environments is associated with new social roles and

behavioral expectations that influence people's attitudes and behaviors. In many vocational-training paths, trainees depend on coworkers who need to rely on each other (see Stryker, 2007). Committing to rules and being a reliable coworker is important not only to the individual (e.g., keeping one's job) but also for the whole team. Vocational training is characterized by well-defined demands and more severe behavioral rules than experiences in school (see Nye & Roberts, 2013). Given our results, it appears that the demands of the vocational path provide clear incentives for personality maturation (Roberts, Caspi, & Moffitt, 2003). Consistent with this interpretation, our findings showed that people on the vocational pathway became more conscientious than people on the academic pathway (see also Leikas & Salmela-Aro, 2015).

New tasks and a different social setting could also influence personality development and may explain the changes in interest orientation because exposure is a precondition for interest development (see Su, Murdock, & Rounds, 2015). Investigative environments (e.g., an academic school track) are postulated to stimulate investigative activities, encourage scientific competencies, and reward people for displaying scientific values and attitudes (Holland, 1997). Correspondingly, students on the academic pathway reported higher investigative interests than individuals on the vocational pathway.

Furthermore, whereas students at school are surrounded by same-age peers with a similar social status, trainees frequently work in teams with older and more experienced colleagues and superiors (see Jokisaari,

2013). In vocational training, there is more need to subordinate to given hierarchies and comply with dominant supervisors. This may reduce self-assurance and delay opportunities to take leadership positions compared with academic-track students. The latter may perceive themselves as more likely to obtain leadership positions because of their higher educational attainment. Thus, the different social settings might explain the differences in enterprising interests.

The social setting might also explain the somewhat counterintuitive finding that the vocational-pathway students became less interested in social activities. These individuals may have less fluid social networks. In contrast to social groups in school, vocational trainees frequently work in set teams and cannot easily switch teams or tracks. Consequently, they may more frequently be exposed to problematic and unsatisfying social interactions and might therefore experience social interactions not only as joyful leisure activities but sometimes also as hard work, which may in turn influence their attitude toward other people. These ideas are purely speculative and suggest the need to better identify the intervening mechanisms that might help explain the personality changes we found.

This is the first study to use PSM to investigate how the decision of entering and following an educational pathway may influence personality development. Given the design, broad set of variables, and analytical strategy, we were able to estimate the relationships between educational pathways and personality development. In contrast to previous research using observational methods and analytical models, we used PSM to control for group differences before the life event occurred. This enabled us to draw stronger inferences about differential personality development in different environments.

However, the study has several limitations. First, in PSM, the selection of covariates determines the quality of matching results and conclusions that are drawn from the data. Effect estimates are causally unbiased only if all relevant covariates for choosing one of the two pathways and the outcome variables are included in the model. We used a broad set of covariates that may affect the pathway decision and the most important outcome predictors (the pretests of our target outcomes) to fulfill this requirement.

Second, we had no information about the mechanisms underlying the observed changes in personality (e.g., role perception in both tracks; see Roberts & Nickel, 2017). We can only speculate about which changes in the environment may have led to the differences in conscientiousness and interest orientations.

Third, we had no indicator of when the differences occurred between the two groups. Additional measurement occasions (e.g., immediately at the end of the vocational training and academic-track school) would

reveal more information about the time course of personality changes. Nevertheless, the advantage of the chosen time points is that observed effects cannot be attributed to a specific situation (e.g., the experience of a first job) but rather reflect the cumulative association of experience on personality change.

Fourth, this study design provides insights into personality change associated with different life paths, but the generalizability of the results probably depends on the affordances and constraints of the investigated school system and cultural background. Furthermore, there was a large dropout rate. Almost 68% of the original sample did not participate at the second measurement occasion. Although high attrition rates are common in longitudinal survey designs, this high level of attrition limits the representativeness of our sample. In addition, differential dropout rates between people in different educational pathways (e.g., due to differences in conscientiousness) cannot be excluded. However, the differences between the samples of dropouts and continuers were rather small, especially for the targeted outcome variables measured at the end of Grade 10 (for further details, see the Supplemental Material).

In conclusion, we conducted a longitudinal investigation of the putative effect of choosing one of two different life paths—early entry into work or continued education. We found differential effects showing that people who chose a vocational path appeared to mature at a faster rate and showed diminishing interests in several domains (e.g., social and enterprising interests). Future longitudinal investigations are needed not only to replicate this work but also to test potential mechanisms that might explain these patterns.

Action Editor

D. Stephen Lindsay served as action editor for this article.

Author Contributions

U. Trautwein and B. Nagengast developed the study concept. U. Trautwein, B. Nagengast, and R. Göllner contributed to the study design. N. Hübner and S. Rieger were responsible for data preparation and data management. J. Golle and N. Rose analyzed the data, and all authors were involved in interpreting the results. J. Golle drafted the manuscript, and all coauthors contributed to the final manuscript. All the authors approved the final manuscript for submission.

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Supplemental Material

Additional supporting information can be found at <http://journals.sagepub.com/doi/suppl/10.1177/0956797618806298>

Open Practices

This study was conducted several years ago. The data will not be readily available to all readers, but we will make the data and syntax available to other researchers who would like to recalculate our analyses. Materials have not been made publicly available, and the design and analysis plans for the study were not preregistered.

Note

1. This average was calculated from the absolute values of the meta-analytic correlations provided in Mount et al.'s (2005) Table 3. This average is not a sample-size-weighted average.

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