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Discontinuities in vocational education and training: the influence of early-risk factors and personality constructs on premature training termination and subsequent trajectories

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Abstract

Background: For adolescents, preventing a premature training termination (PTT) and withdrawal from education and training after a PTT is an important societal task. While studies reveal that early-risk factors such as a low educational background or selected personality constructs are relevant for predicting PTT, less is known about subsequent trajectories after a PTT and the factors that determine them.

Methods: Using data from the German National Educational Panel Study, we examine the influence of early-risk factors and personality constructs on the first PTT ($n = 4892$) in the training course using a binomial logistic regression model. In a second step, by using a sequence and cluster analysis we explore subsequent trajectory patterns within 24 months after PTT ($n = 944$) and analyze the influence of early-risk factors and personality constructs on subsequent trajectory clusters after PTT.

Results: We identify 7 different trajectory clusters, of which three clusters show risk-related trajectories (37.0%) with tendencies to withdraw from education and training. Furthermore, our analysis confirms the relevance of early-risk factors for predicting PTT as well as trajectories after PTT: a low educational qualification, graduation after more than the typical number of years, and low parental education increase the probability of discontinuities in adolescents' educational and training paths. Additionally, it is important to consider the influence of personality traits on the subsequent trajectories: adolescents with strong openness tend to have continued school attendance after PTT, indicating a constructive career adaptation process, while adolescents with strong self-efficacy seem to assess their chances in the labor market as positive even without a vocational qualification.

Conclusions: The longitudinal perspective on the consequences of a first termination of a VET program revealed that educational trajectories after a PTT are highly heterogeneous indicating the need for different types of policy measures to minimize the incidence of PTT and withdrawing from education and training.

Keywords: Vocational education and training, Premature training termination, Trajectories after a premature training termination, Early-risk factors, Withdrawal from education and training, Social and migration background, Educational background, Big Five, Sequence and cluster analysis

Introduction

Educational transitions play a pivotal role in shaping educational careers, as they have long-lasting consequences. Adolescents leaving educational programs without an occupational degree face problems concerning not only their integration into the labor market but also their social integration (Gesthuizen and Solga 2014; Patzina and Wydra-Somaggio 2020; Vanttaja and Järvinen 2006). In addition, successful school-to-work transitions are important for securing a skilled workforce. Hence, preventing students from dropping out of education before achieving a recognized level of educational attainment is an important societal task (Psifidou et al. 2021). However, early termination of education and training is a key challenge in several countries: the share of early leavers of education and training programs varies widely in 2020 between European Union (EU) member states, ranging from 2.2% in Croatia to 16.0% in Spain in the 18- to 24-year-old adolescent population (EU-27 average, 9.9%; Eurostat 2021).

The fully qualifying vocational education and training (VET) as one option of postsecondary education is assigned a high priority to foster integration into the labor market. However, training-to-work transitions do not necessarily follow linear patterns but can result in trajectories with multiple episodes and transitions including a premature training termination (PTT). This is observable independently of the structure of the VET-system (company based, dual training or school-based VET system) in several countries (e.g., Australia: Karmel and Mlotkowski 2010; Germany: BiBB 2021; England: Gambin and Hogarth 2016; Switzerland: Schmid and Stalder 2012).

While most research studies have focused on the factors explaining PTT (cf. Böhn and Deutscher 2021b), little is known about the educational trajectories after PTT. Some studies have analyzed specific events after PTTs and have shown that a PTT does not necessarily indicate dropping out of the VET system without graduation, as adolescents may continue their training with another training provider and/or in another occupational field (Lettau 2017; Kotte 2018; Neuenschwander and Süss 2004; Schmid and Stalder 2012; Wydra-Somaggio 2021) or decide to continue their education outside of VET, whether in general or in higher education. However, these studies fall short in visualizing the heterogeneous patterns and diversity within a trajectory. Only Duc and Lamamra (2014) analyzed individual trajectories using a qualitative longitudinal study design and revealed heterogeneous and idiosyncratic patterns of trajectories; however, their sample consisted of only 46 Swiss trainees and was therefore not representative.

The aim of this paper was to extend the current research perspective on PTT from a longitudinal perspective on the consequences of a first termination of a VET program. Thus, we will consider an integrated perspective of first PTTs in the training course and subsequent trajectories to better understand how PTT can be prevented and how guidance and counseling can be improved to minimize the risk of withdrawing from education and training. For this purpose, we applied a sequence and cluster analysis to examine the different trajectory clusters that emerged after PTTs and to investigate

how they can be explained. We used current representative data from Germany, which constitute an interesting case, as the German VET system is of interest to many policy makers in different European countries. It represents an occupational labor market setting such as Austria, Denmark, and Switzerland, in which returns to education strongly depend on the attainment of formal degrees (Shavit and Müller 1998).

For the analysis of the predictors of PTT and subsequent trajectory clusters after PTT, we focused on a life-course perspective on discontinuity in VET. We presumed that important presage factors can influence adolescents' capabilities to shape their education and training course in a responsible and self-directed way (Baethge et al. 2006), such as outcomes of prior educational pathways, family resources, and occupational aspirations. Therefore, we concentrated on the following factors: low educational qualification, low school achievement, discontinuity in the previous educational course, low socioeconomic background, a migration background, and failure of adolescents to realize their desired occupations. We call these early-risk factors. Moreover, we examined the relevance of personality constructs that are important for career adjustments in the training course. To address the question of why some individuals successfully master the trajectory after a PTT, whereas others do less well, we paid attention to within-group differences to better understand how guidance and counseling can focus on specific risk groups.

Theoretical-conceptual framework of the relevance of early-risk factors and personality constructs for predicting PTT and subsequent trajectories

By following the 3-P model of workplace learning (Tynjälä 2013), several presage and process factors can be considered important for explaining training success (product). Presage factors include, on the one hand, learner factors that emphasize the preconditions of the learner regarding their knowledge, competencies, motives and engagement, dimensions that are not independent of the educational biography and family background of the learner. On the other hand, they also include factors regarding the occupational prerequisites of the learning context (company and schools), such as organizational structure or quality of the staff. Meanwhile, process factors can be characterized as the types of learning practices applied in the learning context (e.g., informal learning vs. explicit teaching, and social interactions). The model illustrates that training success is a complex interplay of all these factors. However, research has shown that the learning context and training quality have a great impact on training (Böhn and Deutscher 2021a; 2021b). In this study, we concentrated on a life course perspective of discontinuity in the training course and therefore on important learner factors that signal adolescents' capabilities to shape their educational and vocational trajectory in a responsible and self-directed way (Baethge et al. 2006). In this regard, we consider PTT to be not just an effect of the situation within the training situation itself (following the assumptions of Dawis and Lofquist 1984). Rather, we analyzed PTT as the cumulative result of multiple risk factors that can be identified early in a person's life and relied on important assumptions drawn from research on transitions from school to the labor market.

High relevance is attributed to educational biography, especially to the skills and abilities that adolescents acquire through formal education, as these characteristics are

important learner factors for coping with the demands in the training process and for developing vocational skills (Tynjälä 2013; Winther and Achtenhagen 2009). Beyond this, family resources and a migration background must be considered, as they are relevant characteristics that cause inequalities in educational careers (for a summary of theoretical assumptions and research findings, see Busse 2020; Solga 2005; Stocké et al. 2011). The assumptions of person-environment fit research are used to explain the effects of not starting VET in the desired occupation (Kristof-Brown et al. 2005; Nägele and Neuenschwander 2015). Furthermore, theoretical assumptions on career development highlight the importance of personality constructs for career adaptability (Savickas 1997; 2013). In summary, we distinguished four dimensions of early-risk factors (low educational performance, low socioeconomic background, migration background, and failure to realize the desired occupation) and selected personality constructs to explain PTT and the subsequent trajectories. In the following sections, we will provide theoretical considerations on why adolescents' likelihood for PTT and the subsequent trajectories after PTT vary by these characteristics.

Low educational performance

The findings of previous research reveal that the former educational experience influences the likelihood of experiencing a PTT: Those with a low school-leaving qualification are more likely to experience a PTT (Beicht and Ulrich 2009; Beicht and Walden 2013; Laporte and Mueller 2013; Rohrbach-Schmidt and Uhly 2015). Furthermore, low school grades (Beicht and Ulrich 2013; Seidel 2019) and discontinuity within the educational path (Beicht and Walden 2013) foster the experience of a PTT. One reason for these effects is the fact that a low school-leaving qualification and low grades are associated with more learning problems within the VET, which can subsequently lead to the decision to quit the training prematurely (BiBB 2020). In addition, low school performance limits the possibilities of occupational choices within the two sectors of VET, as the chances of entering training in a particular track or occupational field vary with the obtained school degree (Autorengruppe Bildungsberichterstattung 2020; Michaelis and Busse 2021). This in turn can lead to problems fitting with the VET environment and may result in more conflicts within the training course. We therefore expect higher risks of PTT among adolescents with low school performance (*Hypothesis 1a, H1a*).

A PTT might lead to a reduced effort to look for a new VET position. This happens when adolescents have learned—owing to their mostly negative school experiences and now failure in a specific VET program—that they are stigmatized as not being good enough (Goffman 1963). As a consequence, disidentification with educational goals and a voluntary withdrawal from any educational setting takes place (Solga 2004). Following the assumptions of signaling theory and job competition models, this experience could be reinforced if employers use information about PTT in addition to formal degrees and grades as a proxy for trainability (Spence 1974; Thurow 1975). In this sense, the label of “having a low qualification” in combination with a PTT may strongly restrict the success of returning to institutional education owing to employers' screening of applicants (Holtmann et al. 2017). The few studies analyzing further trajectories after a PTT suggest that low-qualified adolescents face higher problems re-entering VET (Wydra-Sommagio 2021; Lettau 2017) and are more likely to withdraw from education and training (Lettau

2017). In addition, admission regulations in vocational schools, especially at institutions of higher education, limit the educational opportunities of low-qualified adolescents and therefore influence further trajectories after PTT. Altogether, we expect that adolescents with low educational performance are less likely to stay within the educational system (*Hypothesis 1b, H1b*).

Low socioeconomic background

Educational achievement and integration into the labor market are highly socially selective (Bourdieu 1983; Breen and Jonsson 2005). Studies on the influence of socioeconomic background on the likelihood of experiencing a PTT and on further trajectories after a PTT are scarce but thus far suggest that family resources are still of importance after entering VET. Thus, adolescents from educationally and socially deprived families have higher risks not only of PTT (Beicht and Walden 2013) but also of stopping further educational investments (Lettau 2017).

The reasons for the influence of parental background on educational trajectories are manifold. First, parents are important providers of information about the structure and organization of educational and training paths (Erikson and Johnson 1996) and about available training places and job requirements (Granovetter 1974). This includes subject-specific knowledge about VET opportunities and general aspects of employment, such as work processes and working conditions (Buchmann and Kriesi 2012; Richter 2016). Hence, less educated and less employed parents are less likely to be able to continuously support the educational trajectories of their child. Second, a low socioeconomic background of parents is associated with less parental guidance, engagement, and monitoring. As perceived encouragement and support from parents fosters behavioral engagement in school and VET (Elffers 2013), it can be expected that poor family resources go along with more problems during VET. Third, parental educational expectations substantially influence adolescents' educational and career decisions (Schoon and Parsons 2002; Schuchart and Maaz 2007). These expectations and the value parents attach to different educational options in turn vary according to social origin (Boudon 1974; Breen and Goldthorpe 1997). Thus, the intergenerational link with regard to educational achievement is reinforced, as adolescents tend to prefer the type of educational program completed by their parents (Buchmann et al. 2007).

We therefore expect that lower parental resources decrease the chances of adolescents successfully completing the VET program (*Hypothesis 2a, H2a*), and adolescents are more likely to face problems re-entering an educational setting after experiencing a PTT (*Hypothesis 2b, H2b*).

Migration background

Research on PTT thus far reveals that migrants respectively persons with a foreign nationality more frequently terminate their VET program before acquiring an occupational degree (Beicht and Walden 2013; Rohrbach-Schmidt and Uhly 2015; Stalder and Schmid 2016) or have higher intentions to quit their VET (Seidel 2019). Additionally, those few studies in Germany and Switzerland that analyze further educational trajectories after a PTT reveal that foreigners and migrants face more problems re-entering VET than native-born citizens (Stalder and Schmid 2016; Wydra Somaggio 2021). Often,

the lower performance of migrants can be at least partly explained by their lower educational achievements and family resources on average (Beicht and Walden 2019; Autorengruppe Bildungsberichterstattung 2020). Additionally, we know from research on school-to-VET transitions that the concept of social interactions within firms is important for explaining recruitment practices as companies seek to keep horizontal and vertical social relationships free of conflict. According to this, some ethnic majority business owners perceive the potential of minorities to disturb smooth and familiar ways of social interaction (Imdorf 2017). Thus, the disadvantages of migrants regarding the successful completion of a VET program might be due social barriers within the company. In addition, adolescents with a migration background find themselves more often in economic sectors and training occupations in which the risk of a PTT is particularly high (Granato 2003), which in turn can lead to higher risks of a PTT. Regarding further educational trajectories, the perceived barriers migrants might have faced during their search for a training place are expected to influence later educational behavior (Ogbu and Simons 1998). As a result of anticipated discrimination, migrants may elect to remove themselves from the applicant pool and instead try to improve their educational chances by achieving a higher school degree. This might be reinforced by the high educational aspirations of migrants shown in several studies (e.g. Becker and Gresch 2015; Busse 2020). Accordingly, we assume that migrants not only face a higher risk of prematurely terminating their VET program (*Hypothesis 3a, H3a*) but are also less likely to experience re-entry into a VET program after a PTT (*Hypothesis 3b, H3b*).

Failure to realize the desired occupation

Research on person-environment fit reveals that congruence between an employee and his or her work environment prevents job termination (Kristof-Brown et al. 2005). Hence, finding an occupation that corresponds to adolescents' needs (e.g., interests, skills, etc.) is an important task in the school-to-VET transition. Findings on the influence of person-occupation fit on career prospects confirm this assumption: A good fit between a trainee and his or her occupation is important for less friction in the training process (Nägele and Neuenschwander 2014; 2015; 2016). Additionally, some studies show that the risk of a PTT decreases significantly when trainees can realize their desired occupation (Beicht and Ulrich 2009; Beicht and Walden 2013; Michaelis and Findeisen 2022), which should be seen as an indicator of person-occupation fit. Consequently, we assume that if adolescents are not able to realize their desired occupation, PTT is more likely (*Hypothesis 4a, H4a*).

Determining to what extent a failure to realize the desired occupation also has an impact on trajectories after PTT is another research goal. Assuming that adolescents try to realize their desired occupation in another way, we expect that they continue with education and training (*Hypothesis 4b, H4b*).

Personality constructs

Based on the assumptions of social cognitive theory (Bandura 2001), decision processes depend on self-regulatory capabilities (agency). Therefore, career construction theory particularly highlights the relevance of career adaptability and the ability of individuals to find career-, vocational- and work-related environmental contexts that fit their own

psychosocial resources (Savickas 1997; 2013; Hirschi et al. 2015). Due to the complex structure of relevant psychosocial resources, the Big Five traits (extraversion, agreeableness, conscientiousness, openness, neuroticism) are often used as proxies for important personality constructs. Empirical findings reveal a relationship between Big Five personality traits and career adaptability (Rottinghaus et al. 2005; Rudolph et al. 2017; Zacher 2014). In the context of VET, the influence of the Big Five dimensions is less consistent. In the study of Volodina et al. (2015), the Big Five dimensions were not important for explaining PTT intentions, and only neuroticism proved to have a small effect. However, the representativeness of this sample for the VET system is limited because only 4 occupations (industrial clerks, car mechanics, industrial technicians, and electrical technicians) were included. In a study by Nießen et al. (2020) with a more representative sample, different results of the Big Five traits were found: whereas agreeableness and openness increased the risk of a PTT and the intention to quit, conscientiousness helped prevent PTT. The effect of openness and agreeableness on the likelihood of a PTT in our view can be seen as a result of a lack of social compatibility in the vocational track, and in this situation, adolescents try to proactively shape their own career. Therefore, we assume that openness and agreeableness bring about a constructive change in the education and training course, which in turn leads to higher risks for a PTT but also to a higher likelihood of adolescents re-entering into education and training programs after a PTT (*Hypothesis 5a, H5a*). Conscientiousness is often associated with traits such as “careful, thorough, responsible, organized, and plan-oriented” and sometimes also “hardworking, achievement-oriented, and persevering” (Barrick and Mount 1993, p 4). Therefore, in the context of VET, conscientiousness should be regarded as important for task mastery. Thus, we assume that low conscientiousness negatively affects further progress and increases the risk for a PTT as well as risk-related trajectories of withdrawing from education and training (*Hypothesis 5b, H5b*).

In addition to the Big Five traits, self-efficacy is an important personality construct of career development (Lent et al. 1994) and is often linked to research on career adaptability (Chen et al. 2020). Self-efficacy is the belief in one’s own capabilities “to organize and execute courses of action required to attain designated types of performances” (Bandura 1986, p. 391). Findeisen et al. (2022) show that occupational self-efficacy increased the persistence intention in VET. However, we do not know of any studies that investigate the influence of self-efficacy on PTT or subsequent trajectories after PTT. Based on the theoretical assumptions of Bandura (1986) we assume that low self-efficacy not only increases the risk of experiencing a PTT but also leads to a higher probability of withdrawing from education and training (*Hypothesis 5c, H5c*).

Institutional structure of school-to-work transitions in Germany

Germany is a country with a strong VET tradition indicating that after leaving general education, VET alongside higher education is a major provider of postsecondary education. In 2019, approximately 500,000 of the new entrants into postsecondary education started in higher education and approximately 700,000 started in a VET program; two-thirds of them were in the dual system of firm-based training combined with school-based education and one-third were in the school-based VET system (Autorengruppe Bildungsberichterstattung 2020). These two sectors train for different

occupations, as school-based programs focus mainly on occupations in sectors such as health, social work and education, whereas occupations of the handcraft sector, the industrial manufacturing sector and, to a much lesser extent, the service sector are more strongly represented in the dual system (Protsch and Solga 2015b). Beginning an apprenticeship in the dual system is open to all school leavers—even those without a school-leaving certificate. However, the chances of entering training in a particular track or occupational field vary with respect to the school-leaving qualification (Protsch and Solga 2015b). In contrast, access to school-based VET is institutionally regulated, with an intermediate school degree being the minimum qualification in most of the trainings offered (Michaelis 2017). Thus, firms and vocational schools (as providers of school-based VET programs) influence the chances of obtaining a training place as they select candidates. Individuals who do not manage to directly enter higher education or VET often end up in prevocational training programs, which usually last one year and are mainly school-based; some also include mostly short terms of workplace training. Those programs do not lead to a recognized occupational training certificate but are established to increase the chance of obtaining a vocational training place afterward by improving the skills of the adolescents.

In Germany, every 4th company-based training contract is terminated prematurely (BiBB 2021). For school-based VET, no official data exist, but an analysis by Beicht and Ulrich (2009) reveals even higher rates of PTT for this sector. Adolescents who experience a PTT find themselves in a situation regarding the decision about their further educational trajectories similar to the one they experienced right after general education: depending on their educational achievements as well as the recruiting practices of employers and admission regulations in vocational schools and institutions of higher education, they may either re-enter into fully qualifying VET programs, higher education, or prevocational programs; decide on further school attendance and in this way stay within the educational system; stop their educational investment altogether by entering the labor market as an unskilled worker; or remain unemployed. The timing of re-entering an educational setting is strongly defined by the beginning of a new school year. Therefore, short periods of employment or unemployment after PTT are possible but seem to be less likely if adolescents change the VET program within the same occupational field or move to another company but continue in the same occupation (Schmid and Stalder 2012).

Methods

Data

For our empirical analysis regarding the occurrence of a PTT and subsequent trajectory patterns, we used data from Starting cohort 4 (SC 4) of the German National Educational Panel Study (NEPS) (Blossfeld et al. 2011). This longitudinal dataset contains biographical information on 16,425 adolescents who participated in the 9th grade of general education in Germany in the fall of 2010 and allows for monitoring until 2018/2019.¹

¹ From 2010 to 2013, adolescents were interviewed up to twice a year. Since 2014, interviews have generally been conducted annually. Whereas the first interviews were conducted at school, after leaving general education computer-assisted telephone and web interviews are used. With each interview, status information is obtained monthly (e.g., participation in education and training programs, employment, and unemployment status, etc.). Participation in the survey was voluntary but incentives were used to increase the motivation for participation.

This dataset was suitable for our analyses in two main ways. First, it allowed us—in contrast to many others—to observe training not only in the dual VET system but also in the school-based VET system. Second, as participants were resurveyed once or twice a year, the dataset consists of rich information about the educational and employment trajectories of adolescents, which made the analyses of trajectories after the first PTT possible. The main limitation of the data is that it hardly encompasses the institutional characteristics of vocational schools and companies that have an influence on the risk for a PTT (e.g., Rohrbach-Schmidt and Uhly 2015), which often remains a black box in survey-based research.

As we were interested in the training courses of the adolescents, whether they were successful or not and what paths were taken after a PTT, we focused on adolescents who began a VET program within the observation period between 2011 und 2019 ($n = 4892$). A VET program is defined as an apprenticeship (dual VET) or training at a school of public health or vocational schools (school-based training; in German: *Berufsfachschule*, *Fachschule* or *Schule des Gesundheitswesens*).² We excluded from the analysis those trainees who began their first VET program abroad and those for whom we had a start of training before 2009, as this is methodologically implausible.

In a second step, we focused on trajectories after PTT. Therefore, we reduced the sample to those participants with an observation period of at least 24 months after their PTT. Following Dlouhy and Biemann (2015), persons with more than 30% missing data in the observable months after PTT were excluded. Thus, we deleted persons with missing data in more than 7 months of the 24 months observation period after PTT. 944 persons were left for the analysis of the trajectories after PTT. Figure 1 displays the derivation of the sample and subsamples.

Dependent variables

Premature training termination

Our first dependent variable, PTT, describes individuals who began a VET program for their first time—either in the dual or school-based VET system—but did not complete it with an occupational degree (1). Graduates, by contrast, successfully obtained a formal vocational certificate (0). As we did not have information about the graduation status for all vocational episodes, we edited the data in these cases as follows: a PTT was assumed if the observation duration was less than 13 months, whereas episodes that lasted 13 months and more were considered successful.³ This cutoff was set because it is almost impossible in Germany to complete a VET program within one year. At the same time, it is a less restrictive setting in comparison to the standard period of 24 to 48 months of VET programs in Germany (the majority of training tracks last 36 months). However, in Germany, the training duration time can be reduced due to recognitions from prevocational programs or voluntary reductions in duration time by higher educational qualification (up to 12 months). Additionally, one must keep in mind that underestimations were possible, as starting and end times were based on participant answers and not on

² As some respondents had difficulties differentiating between VET, prevocational programs and further or other training we used a generated variable (ts15105) offered by the data holder which considers these inaccuracies.

³ For 451 cases we had to edit the data as we had no information on the graduation status.

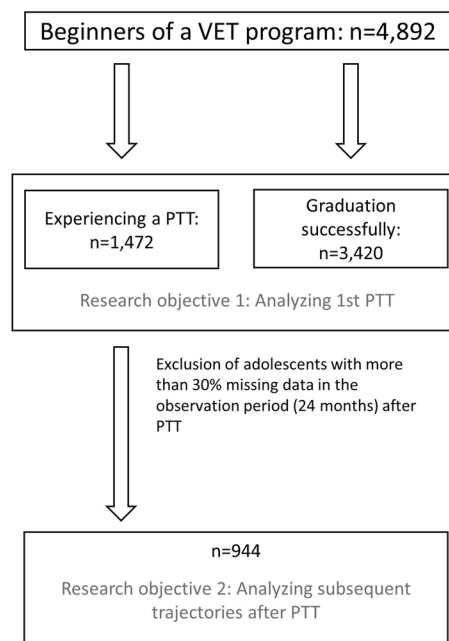


Fig. 1 Study sample

official information from training contracts or school records. Thus, we identified 1472 adolescents with a PTT in their first VET program and 3420 trainees who graduated successfully.

Belonging to a specific trajectory cluster after PTT

The second dependent variable describes belonging to a specific trajectory cluster after PTT in the first VET program. We conducted a sequence and cluster analysis (see “[Analysis strategy](#)” section) for which we used detailed information from the participants’ biographies for the first 24 months after their PTT. NEPS provides information on a monthly basis about the activity status, of which we distinguished 8 different types: (1) VET, (2) prevocational program, (3) general education, (4) higher education, (5) unemployment, (6) employment, (7) other, like military, and (8) unknown. In some cases, parallel statuses appeared in the same month. We resolved these duplicates by using only one status per month, prioritizing the status according to the ranking above. This means that VET superseded prevocational programs, prevocational programs superseded general education, etc.

Independent variables

Low educational performance

We distinguished four different early-risk factors to describe low educational performance. Regarding the school-leaving certificate we differentiate between trainees with no or a low school-leaving qualification (coded as 1) and those with an intermediate or upper secondary school degree (coded as 0). To analyze the effect of school achievement,

we also used information about the last known grade point average (GPA). In Germany, grades differ between 1 (very good) and 6 (unsatisfactory). We differentiated between adolescents who achieved a GPA of greater than 3.0 (coded as 1) and those who did better. This threshold was used because it seems to be an important selection criterion for human resource managers (Protsch and Solga 2015a, p. 525). In addition, we included variables to describe discontinuity in the previous educational trajectory before beginning the first VET program. First, we distinguished whether the educational qualification had been accomplished in more than the typical number of years of general education (for no or a low school-leaving qualification, this would be 9 years; for an intermediate school-leaving qualification, 10 years; and for an upper secondary school degree, 12 to 13 years). Second, we considered whether someone had participated in a prevocational program before beginning VET.

Low socioeconomic background

We used different measurements to capture the various ways parents may influence the educational pathways of their children. On the one hand, we used information on the highest parental education based on the CASMIN classification. We differentiated between low parental education (coded as 1), meaning that no parent achieved an upper secondary school certificate, a VET or a higher educational qualification, and those whose parents achieved at least one of these qualifications (coded as 0). On the other hand, we used the highest occupational status of the parents measured by the International Socio-Economic Index of Occupational Status (ISEI-08). The ISEI-08 scale ranges from 11 to 89, and we followed the conception of Autorengruppe Bildungsberichterstattung (2020) by distinguishing two groups based on the distribution of the ISEI-08 in the entire NEPS dataset. We identified adolescents as having parents with a low occupational status if the highest parental ISEI-08 score was lower than two-thirds of all parents in the NEPS ($\text{ISEI-08} \leq 32.50$, coded as 1; all others coded as 0). For both variables, we used information obtained through surveys of parents and adolescents but prioritized information from parental surveys.

Migration background

In the NEPS dataset, differentiated information about the generation status of adolescents is available. To avoid overestimating effects in our statistical models, we dichotomized the information of the generation status by coding as 1 those who were born abroad or had at least one parent born abroad, and all others were coded as 0.

Failure to realize the desired occupation

In the NEPS dataset, no scales exist to measure a failure in person-occupation fit. However, during general education and prevocational programs, adolescents were regularly asked about their intention to apply for a specific occupation. We used the information of the last application intention before beginning VET and checked whether the realized training occupation corresponded to the application intention (coded as 0) or not (coded as 1). For this, we used the information of the occupation on the most differentiated

occupational level of the German standard occupational classification system *KldB 2010* (5-digit level)⁴ given in the dataset.

Personality constructs

Based on the findings of Nießen et al. (2020), we included conscientiousness, agreeableness and openness of the common Big Five factor model of personality. The NEPS used a short scale of the Big Five Inventory with two items per dimension (BFI-10; Rammstedt and John 2007). Only for measuring agreeableness the NEPS dataset was expanded by a third variable. As was already known from Nießen et al. (2020), Cronbach's alpha values of the Big Five dimensions in the NEPS dataset are low (for conscientiousness: 0.483; for agreeableness: 0.351 and for openness: 0.359), which is particularly related to the number of items. However, convergent validity of the BFI-10 with the NEO-PI-R (a common scale for measuring Big Five factor model of personality) is strong (Rammstedt and John 2007), which is a more important diagnostic criterion. Additionally, we included a 10-item scale for general self-efficacy (Cronbach's alpha: 0.793). All personality scales were used in z-standardized form (mean = 0, standard deviation = 1) in our multivariate analyses.

Control variables

We included several control variables. We distinguished between sectors of VET because of higher rates of PTT in Germany's school-based VET system (Beicht and Ulrich 2009). In addition, we distinguished whether the training took place in a federal state of West or East Germany, as research for the dual system has shown that PTT is more frequent in eastern German federal states (BiBB 2021; Seeber et al. 2019). Furthermore, we controlled for sex; females were coded as 1 and males were coded as 0. Due to findings of Wydra-Somaggio (2021) that a short training duration until first PTT can lead to a higher probability returning into VET, we also controlled for the time spent in first VET until PTT in months in the analysis of cluster membership after PTT.

Table 1 contains the operationalization of the dependent, independent and control variables including information on scales and time of measurement. Distributions and descriptive statistics of the independent and control variables are presented in Table 2.

Analysis strategy

In the first step, predictors of PTT in the adolescents' first VET program were examined. Binomial logistic regressions were used to calculate the effects of the independent and control variables on the likelihood of experiencing a PTT. The output was specified in average marginal effects (AME). This term showed the average change in probability of a PTT in percentage points if the respective variable increased by 1 unit. To support the interpretation of the results bivariate correlations between PTT and the independent as well as control variables can be found in Appendix in Table 6.

In a second step, sequence patterns within 24 months after the first PTT were identified. Therefore, we used the holistic explorative method of sequence analysis (Macindoe and Abbott 2004) combined with a subsequent hierarchical cluster analysis. The

⁴ The 5-digit level is the most differentiated occupational level in Germanies' standard occupational classification system *KldB 2010* (German: "Klassifikation der Berufe 2010). This level predominantly shows individual occupations or very concentrated occupational groups (Paulus and Matthes 2013).

Table 1 Descriptions of independent and control variables

Construct	Operationalization and scale information	Time of measurement
Low educational qualification	No or a low school-leaving qualification achieved in general education	At time of leaving general education
Poor GPA	Average grade point average on school-leaving report > 3.0	At time of leaving general education
Graduation after more than the typical number of years	Accomplishment of educational qualification in more than the typical number of years of general education	At time of leaving general education
Participating in a prevocational program before VET	Participation in a prevocational program before beginning VET	At time of transition from school to VET
Migration background	Born abroad or at least one parent is born abroad	Wave 1 (autumn 2010), wave 2 (summer 2011), wave 3 (2011/2012), wave 4 (2012/2013)
Low parental education	No parent achieved an upper secondary school certificate, a VET or a higher educational qualification	If available, information on parental education was used from the parents' survey, otherwise data from the adolescents' survey. This information was collected in different waves
Low parental occupational status	The highest parental ISEI-08 score is lower than two-thirds of all parents in the NEPS (ISEI-08 \leq 32.50)	See above information on parental education
Failure to realize the desired occupation	Match of last known intended training application before beginning VET and realized training occupation	Before beginning VET program
Agreeableness, Conscientiousness, Openness	Big Five Inventory with two items per dimension (FI-10; Rammstedt and John 2007), expansion of agreeableness by a third variable	Wave 1 (autumn 2010)
Self-efficacy	Scale of Schwarzer and Jerusalem (1999)	Wave 5 (2012/2013)
Sex (female)	Females are coded as 1	Different waves
Training in eastern federal states	Beginning of the first VET program in an eastern federal state in Germany (Berlin, Brandenburg, Mecklenburg-Western Pomerania, Saxony, Saxony-Anhalt, Thuringia)	Episode of first VET program
Training in school-based VET system	Beginning of the first VET program in a vocational school (Berufsfachschule, Fachschule or Schule des Gesundheitswesens)	Episode of first VET program
Time spent in first VET program until PTT (in months)	Training duration in first VET program	Episode of first VET program

aim of this method was to group together individuals with similar trajectories within the first 24 months after a PTT with regard to the kinds of activities, their sequence, timing and duration. The package SQ-Ados in Stata was used for this purpose (Brzinsky-Fay et al. 2006), as it compares sequences by an optimal matching algorithm. The calculated distances between sequences were then used for grouping sequences by cluster analysis, Ward's hierarchical fusion Algorithm is used (Brzinsky-Fay et al. 2006). To define the ideal number of clusters most importantly content-related arguments, in particular aspects of institutional structures of school-to-work transitions, were used. In the last

Table 2 Distribution of independent and control variables

	Total sample	Graduation of first VET program	PTT in first VET program	Sample for analysis of subsequent trajectory clusters after PTT
N	4892	3420	1472	944
General characteristics (in %)				
Low educational qualification	31.9	27.2	43.2	43.6
Poor GPA	36.0	33.3	42.9	40.8
Failure to realize the desired occupation	66.9	63.8	74.7	74.2
Graduation after more than the typical number of years	19.2	16.3	26.3	24.7
Participating in a prevocational program before VET	21.0	18.0	27.8	26.6
Migration background	23.3	19.6	31.8	30.9
Low parental education	6.4	4.9	10.3	8.2
Low parental occupational status	27.3	24.5	34.0	34.1
Sex (female)	46.0	44.8	48.8	49.3
Training in eastern federal states	13.6	12.9	15.3	14.2
Training in school-based VET system	28.7	24.0	39.5	41.3
Personal characteristics and time spent in first VET program until PTT (mean/SD)				
Agreeableness (z-stand.)	0.000/1.000	0.002/.989	− 0.005/1.023	0.000/1.000
Conscientiousness (z-stand.)	0.000/1.000	0.018/1.004	− 0.044/.990	0.000/1.000
Openness (z-stand.)	0.000/1.000	− 0.031/.993	0.078/1.013	0.000/1.000
Self-efficacy (z-stand.)	0.000/1.000	− 0.015/.976	0.034/1.052	0.000/1.000
Time spent in first VET program (in months)	26.142/13.439	33.189/7.683	9.770/8.924	7.835/7.791

Values for personal characteristics of the sample with information on status after PTT were again z-standardized; data not imputed

step, we analyzed the influence of early-risk factors and personality constructs on subsequent trajectory clusters after the first PTT. Again, output was specified in AMEs.

Results

Predictors of premature training terminations

Thirty percent of the observed adolescents experienced a PTT in their first VET program. The results of the regression model displayed in Table 3 show that the probability of a PTT differed strongly by early-risk factors. As we expected and as has been shown in other studies (Beicht and Ulrich 2009; Beicht and Walden 2013; Rohrbach-Schmidt and Uhly 2015), low educational performance increased the likelihood of a PTT (H1a). The strongest effect was found for a low educational qualification; the risk of a PTT for those with no or a low school-leaving qualification was in general 11.1 percentage

Table 3 Binomial regression model to explain PTT in adolescents' first VET program

	AME (dy/dx)	S.E	p-value (P)
Low educational qualification	0.111	0.017	0.000
Poor GPA	0.043	0.015	0.003
Failure to realize the desired occupation	0.086	0.016	0.000
Graduation after more than the typical number of years	0.067	0.017	0.000
Participating in a prevocational program before VET	0.043	0.017	0.011
Migration background	0.081	0.017	0.000
Low parental education	0.068	0.029	0.021
Low parental occupational status	0.037	0.015	0.017
Conscientiousness (z-stand.)	– 0.014	0.007	0.057
Agreeableness (z-stand.)	– 0.002	0.007	0.760
Openness (z-stand.)	0.018	0.007	0.010
Self-efficacy (z-stand.)	0.011	0.008	0.171
Sex (female)	0.006	0.014	0.684
Training in eastern federal states	0.050	0.019	0.010
Training in school-based VET system	0.153	0.015	0.000
R ²	0.091		

Reference group: Successful in first VET program; n = 4892; significance levels refer to AME coefficients; effects with a $p \leq 0.1$ in bold type

points higher than that of more highly educated adolescents. In addition, we observed that parental resources play a remarkable role in adolescents' termination behavior: low parental education and low occupational status resulted in a higher probability of experiencing PTT (H2a). Furthermore, adolescents with a migration background were more likely to experience PTT, independently of their educational qualification and family resources (H3a). As adolescents often face several early-risk factors at a time the likelihood to experience a PTT is for some groups significantly higher than for others. For example, the probability of a PTT for adolescents with a low educational qualification and a migration background was 44.3%, whereas adolescents without a migration background who held at least an intermediate educational qualification showed a significantly lower probability (24.4%) of a PTT, when other factors were equal.

In addition, not being able to start a VET program in the desired occupation strengthened the likelihood of a PTT, as expected (H4a). This result indicated the relevance of being able to fulfil one's own needs within the VET program.

Concerning personality traits, the previous findings of Nießen et al. (2020) on the Big Five dimensions of PTT were confirmed by our regression results. Openness increased the probability of a PTT (H5a), and conscientiousness had a preventive effect (H5b). In general, the effect size for both characteristics was rather small. For example, an increase of one standard deviation in openness increased the risk of a PTT by 1.8 percentage points. The effect for self-efficacy was not significant, indicating that, against our assumption (H5c), self-efficacy had no effect on PTT.

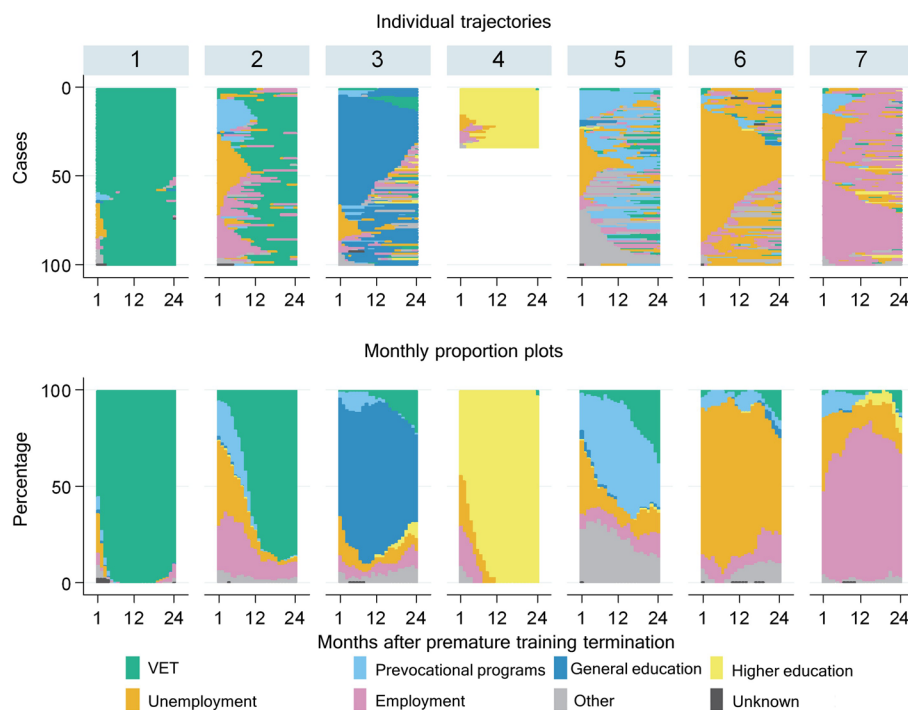


Fig. 2 Subsequent trajectory clusters within 24 months after PTT. Note. Names of clusters: 1 Direct re-entry into VET, 2 Later re-entry into VET, 3 Further school attendance, 4 Transition to higher education, 5 Fragmented trajectories, 6 Transition to unemployment, 7 Transition to employment; Reading note: The above plots are individual trajectories of 100 persons per cluster and have to be read horizontally. As an example, in cluster 1 the majority of adolescents re-entered VET in the first month after PTT. The monthly proportion plots on the contrary have to be read vertically. Here, the distribution of the status of all cluster members for each month is shown ignoring the character of the individual sequence. For cluster 1 the monthly proportion plot shows that more than half of the cluster members were in VET in the first month after PTT. In month 12 all cluster members participated in VET

Trajectory clusters for the 24 months after PTT

Figure 2 presents the identified clusters that emerged from the sequence and cluster analysis for the trajectories 24 months after PTT. The results are presented in two different ways. In the upper part, individual trajectories and thus an intraindividual development of adolescents' trajectories are shown. The plots below display the monthly proportion of statuses, the distribution of the status of the cluster members for each month. Here, developments of the prevailing status in the trajectories and thus characteristics of the clusters are more precisely emphasized. Additionally, Table 4 reports descriptive information about cluster characteristics.

We differentiated 7 clusters to describe the various trajectories within 24 months after adolescents' first PTT.⁵ Four of them can be described as trajectories of re-entry in education and training (63%): Clusters 1 and 2 are characterized by re-entry into VET but differ by time of re-entry. While adolescents in Cluster 2 experienced a later re-entry into VET as they spent time in prevocational programs and/or were (un)employment beforehand (30%), those in Cluster 1 re-entered VET immediately (17%). With this result, we confirmed the findings from other studies that the majority of adolescents re-enter VET

⁵ We also proofed other cluster solutions but both a smaller number of clusters as well as more clusters did not produce better differentiated results. Besides, cluster solutions with more than 7 clusters led to very small cluster sizes.

Table 4 Descriptive information of subsequent trajectory clusters within 24 months after PTT

Characteristics	1 Direct re-entry into VET	2 Later re-entry into VET	3 Further into school attendance	4 Transition to higher education	5 Fragmented trajectories	6 Transition to unemployment	7 Transition to employment
n	161	279	121	34	129	108	112
General characteristics (in %)							
No change of status	44.7	0.0	17.4	41.2	5.4	17.6	19.6
One change of status	46.6	36.6	34.7	38.2	17.8	13.9	19.6
More than one change of status	8.7	63.4	47.9	20.6	76.7	68.5	60.7
Average time in status (in months)							
VET	22.8	13.7	1.7	0.0	3.0	0.8	0.6
Prevocational program	0.2	2.1	0.9	0.0	9.7	1.4	1.1
General education	0.1	0.1	16.7	0.0	0.3	0.3	0.1
Higher education	0.0	0.1	0.4	21.3	0.1	0.0	0.8
Unemployment	0.4	3.3	1.8	1.4	3.3	17.4	4.1
Employment	0.3	4.1	1.4	1.1	1.9	2.4	16.9
Other	0.2	0.7	1.1	0.2	5.6	1.5	0.5
Unknown	0.1	0.0	0.0	0.0	0.0	0.1	0.0

after PTT (Lettau 2017; Kotte 2018; Neuenschwander and Süss 2004; Schmid and Stalder 2012; Wydra-Somaggio 2021). However, compared to other studies, our results illustrate that for most adolescents, the process of returning to VET is not straightforward, and trajectories are often characterized by status shifts indicating adaptation processes by adolescents.

In addition to re-entering VET, the adolescents also considered other educational alternatives: those in Cluster 3 decided to continue with general education (13%), and a small group of adolescents with an upper secondary school qualification participated in a study program in higher education after PTT (Cluster 4).

From these four clusters, we distinguished the following three clusters in which adolescents tended to withdraw from education and training (37%). Cluster 5 comprised adolescents who experienced fragmented trajectories after a PTT (14%). These are characterized by a high share of status changes (76.7%). Adolescents mostly shifted back and forth from prevocational programs to (un)employment. In contrast to those in Cluster 2, adolescents in this cluster did not seem to benefit from attending prevocational programs. This is in line with findings from Holtmann et al. (2021), who showed that participating in prevocational programs does not always lead to a successful entry into VET. Nevertheless, an open question remains whether they re-enter into a stable institutionalized educational setting at a later point. The trajectories of adolescents in Clusters 6 and 7 describe patterns in the labor market without having obtained an occupational

qualification. Whereas those in Cluster 6 were predominantly unemployed (11%), adolescents in Cluster 7 found themselves in the labor market as unskilled workers (12%).

Predictors of the subsequent trajectory clusters after PTT

Due to the small sample sizes in the clusters, we estimated two regression models. In the first step, we used the more hierarchical differentiation of our sequence cluster result and differentiated between adolescents with a trajectory of re-entry into education and training (Clusters 1 to 4) and those with trajectories that indicated a withdrawal from education and training (Clusters 5 to 7). Relating results show more systematically the influence of early-risk factors and personality constructs on subsequent trajectories by a binomial logistic regression (Table 5). However, the aggregation of the clusters can level the variances of the predictors so that cluster-specific effects remain undetected. Therefore, despite small cluster sizes, we also conducted a multinomial logistic regression model (Appendix in Table 7) to estimate the influence of early-risk factors and personality constructs for each cluster individually.

When interpreting the results regarding the likelihood of belonging to one of the above clusters, one must take into account that we now focused on a sample of adolescents who experienced a PTT and—as shown in the "[Predictors of premature training terminations](#)" section – who were characterized by higher shares of early-risk factors compared to the whole sample (see also Table 2 for change of sample characteristics by sample adjustment).

Table 5 Binomial regression model to explain tendencies to withdraw from education and training

	AME (dy/dx)	S.E	p-value (P)
Low educational qualification	0.124	0.038	0.001
Poor GPA	0.056	0.036	0.123
Participating in a prevocational program before VET	0.048	0.040	0.229
Graduation after more than the typical number of years	0.092	0.040	0.021
Failure to realize the desired occupation	0.034	0.037	0.356
Migration background	− 0.038	0.035	0.286
Low parental education	0.122	0.064	0.055
Low parental occupational status	0.030	0.035	0.397
Conscientiousness (z-stand.)	− 0.016	0.018	0.384
Agreeableness (z-stand.)	− 0.019	0.019	0.327
Openness (z-stand.)	0.004	0.019	0.846
Self-efficacy (z-stand.)	0.018	0.018	0.327
Sex (female)	0.002	0.032	0.945
Training in eastern federal states	0.042	0.045	0.349
Training in school-based VET system	−0.080	0.032	0.013
Time spent in first VET program until PTT	0.002	0.002	0.374
R ²	0.077		

Dependent variable: entry in risk clusters (Cluster 5 to 7); reference group: re-entry in institutionalized education (Cluster 1 to 4); n = 4892; significance levels refer to AME coefficients; effects with $p \leq 0.1$ in bold type

The results shown in Table 5 revealed that early-risk factors are not only important for explaining PTT but also play a significant role for trajectories after a PTT. In particular, educational performance and family resources had an impact on whether adolescents returned to education and training after a PTT in their first VET program or were more likely to withdraw from education and training. A low educational qualification, graduation after more than the typical number of years and low parental education increased the probability of withdrawing from education and training, supporting Hypotheses H1b and H2b. Taking into account that adolescents not seldom face several early-risk factors we can identify significant group differences: Whereas the likelihood to withdraw from education and training of adolescents who hold at least an intermediate school degree and have well educated parents was 30.2%, low qualified adolescents with low educated parents have a 20 percentage point higher risk to end up in trajectories which do not lead to an occupational degree. Against this, a migration background and personality constructs did not seem to play an important role in explaining trajectories after PTT when considering only 2 different groups.

The results of the multinomial regression model (Appendix in Table 7), on the other hand, reveal cluster-specific findings, but due to small sample sizes, only partially significant results emerged. Regarding a low educational qualification, the above-mentioned effect was confirmed by cluster-specific analyses; in particular, belonging to a cluster with fragmented trajectories was associated with a low school qualification. Additionally, the GPA in general education seemed to be of importance, but the effects differed between clusters: whereas a poor GPA significantly decreased the probability of a direct re-entry into VET (Cluster 1), it increased the probability of a later re-entry into VET (Cluster 2) or unemployment (Cluster 5) by five to six percentage points on average. This indicates once again the importance of GPA for employers as a sign of trainability and employability. Overall, the results indicated, as expected (H1b), that adolescents with poor school performance face substantial problems in the training and labor market, as proposed by the job competition model (Thurow 1975). Additionally, the differentiated cluster consideration illustrated that negative school experiences (such as having to repeat a grade or having a poor GPA), as well as participating in prevocational programs, made a return to general education (further school attendance) less likely.

The described effect of low parental education on the risk of adolescents withdrawing from education and training was especially apparent regarding trajectories leading to unskilled employment (Cluster 7), but it was also visible for those who were mainly unemployed after PTT (Cluster 6); however, the effect was not significant. In contrast to our assumption, we found a positive effect of low parental education on further school attendance. Considering the positive effect of a migration background for this cluster, indicating that migrants tend to continue with general education more often than those without a migration background, we assumed an interaction effect between the two characteristics. Due to the small sample size, it was not possible to calculate this term, but descriptive results showed that 93% of adolescents in this cluster with a low parental educational background also had a migration background. From our point of view, two reasons can be considered to explain these effects. First, we know from research that, independent of parental education, migrants often show higher aspirations regarding their educational qualifications than those without a migration background (Busse

2020, p. 92), which might explain the presented effects. Second, it might be that at least some adolescents experienced or perceived discrimination (Abella 2000) in the training and/or labor market which may in turn lead to higher rates of further school attendance as one main educational alternative to VET to circumvent discrimination. In contrast to parental education, the effects of occupational status were smaller but showed the same direction: a low parental occupational status increased the risk of longer phases of unemployment after PTT. Overall, the findings support our Hypotheses H2b and H3b but also indicate that effects differed by cluster. In particular, further research is needed to disentangle the effects of social origin and migration background.

Against our assumption that a failure to realize the desired occupation increases the likelihood of returning to education and training (H4b), the results revealed a higher probability of entering the labor market as an unskilled worker after PTT (Cluster 7). Thus, adolescents who experienced a PTT in a VET program that did not correspond to the desired occupation did not seem to revise their training decision. Due to data restrictions, we could not investigate the reasons for this effect in more detail, e.g., how VET aspirations changed during the training process.

Contrary to the general finding that personality constructs do not explain differences between returning to education or training after a PTT and withdrawing from education, the multinomial regression model revealed cluster-specific results for the traits of openness and self-efficacy. Higher values of openness increased the probability of further school attendance, whereas direct re-entry into VET was less likely. This suggests that adolescents tried to improve their educational opportunities in the VET system and/or higher education by achieving a higher educational qualification and can therefore be seen as an indicator of carrier adaptability (H5a). Contrary to what we expected (H5c), we also found an effect of high self-efficacy on the likelihood of becoming employed after a first PTT as well as a lower probability of further school attendance. It seems that adolescents with a PTT in their first training program and higher self-efficacy were convinced of their skills and perceived these skills as sufficient for the labor market.

Discussion

General discussion

Educational attainment and skills are important for integration into the labor market and society. Hence, preventing PTT and early leaving from education and training programs and, in turn, achieving an occupational qualification are of high importance for trainees, training companies, and the economy. However, a PTT does not have to be viewed only in a negative way, as it can initiate career change (Krötz and Deutscher 2022; Lettau 2017; Kotte 2018; Neuenschwander and Süss 2004; Schmid and Stalder 2012; Wydra-Somaggio 2021). However, more needs to be known about the patterns of reentering education and why some succeed in the transition, whereas others do not. Thus, the aim of this study was to provide further findings on this topic from a longitudinal perspective on the consequences of a first termination of a VET program by using a sequence and cluster analysis. In this vein, we investigated the role of presage characteristics that influenced adolescents' capabilities to shape their educational and vocational trajectories in a responsible and self-directed way, namely early-risk factors and selected personality constructs.

In our study, 30% of the observed adolescents experienced PTT in their first VET program. Furthermore, the results showed within-group differences in trajectories after a PTT. We found that approximately two-thirds of the adolescents in our sample with a PTT succeeded in returning to education and training, which indicates a constructive career adaptation process in the training course. On the contrary, one-third of the adolescents were in trajectories with tendencies to withdraw from institutional education, which is quite comparable with the official data on early leavers from education and training programs (Eurostat 2021). Moreover, our methodological approach (a sequence and cluster analysis) allowed us a more differentiated view of the life course after PTT, showing that the first year after PTT is crucial for further trajectory patterns. The results indicate that interventions of reintegration into education and training must be applied immediately after PTT.

Our findings show that experiencing a PTT and having tendencies to withdraw from education and training after the PTT are, to a certain degree, predictable by early-risk factors and personality constructs. While all early-risk factors significantly increased the risk of experiencing a PTT, which is in line with previous research (Beicht and Walden 2013; Böhn and Deutscher 2021b; Michaelis and Findeisen 2022; Rohrbach-Schmidt and Uhly 2015), their influence on withdrawing from education and training can only be partially confirmed. Low educational qualification, graduation of the educational qualification after more than the typical number of years, and low parental educational level significantly increased the risk of withdrawing from education and training. This indicates that these characteristics remain important even for explaining trajectories after PTT. In addition, the more differentiated analysis of the trajectory clusters revealed that personality constructs such as openness and self-efficacy appeared to have an impact on trajectories after a PTT: While adolescents with strong openness showed tendencies for a constructive change in their career development, strong self-efficacy more often led to unskilled employment.

Overall, our results support the need for different types of policy measures to minimize the incidence of PTT. In their analysis, Psifidou et al. (2021) distinguished between prevention, intervention, and compensation practices, which can be found in EU member states. In light of our results, prevention measures should focus on the provision of information on occupational and educational alternatives based on adolescents' personal traits and aspirations. This might reduce the interruptions that could be observed in the educational trajectories of two-thirds of adolescents. For those with a tendency to withdraw from education and training interventions, measures such as continuous career counseling over the education and training course are of relevance. Trainees with low family resources may benefit from personalized coaching and mentoring to motivate them to participate in education and training programs. Last but not least, compensation measures such as state-financed training opportunities, especially for adolescents with low school qualifications and poor school grades, may help provide a second chance to adolescents who lack offers in the training market.

Limitations of the study and implications for further research

Even though our study contributes to the existing literature on the consequences of PTT, there are some limitations that restricted our analyses and should be kept in mind while

interpreting the results. Due to data restrictions, we were not able to account for differences in the occurrence of a PTT by occupation. Rohrbach-Schmidt and Uhly (2015) have shown that a multilevel analysis including occupational level improves model estimation. However, this method has strict requirements regarding the number and size of groups (Hox 1998), which the NEPS dataset does not fulfil. Additionally, the NEPS does not provide information on institutional characteristics, nor does it have precise information on the decision process after PTT or direct scales for measuring career adaptability (cf. Savickas 2013), which are of interest for explaining PTT. Further research should focus on the explanation of the different trajectories adolescents experience after a PTT. In this vein, analyses regarding the role of specific training experiences in the first VET program (e.g., social conflicts, excessive demands), the importance of search and application activities and thus the information behavior of adolescents (e.g., use of career counseling), and the role of family and friends as social resources should be considered in more detail. Moreover, perceived discrimination in application processes and during the training course might be of relevance and should be considered when analyzing discontinuities in VET. Additionally, we need on the one hand more information on the usage of counselling and guidance offers by the adolescents and on the other hand more evidence about the quality of implemented measures as well as the professional competencies of career counsellors.

With NEPS, we were able to analyze difficulties in the training course in more detail, as the longitudinal data allowed us to focus on trajectories after PTT. Due to the survey design, we had to restrict the observation period to 24 months after PTT. Therefore, the identified trajectories have to be interpreted as trends. Moreover, the sample size limited the analysis potential to explain belonging to a specific trajectory cluster, particularly regarding possible interaction effects. In this regard, research on subsequent trajectories after PTT and the long-term effects of PTT have to be intensified. Existing analyses already show a wage penalty in later employment after PTT (Patzina and Wydra-Somagio 2020), but it is still an open question whether this finding differs by different trajectory patterns after PTT. Moreover, the nonmonetary effects of PTT, such as subjective well-being, should also be addressed.

Conclusion

Based on a longitudinal study of German trainees we analyzed the consequences of a PTT for the further educational trajectories of the adolescents. In sum, we observed that experiencing a PTT may initiate constructive changes in the education and training course. The largest share of adolescents succeeds in returning to education and training. However, tendencies to withdraw from education and training is already observed after the first PTT. This can have negative consequences if adolescents tend to withdraw from education and training without having obtained an appropriate qualification for the labor market. It can be assumed that they are most likely exposed to persistent disadvantages throughout their career. To minimize this risk, different career counseling approaches should be applied varying from improving the quality of career choice processes before VET to measurements which aim at stabilizing the training course.

Table 6 (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(11) Conscientiousness (z-stand.)	p	-0.028	0.004	-0.129	-0.033	-0.048	-0.020	0.039	0.028	0.068	0.248	1.000					
	p-value	0.068	0.821	0.000	0.059	0.002	0.201	0.012	0.080	0.000	0.000						
(12) Openness (z-stand.)	p	0.049	-0.073	-0.034	0.046	-0.016	-0.003	0.056	0.002	-0.039	0.142	0.099	1.000				
	p-value	0.001	0.000	0.036	0.010	0.323	0.830	0.000	0.889	0.012	0.000	0.000					
(13) Self-efficacy (z-stand.)	p	0.022	0.060	-0.024	-0.036	0.051	-0.015	-0.029	-0.007	-0.023	0.050	0.113	0.059	1.000			
	p-value	0.171	0.000	0.163	0.049	0.003	0.355	0.076	0.703	0.154	0.005	0.000	0.001				
(14) Training in school-based VET system	p	0.158	-0.060	0.007	0.060	0.007	-0.031	0.057	-0.006	-0.027	0.046	0.018	0.088	1.000			
	p-value	0.000	0.000	0.631	0.000	0.629	0.028	0.000	0.673	0.063	0.003	0.248	-0.002	0.898			
(15) Sex (female)	p	0.037	-0.093	-0.059	0.026	-0.001	-0.033	0.043	0.016	0.039	0.112	0.189	-0.105	0.256	1.000		
	p-value	0.010	0.000	0.000	0.119	0.966	0.019	0.003	0.296	0.007	0.000	0.000	0.000	0.000			
(16) Training in eastern federal states	p	0.033	-0.002	0.017	-0.006	-0.024	0.016	-0.109	-0.054	0.017	-0.043	-0.056	0.014	-0.003	0.014	1.000	
	p-value	0.023	0.894	0.256	0.719	0.103	0.267	0.000	0.000	0.234	0.005	0.000	0.348	0.879	0.114	0.344	
(17) Time spent in first VET program until PTT	p	-0.799	-0.118	-0.069	-0.109	-0.114	-0.120	-0.128	-0.102	-0.080	-0.002	0.010	-0.055	-0.011	-0.211	-0.112	-0.021
	p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.880	0.506	0.000	0.519	0.000	0.000	0.141

n = 4892; data not imputed; effects with $p \leq 0.1$ in bold type

Table 7 Multinomial logistic regression model to explain sequence clusters after PTT

Cluster	1 Direct re-entry into VET			2 Later re-entry into VET			3 Further school attendance			4 Transition to higher education			5 Fragmented trajectories			6 Transition to unemployment			7 Transition to employment		
	AME	S.E	p-value	AME	S.E	p-value	AME	S.E	p-value	AME	S.E	p-value	AME	S.E	p-value	AME	S.E	p-value	AME	S.E	p-value
Low educational qualification	-0.037	0.029	0.205	-0.011	0.036	0.752	-0.030	0.025	0.230	-0.045	0.010	0.000	0.086	0.028	0.002	0.038	0.025	0.123	0.000	0.025	0.994
Poor GPA	-0.051	0.027	0.061	0.061	0.034	0.073	-0.054	0.023	0.020	-0.011	0.013	0.389	0.026	0.026	0.316	0.055	0.024	0.024	-0.026	0.023	0.254
Graduation after more than the typical number of years	-0.024	0.031	0.439	-0.008	0.037	0.834	-0.042	0.024	0.082	-0.019	0.013	0.152	0.042	0.030	0.153	0.041	0.027	0.135	0.010	0.027	0.703
Participating in a prevocational program before VET	-0.011	0.031	0.726	0.040	0.037	0.286	-0.048	0.024	0.049	-0.018	0.015	0.226	0.003	0.026	0.902	0.006	0.024	0.808	0.029	0.028	0.297
Failure to realize the desired occupation	0.023	0.032	0.476	-0.065	0.040	0.098	0.002	0.032	0.940	-0.010	0.025	0.701	-0.014	0.028	0.626	0.003	0.025	0.913	0.061	0.024	0.013
Migration back-ground	0.017	0.029	0.553	-0.038	0.034	0.255	0.072	0.026	0.005	-0.014	0.013	0.271	-0.037	0.025	0.142	-0.017	0.023	0.472	0.016	0.025	0.513
Low parental education	-0.103	0.039	0.008	-0.106	0.054	0.049	0.100	0.055	0.070	-0.032	0.024	0.184	0.007	0.047	0.880	0.048	0.045	0.291	0.086	0.052	0.099

Table 7 (continued)

Cluster	1 Direct re-entry into VET			2 Later re-entry into VET			3 Further school attendance			4 Transition to higher education			5 Fragmented trajectories			6 Transition to unemployment			7 Transition to employment		
	AME	S.E	p-value	AME	S.E	p-value	AME	S.E	p-value	AME	S.E	p-value	AME	S.E	p-value	AME	S.E	p-value	AME	S.E	p-value
Low parental occupational status	-0.018	0.028	0.518	0.032	0.034	0.344	0.001	0.025	0.982	-0.045	0.007	0.000	0.004	0.025	0.886	0.047	0.024	0.051	-0.021	0.024	0.376
Conscientiousness (z-stand.)	0.010	0.014	0.479	0.018	0.017	0.314	-0.012	0.012	0.335	0.000	0.007	0.951	-0.013	0.014	0.374	0.012	0.012	0.305	-0.016	0.012	0.198
Agreeableness (z-stand.)	0.021	0.014	0.118	0.003	0.018	0.860	0.002	0.012	0.856	-0.009	0.007	0.170	0.006	0.015	0.692	-0.021	0.013	0.111	-0.002	0.012	0.844
Openness (z-stand.)	-0.027	0.014	0.055	0.000	0.017	0.982	0.026	0.011	0.021	-0.002	0.006	0.763	-0.027	0.014	0.056	0.016	0.014	0.246	0.014	0.012	0.253
Self-efficacy (z-stand.)	0.005	0.014	0.709	-0.003	0.017	0.843	-0.022	0.013	0.082	0.000	0.016	0.989	0.004	0.012	0.717	-0.008	0.011	0.486	0.024	0.012	0.054
Sex (female)	0.010	0.025	0.688	0.020	0.031	0.531	-0.020	0.022	0.363	-0.013	0.013	0.321	0.017	0.024	0.472	-0.025	0.022	0.248	0.010	0.022	0.634
Training in eastern federal states in 1st VET program	0.029	0.038	0.448	-0.032	0.042	0.442	-0.033	0.030	0.275	-0.007	0.016	0.663	0.020	0.034	0.561	0.083	0.035	0.016	-0.060	0.025	0.017

Table 7 (continued)

Cluster	1 Direct re-entry into VET			2 Later re-entry into VET			3 Further school attendance			4 Transition to higher education			5 Fragmented trajectories			6 Transition to unemployment			7 Transition to employment		
	AME	S.E	p-value	AME	S.E	p-value	AME	S.E	p-value	AME	S.E	p-value	AME	S.E	p-value	AME	S.E	p-value	AME	S.E	p-value
Training in full-time school-based VET system in 1st VET program	0.018	0.025	0.471	-0.055	0.031	0.071	0.108	0.023	0.000	0.010	0.012	0.429	0.018	0.024	0.449	-0.065	0.020	0.001	-0.034	0.021	0.116
Time spent in first VET program until PTT	0.005	0.001	0.001	0.000	0.002	0.816	-0.006	0.002	0.002	-0.001	0.001	0.313	-0.001	0.001	0.492	0.001	0.001	0.557	0.003	0.001	0.031
R ²	0.054																				

n = 944

Significance levels refer to AME coefficients

Effects with $p \leq 0.1$ in bold type

Abbreviations

AME	Average marginal effect
EU	European Union
GPA	Grade point average
PTT	Premature training termination
VET	Vocational education and training

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Author contributions

CM conceived the aim of the study and coordinated the study. CM and MR were responsible for generating theory, hypothesis, methodology and discussion of the results. CM prepared the data, performed the statistical analysis and visualized the figures and tables. CM and MR wrote, reviewed and edited the manuscript in several rounds. Both authors read and approved the final manuscript.

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Availability of data and materials

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Declarations

Competing interests

The authors declare that they have no competing interests.

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