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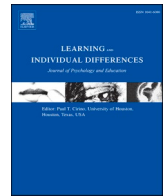
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Trajectories of adolescents' adjustment behaviors across the transition to upper secondary education: The role of individual and environmental factors[☆]

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ABSTRACT

This longitudinal study examined the developmental trajectories of 901 Finnish adolescents' ($M = 15.3$ at T1, $SD = 0.37$) adjustment behaviors (prosocial behavior and externalizing problems) across the transition to upper secondary education. The role of adolescents' temperament and relationship with parents and teachers were investigated. Four trajectories of adjustment behaviors were distinguished: *moderate prosocial and high externalizing* (25.8 %), *high prosocial and low externalizing* (64.9 %), *decreasing prosocial and increasing externalizing before the transition* (7.4 %), *decreasing prosocial and increasing externalizing after the transition* (1.9 %). Adolescents' higher negative affectivity, lower effortful control, and less close and conflicting relationship with parents and teachers are positively associated with the trajectory of *moderate prosocial behavior and high externalizing problems*. In contrast, high effortful control, high closeness, and low conflict are positively associated with the trajectories of *high prosocial and low externalizing problems* as well as *decreasing prosocial and increasing externalizing after the transition*.

Educational relevance statement

The current study brings new knowledge regarding distinct groups of adolescents who follow different trajectories of adjustment behaviors during the transition from lower to upper secondary education. A person-oriented approach distinguished four distinct groups of adolescents in terms of their prosocial behavior and externalizing problems. Most adolescents showed no adjustment difficulties across the transition. However, three distinct groups showed some challenges: some adolescents had moderate prosocial behavior and high externalizing problems throughout the transition, some had difficulties right before it, and others right after it. The results suggest that parents and teachers may help adolescents with different temperamental characteristics to successfully face the challenges of the transition by avoiding conflict and maintaining closeness with them through warm and trustful relationship.

1. Introduction

The transition from basic to upper secondary education is challenging for many adolescents due to their decision to follow either academic or vocational path along with increased academic demands and responsibility for their learning (Aunola et al., 2018; Virtanen et al., 2022). During this transition, adolescents may also face challenges in their adjustment behaviors. The present study focused on two student behaviors which indicate the outcomes of successful (i.e., high prosocial behavior and low externalizing problems) and poor (i.e., low prosocial behavior and high externalizing problems) adjustment across the transition (De Jong et al., 2018; Jaruseviciute et al., 2022; Nurmi et al., 2018; Roorda et al., 2020). Focusing on only one adjustment indicator may not provide an overall picture of the adjustment of adolescents. In addition, different adolescents may show different types of adjustment behaviors across the transition. Therefore, a person-oriented approach is

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essential in identifying distinct groups of adolescents in their adjustment behaviors trajectories, as well as in investigating the role of individual and environmental factors on these trajectories (Laursen & Hoff, 2006; Lubke & Muthén, 2005; Tunkkari et al., 2022). Specifically, the developmental trajectories of adolescents' adjustment behaviors and the role of temperament and relationship with parents and teachers in these trajectories during the critical transition to upper secondary education were examined.

1.1. Developmental trajectories of adolescent adjustment behaviors across the transition to upper secondary education

Adjustment behaviors in the present study represent the outcomes of the propensity to adjust behavior to environmental changes (Kitayama et al., 2018). This study addressed two such outcomes: prosocial behavior and externalizing problems (De Jong et al., 2018; Jaruseviciute et al., 2022; Nurmi et al., 2018; Roorda et al., 2020). Both prosocial behavior and externalizing problems represent observable behaviors that are directed toward others. High prosocial behavior indicates successful adjustment and represents behavior directed toward benefiting others without personal gain, such as sharing, helping, comforting, or empathizing with others (Eisenberg, 1982; Rushton, 1982). When adolescents are more prosocial, they engage in a broader variety of positive behaviors, the indicators of behavioral adaptation at school (Memmott-Elison et al., 2020). In contrast, externalizing problems represent adjustment difficulties that manifest via disruptive behaviors, aggression, disobedience, and difficulty in maintaining attention (Hinshaw, 1992; McMahan, 1994). Primary externalizing domains are frequently conceptualized via conduct problems and hyperactivity (Hinshaw, 1992; McMahan, 1994; Metsäpelto et al., 2017). The more prosocial and helpful adolescents tend to engage less in externalizing problems (Memmott-Elison et al., 2020). When adolescents show higher prosocial behavior they may be perceived as acting in socially prescribed ways, which is an important factor for adjusting to the new school environment. Whereas, high externalizing problems may be perceived as anti-social acts and disobedience to social norms which can indicate a poor adjustment to transition (e.g., De Jong et al., 2018; Metsäpelto et al., 2017; Nurmi et al., 2018). Combined high prosocial behavior and low externalizing problems can therefore act as indicators of successful adjustment across the transition to upper secondary education.

According to the stage-environment fit theory (Eccles et al., 1993; Eccles & Roeser, 2009), the increased challenges in adaptation during the transition can relate to changes in a classroom environment that do not fit with adolescents' developmental needs and expectations. The transition from lower secondary education (or middle school) to upper secondary education (or high school and vocational school) is a critical time in most educational systems as adolescents must choose the educational track to follow. Because some students choose the vocational track and others the academic one, the changes in classroom compositions can be even higher than during previous educational transitions (Virtanen et al., 2022). Previous studies have shown decreased academic achievement (Benner, 2011; Benner et al., 2017), and school attendance (Benner & Wang, 2014) across the transition from lower to upper secondary education. In addition, Jaruseviciute et al. (2023) found that adolescents' prosocial behavior decreased, and externalizing problems increased across the transition from primary to lower secondary school. These studies indicate that educational transitions may bring adjustment challenges for some adolescents. However, less is known about prosocial behavior and externalizing problems across the transition to upper secondary education. Yet not all adolescents have difficulties in adjusting to school transition, thus it is important to investigate the heterogeneity in the developmental trajectories of adjustment behaviors. Previous studies, however, are highly limited as they did not investigate the trajectories of both prosocial behavior and externalizing problems together (Memmott-Elison et al., 2020), especially during the transition to upper secondary education.

Many previous studies investigated the trajectories of externalizing problems and prosocial behavior separately. For example, Shi et al. (2021) found that 11.9 % of students from grades 1 to 12 had low and stable levels of prosocial behavior, 15.0 % had high prosocial behavior which declined during later grades, 20.6 % had moderate levels of prosocial behavior which increased over time, and 52.5 % had stable and high levels in prosocial behavior. Flynn et al. (2015) found three stable trajectories in prosocial behavior from grades 4 to 12: 18.7 % showed a low level of prosocial behavior, 52.8 % a medium level of prosocial behavior, and 29.6 % a high level of prosocial behavior. However, none of these studies focused on adjustment behaviors specifically across the transition from lower to upper secondary education, and only parent or teacher reports on adjustment behaviors were used. Adolescents can identify their adjustment behaviors well, thus investigating their perception may add new insights into the development of their adjustment behaviors across the transition.

In addition, only a few attempts have been made to investigate combined prosocial behavior and externalizing problems trajectories. Jambon et al. (2019) found four distinct trajectories in physical aggression and prosocial behavior from ages 3 to 6: 54.4 % demonstrated low-stable aggression, high-increasing prosocial; 6.7 % high-stable aggression, low-stable prosocial; 19.6 % high-declining aggression, moderate-increasing prosocial; 19.3 % low-increasing aggression, moderate-stable prosocial. Padilla-Walker et al. (2018) found three distinct trajectories in prosocial and problem behaviors at age 12 (75 % prosocial, non-problem; 20 % low levels of prosocial, moderate levels of aggression and delinquency; 5 % low prosocial, moderate aggression, high delinquency), two trajectories at age 15 (88 % prosocial, non-problem; 12 % low levels of prosocial, moderate levels of aggression and delinquency), and three trajectories at age 18 (61 % prosocial, non-problem; 34 % low levels of prosocial, moderate levels of aggression and delinquency; 5 % low prosocial, high aggression and moderate delinquency). Therefore, the current study expands the previous knowledge by investigating the trajectories of both adjustment behaviors together across the specific transition from lower to upper secondary education.

1.2. Temperament as antecedent of developmental trajectories of adjustment behaviors

While investigating adjustment behaviors across the transition, environmental and individual factors should not be ignored. According to Bronfenbrenner's theory of ecological approach (1979), the closest environmental systems, such as home and school, and the individual characteristics of adolescents shape their development. Each of these domains may independently contribute to the trajectories of adjustment behaviors across the transition to upper secondary education.

Individual characteristics of adolescents, such as temperament, can play an important role in the development of adolescents' adjustment behaviors during this transition (e.g., Putnam, 2012; Tackett et al., 2012; Zentner, 2020). Temperament is understood as individual differences in activity, affectivity, attention, and self-regulation (Goldsmith et al., 1987; Shiner et al., 2012). Even though temperament is relatively stable and has biological roots, environmental factors, and individual experiences also contribute to shaping temperament (Putnam et al., 2001; Shiner et al., 2012). The current study focused on three distinct temperamental dimensions of adolescents: surgency (extraversion), negative affectivity, and effortful control (Rothbart et al., 2001).

First, adolescents with higher surgency or extraversion are more active and outgoing, are less shy, and have positive emotionality (Rothbart, 2007; Rothbart et al., 2001), which could be seen as a favorable quality for prosocial behavior and better adjustment across the transition (Putnam, 2012). On the other hand, adolescents with higher surgency might also have a higher tendency for sensation-seeking, which can lead to more risky behaviors and externalizing problems (Tackett et al., 2012). Cui et al. (2016) found that sensation-seeking and

risk-taking contribute to the development of a high and stable trajectory of reactive and proactive aggression. Second, adolescents with higher *negative affectivity* experience more negative emotions and discomfort that can become difficult to manage (Rothbart, 2007; Rothbart et al., 2001), and bring difficulties in adapting to changes brought about by educational transition (Scrimin et al., 2019; Zentner, 2020). Negative emotionality has been shown to predict the developmental trajectory of children who had the highest externalizing problems, which decreased in adolescence (9 %; Kjeldsen et al., 2021). Finally, adolescents with higher *effortful control* can regulate their behavior and emotions, and better focus their attention (Rothbart, 2007; Rothbart et al., 2001) which can assist them in adapting to higher school demands, and academic path decisions (Rothbart et al., 2001; Symonds, 2015). Olson et al. (2017) have found that children with a chronic trajectory of externalizing problems had low effortful control. On the other hand, children who had high effortful control were more likely to develop a low externalizing problems trajectory. Research on the role of different temperamental dimensions in adjustment behaviors trajectories remains scarce, especially during the transition to upper secondary education.

1.3. Relationship quality as antecedent of developmental trajectories of adjustment behaviors

In addition to individual characteristics, environmental factors, such as relationship quality with parents and teachers, have also been shown to be important for the development of adjustment behaviors in adolescence (e.g., Eccles & Roeser, 2011; Jambon et al., 2019; Shi et al., 2021). Parent–adolescent, and teacher–adolescent relationship is understood via the lens of closeness and conflict. Closeness is defined as affection, warmth, and trust toward one another, whereas conflict is understood as a negative and hostile relationship between adolescents and their parents and teachers (Hamre & Pianta, 2001; Pianta, 2001). Support from adolescents' parents and teachers can be a strong indicator of the successful adjustment of adolescents across the transition. For example, Jambon et al. (2019) have found that children whose mothers engaged in positive parenting belonged to either prosocial (54.4 %; low-stable aggression, high-increasing prosocial behavior) or escalating (19.3 %; low-increasing aggression, moderate-stable prosocial behavior) trajectories between ages 3 and 6. Shi et al. (2021) found that the group with high-stable prosocial behavior (52.5 %; grades 1–12) had warmer and less conflicting relationship with their teachers than the other groups with lower or decreasing prosocial behavior. In addition, Shi et al. (2020) have found that the children in the pure-externalizing group (18.6 %; grades 1–12) had more conflict with their teachers (as antecedents) than children from a low-risk group (fewer problem behaviors; 22.8 %). However, to our knowledge, none of the studies investigated the role of relationship quality on the developmental trajectories of combined prosocial behavior and externalizing problems across the transition from lower to upper secondary education. In addition, most studies investigated only parent or teacher reports on relationship quality. The current study examined adolescent as well as parent and teacher reports on relationship to have a more comprehensive view of the importance of such relationship for distinct trajectories of adjustment behaviors.

1.4. The present study

The current study aimed to investigate the developmental trajectories of adolescent adjustment behaviors across the transition to upper secondary education, as well as to investigate the role of adolescent temperament and teacher– and parent–adolescent relationships in these trajectories.

The following research questions were investigated:

1. What combined developmental trajectories can be identified among adolescents concerning their adjustment behaviors (i.e., prosocial

behavior and externalizing problems) during the transition to upper secondary education (across all four time points)? We expected to find that the largest group of adolescents would have high prosocial behavior and low externalizing problems during the transition to upper secondary education (Hypothesis 1a; e.g., Jambon et al., 2019; Padilla-Walker et al., 2018). We also expected to find a trajectory with moderate levels of adjustment behaviors (Hypothesis 1b; e.g., Flynn et al., 2015; Padilla-Walker et al., 2018). Finally, we hypothesized finding groups of adolescents with difficulties in adjusting to school transition indicated by increases in externalizing problems and decreases in prosocial behavior (Hypothesis 1c; e.g., Benner et al., 2017; Shi et al., 2021).

2. To what extent adolescent temperament is associated with the developmental trajectories of combined adjustment behaviors? It was expected that adolescents in the trajectory with high prosocial behavior and low externalizing problems would have the lowest surgency and negative affectivity, and highest effortful control (Hypothesis 2a; e.g., Olson et al., 2017). It was also expected that adolescents with higher surgency and negative affectivity, and lower effortful control would follow the trajectory of decreasing prosocial behavior and increasing externalizing problems (Hypothesis 2b; e.g., Olson et al., 2017).
3. To what extent adolescent closeness and conflict with parents and teachers before the transition (Grade 9 fall and spring) is associated with the developmental trajectories of combined adjustment behaviors? It was expected that the adolescents in the trajectory with high prosocial behavior and low externalizing problems would have closer and less conflicting relationship with their parents and teachers than the other trajectories (Hypothesis 3a; Shi et al., 2021). We further expected that adolescents on the trajectory of decreasing prosocial behavior and increasing externalizing problems would have the least close and the most conflicting relationship with their parents and teachers (Hypothesis 3b; e.g., Shi et al., 2020, 2021).

Previous studies have shown that girls engage less in externalizing problems and conflict with parents and teachers than boys do (Baker, 2006; Hamre & Pianta, 2001). Relationship with parents and teachers and adjustment behaviors have also been linked to parental education and adolescents' achievement (Hinshaw, 1992; Pakarinen et al., 2018). In addition, the educational track (academic or vocational) may also be associated with the behavior of adolescents (Anttila et al., 2022). Therefore gender, mother's education, father's education, adolescents' achievement, and educational track were included in the analyses.

2. Methods

2.1. Participants

The data were collected as part of a broader longitudinal study following a community sample of Finnish adolescents across critical educational transitions. In Finland, compulsory education consists of nine years of comprehensive school (primary school from Grade 1 to Grade 6 and lower secondary school from Grade 7 to Grade 9). After compulsory education, students move to upper secondary education and choose either upper secondary general or vocational education. The latter concentrates on acquiring vocational qualification for a specific field. After nine years of compulsory education, students may also choose to complete a 10th year of basic or preparatory education before entering upper secondary education (Ministry of Education and Culture, 2023).

Four time points were included in the study (Grade 9 fall [T1], Grade 9 spring [T2], Grade 1 of upper secondary education in fall [T3], and Grade 1 of upper secondary education in spring [T4]). In total, 901 adolescents (884 at T1, 885 at T2, 728 at T3, and 684 at T4; 55.9 % girls and 44.1 % boys) answered questions about their adjustment behaviors at all time points, relationship with parents and teachers in T1, and their

temperament in T2. Parents reported on their relationship with adolescents in T1, and home classroom teachers reported on their relationship with adolescents in T2. The mean age of adolescents at T1 was 15.3 years ($SD = 0.37$). Most of the adolescents were living with both parents (69.0 %) or alternately with their mother and their father (10.6 %), 8.8 % lived with only their mother, 7.0 % lived with their mother and stepfather, 1.9 % lived with only their father, and 1.0 % lived with their father and stepmother. The remaining 1.6 % lived with foster parents or somebody else. One-way ANOVA showed significant differences between categories of family structure and adolescent-reported conflict with mothers ($F[4833] = 3.591, p = .007$), closeness with fathers ($F[4818] = 15.409, p < .001$), and externalizing problems at T2 ($F[4829] = 3.579, p = .007$). In particular, adolescents who lived with their mother and stepfather perceived more conflict with their mothers than those adolescents who lived with their mother and father ($p = .007$) or alternately with their mother and father ($p = .004$). In addition, adolescents who lived with their mother and father or alternately with mother and father perceived a closer relationship with their fathers than those adolescents who lived with only their mother ($p < .001$) or those adolescents who lived with their mother and stepfather ($p < .001$). Regarding externalizing problems, adolescents who lived with mother and stepfather had more externalizing problems at T2, than those adolescents who lived with mother and father ($p = .006$). In the current study, 57.9 % of adolescents chose general upper secondary education, and 32.2 % chose vocational school. The procedures followed the principles of the Helsinki Declaration on research with human subjects. Written consent to participate was collected from the participants and the research plan of the project was approved by the Human Sciences Ethics Committee of the local university.

2.2. Measures

For a description of the respondents and the number of participants at each time point see Table 1.

2.2.1. Temperament (T2)

Each adolescent filled in the Finnish version of the Early Adolescent Temperament Questionnaire-Revised EATQ-R (Capaldi & Rothbart, 1992; Ellis, 2002; Ellis & Rothbart, 2001). Adolescents rated 51 statements on a five-point Likert scale (1 = almost never true; 5 = almost always true). The statements measured temperamental surgency/extraversion, negative affectivity, and effortful control. The mean scores for effortful control, negative affectivity, and surgency/extraversion were calculated. For the validity of the measure in the Finnish sample, see Kiuru, Hirvonen, and Ahonen (2019).

2.2.2. Parent-adolescent relationship (T1)

The adolescents answered questions about their perceived Closeness (five items, e.g., "I have a warm and close relationship with my mother") and Conflict (six items, e.g., "I am often angry at my father") with their

Table 1
Respondents at each time point.

Respondent	Measures	Time points	n
Adolescent	Early Adolescent Temperament Questionnaire	T2	871
		T1 mother	876
	Child-Parent Relationship Scale	T1 father	862
		T1	881
	Student-Teacher Relationship Scale	T1	879
		T2	860
T3		727	
T4		681	
Parent	Child-Parent Relationship Scale	T1	626
Teacher	Student-Teacher Relationship Scale	T2	295

Note. T1 = Grade 9 fall; T2 = Grade 9 spring; T3 = Grade 1 fall of upper secondary education; T4 = Grade 1 spring of upper secondary education.

mothers and fathers using the short form of the Child-Parent Relationship Scale (CPRS; Driscoll & Pianta, 2011; Pianta, 1992; see also Kiuru, Wang, et al. (2019); Mauno et al., 2018) in Grade 9 fall (T1). The adolescents answered the questions on a five-point Likert scale (1 = not true at all; 5 = completely true). In addition, parents also answered questions about their perceived close (five items "I share an affectionate, warm relationship with my child") or conflicting relationship (six items "My child easily becomes angry at me") in Grade 9 fall (T1) based on the same scale.

2.2.3. Teacher-adolescent relationship (T1 and T2)

The adolescents reported their perceived quality of relationship with their teachers in Grade 9 fall (T1) using the short form of the Student-Teacher Relationship Scale (STRS; Pianta, 1992; Pianta, 2001). The scale includes 11 items rated on a five-point Likert scale (1 = completely disagree; 5 = completely agree); five items measure Closeness (e.g., "If I am upset, I go to my teachers for comfort"), and six items measure Conflict (e.g., "My teachers are tired of my behavior"). In addition, home classroom teachers ($n = 57$, mean age 44.7 years) answered questions about their perceived closeness (five items "I share an affectionate, warm relationship with this student") or conflict (five items "Dealing with this student drains my energy") with a subsample of adolescents (max. six students per class) in Grade 9 spring (T2) based on the same scale. Home classroom teachers reported on their work experience in that particular school: 14 % of teachers worked under 2 years, 22.8 % worked 3–5 years, 24.6 % worked 6–10 years, 19.3 % worked 11–15 years, and 19.3 % worked over 15 years in schools that data collection took place in. In addition, 51.1 % of home classroom teachers reported that they teach their Grade 9 students up to 3 h during a week, 31.6 % – 4 to 6 h, and 12.5 % – 13 h and more. Besides teaching their subject home classroom teachers are assigned a class that they meet with occasionally to discuss important school matters. For additional analyses, we also included adolescent reports on their relationship closeness ($\alpha = 0.81$) and conflict ($\alpha = 0.88$) with their teachers at T3.

2.2.4. Adjustment behaviors (T1, T2, T3, and T4)

The adolescents answered questions about their adjustment behaviors using the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) on a scale from 0 to 2 (0 = not true; 2 = certainly true), two times in Grade 9 and two times in Grade 1 of upper secondary education. The scale measures: hyperactivity (five items, e.g., "I am restless, I cannot sit still for a long time"); conduct problems (five items, e.g., "I fight a lot. I get others to do what I want"); and prosocial behavior (five items, e.g., "I am kind to younger people"). Mean scores were calculated for each scale. Hyperactivity and conduct problems scales are recommended to be combined in low-risk or general population samples (Goodman et al., 2010). Therefore, the score of externalizing problems was calculated by averaging the scores of ten items from two scales – hyperactivity and conduct problems.

2.2.5. Control variables

The adolescents' gender was coded as 1 (for girls) or 2 (for boys). Adolescents reported their grade point average in Grade 1 fall of upper secondary education. In Finnish schools, grades range from 4 to 10, with 5 being the lowest passing grade and 10 the highest passing grade. Fathers and mothers separately reported their education level from 1 to 7 (1 = no vocational training; 2 = employment or vocational training courses; 3 = vocational training, 4 = college level education, 5 = university of Applied Sciences, 6 = university or college, 7 = university postgraduate degree). In addition, an educational track with an auxiliary setting was included in the analyses. The adolescents who followed the vocational school track were coded as 1 and adolescents who followed the upper general secondary education (or high school) track were coded as 2.

2.3. Data analysis strategy

Data analysis was performed using Mplus Version 8.6 (Muthén & Muthén, 1998–2017). The missing data of the main study variables ranged from 0 % to 67.3 % (for teacher-reported relationship quality), $M = 15.6 \%$, $SD = 18.9 \%$. Full information maximum likelihood estimation (FIML) with robust standard errors (MLR) was applied. Missing data were assumed to be missing at random (MAR). All the available data were included in the analyses.

The longitudinal factor model with four measurement points was built together for prosocial behavior and externalizing problems. The four time points of prosocial behavior and externalizing problems measures were loaded for both factors separately, which were allowed to be correlated. First, to answer what kind of developmental trajectories adolescents follow based on their prosocial behavior and externalizing problems, factor mixture analysis (FMA; Lubke & Muthén, 2005) was conducted across all four time points. Fig. 1 shows two continuous factors of the tested model, with c representing latent classes. The subgroups were identified based on means of prosocial behavior and externalizing problems at different time points. The random starting values and iteration rounds were increased based on the Mplus manual to avoid local maxima (Muthén & Muthén, 1998–2017). The COMPLEX approach was applied to consider the nested nature of the data. To identify the optimal number of latent trajectory groups, the fit of the model, the number of adolescents assigned to each group, and the theoretical justification of the model solution were considered. For the model fit, the following indices were evaluated: the log-likelihood value (Log L), the Akaike information criterion (AIC), the Bayesian information criterion (BIC), the adjusted Bayesian information criterion (ABIC), the Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMRT), and the Lo-Mendell Rubin adjusted likelihood ratio test (ALMRT; Lo et al., 2001). Lower Log L, AIC, BIC, and ABIC values indicated a better model, and significant ALMRT and VLMRT values suggested the need to choose a higher number of groups. In addition, the posterior probabilities and entropy coefficient were used to identify the final number of latent

trajectories. Posterior probabilities and entropy evaluate the overall classification quality; the higher posterior probabilities and entropy, the clearer classification (Muthén, 2003). FMA was chosen because it considers the heterogeneity of the population and is more flexible toward the fluctuation of nonlinear changes between different time points than, for example, growth mixture modeling (Lubke & Muthén, 2005).

Second, to answer to what extent combined developmental trajectories differ in terms of individual and environmental factors, parent-adolescent relationship (closeness and conflict), teacher-adolescent relationship (closeness and conflict), and temperament (surgency, negative affectivity, and effortful control) were added as auxiliary variables. As an auxiliary setting, a three-step approach (DU3STEP, DE3STEP) was considered. However, the approach did not work well for the current analyses and caused estimation problems. BCH auxiliary setting was therefore chosen as it worked well for the data and did not cause any estimation problems (Asparouhov & Muthén, 2014). In addition, the BCH auxiliary setting does not change the classification of groups. Gender, GPA, mothers' education, fathers' education, and educational track were also included as auxiliary variables in the model. As additional analyses teacher-adolescent closeness and conflict at T3 were included with a BCH auxiliary setting.

3. Results

For descriptive statistics including internal consistency, and zero-order correlations, see Tables 2 and 3, respectively.

3.1. Developmental trajectories of adjustment behaviors

To answer the first research question about the developmental trajectories that adolescents follow concerning their prosocial behavior and externalizing problems during the transition to upper secondary education, first, a two-factor model was estimated for the whole sample, which had a good model fit ($\chi^2[19] = 125.970$, $p < .001$, $CFI = 0.946$, $TLI = 0.920$, $RMSEA = 0.079$, $SRMR = 0.031$). Second, the factor

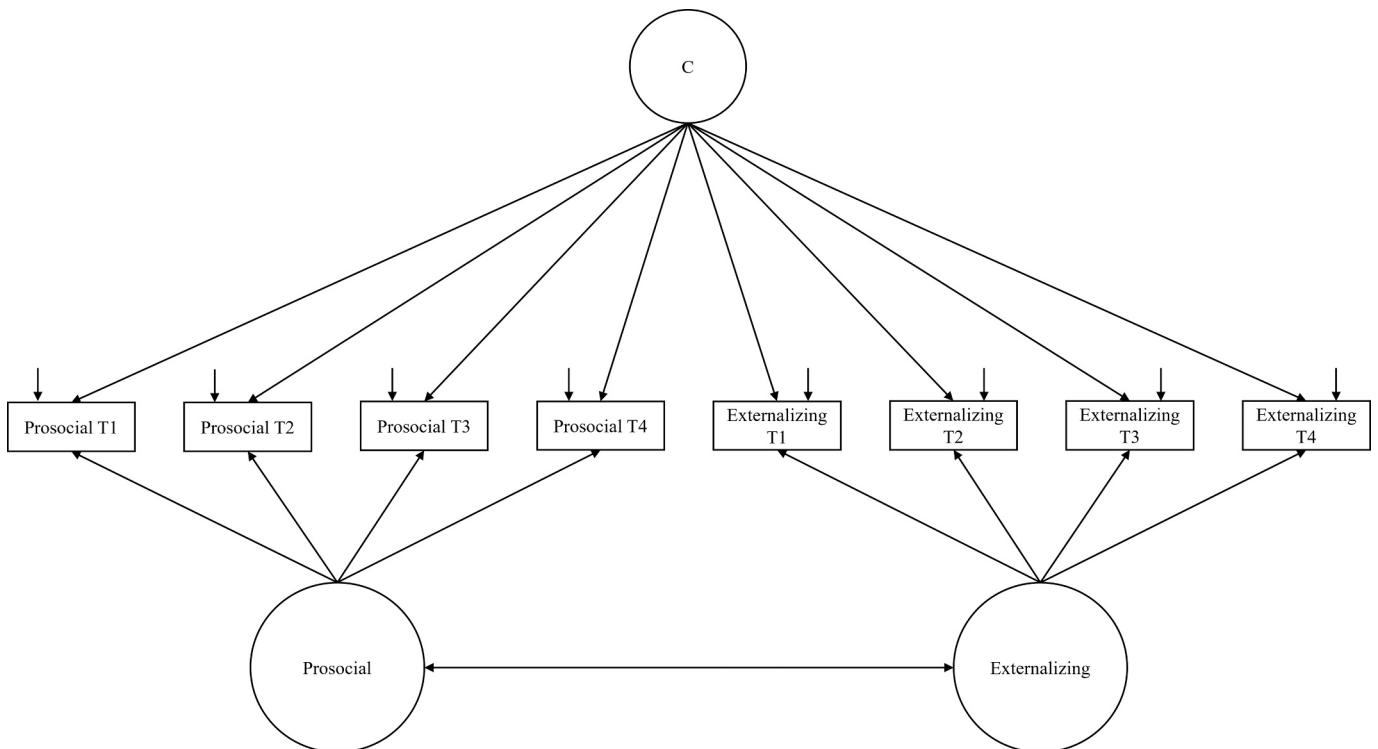


Fig. 1. The tested factor mixture model.

Note. T1 = Grade 9 fall; T2 = Grade 9 spring; T3 = Grade 1 fall of upper secondary education; T4 = Grade 1 spring of upper secondary education.

Table 2
Descriptive statistics of main study variables.

Variable names	<i>n</i>	<i>M</i>	<i>SD</i>	α	Potential range	Actual range	Skewness
<i>Adjustment behaviors</i>							
Prosocial behavior T1	879	1.47	0.39	0.71	0–2	0–2	–0.57
Prosocial behavior T2	860	1.43	0.41	0.73	0–2	0–2	–0.52
Prosocial behavior T3	727	1.52	0.39	0.73	0–2	0.2–2	–0.74
Prosocial behavior T4	681	1.54	0.38	0.70	0–2	0–2	–0.68
Externalizing problems T1	879	0.49	0.34	0.79	0–2	0–1.7	0.76
Externalizing problems T2	860	0.56	0.37	0.81	0–2	0–2	0.45
Externalizing problems T3	727	0.49	0.34	0.79	0–2	0–1.7	0.70
Externalizing problems T4	681	0.48	0.32	0.75	0–2	0–1.5	0.60
<i>Temperament</i>							
Surgency/extraversion T2	871	3.39	0.65	0.73	1–5	1.2–5	–0.25
Negative affectivity T2	871	2.71	0.56	0.86	1–5	1–4.4	–0.19
Effortful control T2	871	3.27	0.51	0.79	1–5	1.6–4.8	0.22
<i>Closeness</i>							
Mother–adolescent closeness T1 (youth r.)	876	3.67	1.05	0.89	1–5	1–5	–0.58
Father–adolescent closeness T1 (youth r.)	861	3.27	1.07	0.88	1–5	1–5	–0.30
Parent–adolescent closeness T1 (parent r.)	626	4.01	0.66	0.82	1–5	1.2–5	–0.66
Teacher–student closeness T1 (youth r.)	880	1.91	0.73	0.79	1–5	1–4.6	1.00
Teacher–student closeness T2 (teacher r.)	295	3.02	0.84	0.86	1–5	1–5	0.06
<i>Conflict</i>							
Mother–adolescent conflict T1 (youth r.)	876	2.09	0.92	0.87	1–5	1–5	0.82
Father–adolescent conflict T1 (youth r.)	862	1.94	0.83	0.84	1–5	1–5	0.99
Parent–adolescent conflict T1 (parent r.)	626	2.08	0.83	0.87	1–5	1–5	0.95
Teacher–student conflict T1 (youth r.)	881	1.73	0.83	0.86	1–5	1–5	1.43
Teacher–student conflict T2 (teacher r.)	295	1.45	0.68	0.88	1–5	1–4.6	1.93
<i>Control variables</i>							
Gender (1 = girl, 2 = boy)	901	1.44	0.50		1–2	1–2	0.24
Mother education	692	4.41	1.36		1–7	1–7	0.02
Father education	556	4.00	1.47		1–7	1–7	0.26
Achievement (GPA)	875	8.27	0.94		5–10	5–10	–0.52
Track (1 = vocational, 2 = academic)	812	1.64	0.48		1–2	1–2	–0.60

Note. T1 = Grade 9 fall; T2 = Grade 9 spring; T3 = Grade 1 fall of upper secondary education; T4 = Grade 1 spring of upper secondary education.

mixture analyses were conducted (see fit indices in Table 4). The analyses have shown good model fit up to the seven-group model. Seven-group model had the lowest Log L, AIC, BIC, and ABIC. In addition, even though six- and seven-group models had high posterior probabilities and entropy, they also had some extremely small subgroups. Therefore, six- and seven-group models were not chosen as finals, and four- and five-group models were considered further. Because the four-group model had a higher entropy score and lower pVLMR and pLMRI values than the five-group model, the four-group model was chosen as the final model. Due to the theoretical justification and meaningfulness of the results, the smallest subgroup of adolescents ($n = 14$) was not excluded. The individual curves of 14 participants from the smallest subgroup and the variation within the class were explored. There were no unusual patterns or strong discrepancies between cases in the smallest class found. However, this result should be interpreted carefully, and future studies are needed to replicate this result.

The four groups were distinguished (Fig. 2):

1. *Moderate prosocial and high externalizing*: (Group 1, 25.8 %). Prosocial behavior remained at a relatively stable moderate level and externalizing problems remained at a relatively stable high level across the transition.
2. *High prosocial and low externalizing*: (Group 2, 64.9 %). Prosocial behavior remained at a relatively stable high level and externalizing problems remained at a relatively stable low level.
3. *Decreasing prosocial and increasing externalizing before transition*: (Group 3, 7.4 %). Prosocial behavior dropped and externalizing problems peaked right before the transition (in T2).

4. *Decreasing prosocial and increasing externalizing after transition*: (Group 4, 1.9 %). Prosocial behavior dropped and externalizing problems peaked right after the transition (in T3).

In addition, follow-up analyses identified the significant differences between time points in each class separately (see Table 5). Even though results showed significant fluctuations in Group 1 (*moderate prosocial and high externalizing*) and 2 (*high prosocial and low externalizing*) across the transition, they were small enough to presume that adjustment behaviors were relatively stable across the transition in Groups 1 and 2. For example, in Group 1 (*moderate prosocial and high externalizing*), prosocial behavior slightly increased and externalizing problems slightly decreased from T2 to T3. In addition, in Group 2 (*high prosocial and low externalizing*), prosocial behavior and externalizing problems slightly increased from T1 to T4.

3.2. Developmental trajectories in terms of temperament

To answer the second research question, the role of adolescents' temperament in distinct trajectories was investigated (see Table 6). Negative affectivity was significantly associated with the trajectories of adjustment behaviors. Group 1 adolescents with *moderate prosocial behavior and high externalizing problems* had the highest negative affectivity and were significantly different from all other groups. However, there were no significant differences between the remaining three groups in terms of negative affectivity. Regarding effortful control, adolescents in Group 1 (*moderate prosocial and high externalizing*) had the lowest levels of effortful control and were significantly different from all other groups. Group 3 adolescents with *decreasing prosocial behavior and*

Table 3
Pearson correlations between main study variables.

Variable name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
1. Prosocial behavior T1	–																									
2. Prosocial behavior T2	0.61**	–																								
3. Prosocial behavior T3	0.63**	0.63**	–																							
4. Prosocial behavior T4	0.58**	0.63**	0.69**	–																						
5. Externalizing problems T1	–0.37**	–0.31**	–0.28**	–0.28**	–																					
6. Externalizing problems T2	–0.33**	–0.42**	–0.28**	–0.31**	0.66**	–																				
7. Externalizing problems T3	–0.30**	–0.32**	–0.37**	–0.27**	0.62**	0.67**	–																			
8. Externalizing problems T4	–0.25**	–0.29**	–0.27**	–0.32**	0.62**	0.64**	0.73**	–																		
9. Surgency/extraversion T2	0.16**	0.19**	0.19**	0.20**	–0.05	–0.08*	–0.09*	–0.08*	–																	
10. Negative affectivity T2	–0.05	–0.05	0.01	–0.03	0.33**	0.32**	0.30**	0.34**	–0.30**	–																
11. Effortful control T2	0.32**	0.36**	0.26**	0.22**	–0.55**	–0.59**	–0.51**	–0.46**	0.14**	–0.32**	–															
12. Mother–adolescent closeness T1 (youth r.)	0.32**	0.26**	0.21**	0.21**	–0.35**	–0.29**	–0.25**	–0.24**	0.06	–0.17**	0.30**	–														
13. Father–adolescent closeness T1 (youth r.)	0.26**	0.22**	0.21**	0.19**	–0.34**	–0.29**	–0.29**	–0.28**	0.13**	–0.28**	0.33**	0.67**	–													
14. Parent–adolescent closeness T1 (parent r.)	0.18**	0.12**	0.11*	0.18**	–0.11**	–0.09*	–0.09*	–0.10*	0.04	–0.09*	0.14**	0.38**	0.28**	–												
15. Teacher–student closeness T1 (youth r.)	0.26**	0.23**	0.18**	0.17**	–0.23**	–0.23**	–0.19**	–0.21**	0.05	–0.09**	0.30**	0.35**	0.37**	0.13**	–											
16. Teacher–student closeness T2 (teacher r.)	0.14*	0.13*	0.07	0.09	–0.05	–0.02	–0.02	0.00	0.08	0.01	0.14*	0.19**	0.10	0.18**	0.26**	–										
17. Mother–adolescent conflict T1 (youth r.)	–0.20**	–0.15**	–0.12**	–0.11**	0.43**	0.36**	0.34**	0.34**	–0.01	0.33**	–0.33**	–0.40**	–0.28**	–0.17**	–0.15**	–0.00	–									
18. Father–adolescent conflict T1 (youth r.)	–0.20**	–0.18**	–0.17**	–0.16**	0.41**	0.30**	0.32**	0.29**	–0.05	0.29**	–0.31**	–0.22**	–0.33**	–0.15**	–0.10**	0.06	0.68**	–								
19. Parent–adolescent conflict T1 (parent r.)	–0.16**	–0.09*	–0.11**	–0.10*	0.29**	0.23**	0.21**	0.21**	–0.03	0.21**	–0.21**	–0.28**	–0.22**	–0.35**	–0.20**	0.02	0.46**	0.35**	–							
20. Teacher–student conflict T1 (youth r.)	–0.29**	–0.31**	–0.26**	–0.23**	0.50**	0.44**	0.38**	0.38**	0.03	0.14**	–0.35**	–0.16**	–0.08*	0.01	–0.13**	0.03	0.40**	0.37**	0.17**	–						
21. Teacher–student conflict T2 (teacher r.)	–0.14*	–0.25**	–0.18**	–0.11	0.32**	0.32**	0.34**	0.33**	–0.02	0.11	–0.25**	–0.03	–0.03	–0.07	–0.17**	–0.03	0.01	–0.02	0.20**	0.30**	–					
22. Gender (1 = girl, 2 = boy)	–0.25**	–0.32**	–0.32**	–0.28**	0.05	0.15**	0.05	–0.03	–0.01	–0.29**	–0.06	–0.08*	0.09*	–0.09*	0.02	–0.06	–0.05	0.00	–0.05	0.26**	0.09	–				
23. Mother education	0.07	0.09*	0.09*	0.06	–0.08*	–0.08	–0.09*	–0.04	0.11**	–0.04	0.06	0.09*	0.10**	0.03	0.07	0.08	–0.01	0.01	–0.01	–0.05	–0.09	–0.00	–			
24. Father education	0.10*	0.09*	0.05	0.13**	–0.13**	–0.10*	–0.08	–0.11*	0.04	–0.02	0.11*	0.11*	0.11**	0.06	0.07	0.09	0.01	0.05	–0.02	–0.05	–0.08	0.03	0.46**	–		
25. Achievement (GPA)	0.28**	0.30**	0.27**	0.25**	–0.39**	–0.41**	–0.34**	–0.32**	0.06	0.07*	0.38**	0.20**	0.12**	0.09*	0.17**	0.13*	–0.13**	–0.09**	–0.22**	–0.34**	–0.48**	–0.35**	0.30**	0.31**	–	
26. Track (1 = vocational, 2 = academic)	0.20**	0.24**	0.15**	0.24**	–0.27**	–0.34**	–0.20**	–0.19**	0.06	–0.00	0.24**	0.10**	0.05	–0.00	0.07*	0.10	–0.09*	–0.07	–0.15**	–0.26**	–0.26**	–0.24**	0.26**	0.30**	0.59**	

Note. * $p < .05$, ** $p < .01$; T1 = Grade 9 fall; T2 = Grade 9 spring; T3 = Grade 1 fall of upper secondary education; T4 = Grade 1 spring of upper secondary education.

Table 4
Fit Indices and group sizes for factor mixture model with different number of groups (n = 899).

No. of Groups	Log-likelihood (df), scaling correction	AIC	BIC	Adjusted BIC	pVLMR	pLMR	Posterior Probabilities	Group Sizes	Entropy
1	-1090.075 (25) 1.5337	2230.151	2350.183	2270.787	-	-	-	899	-
2	-1007.897 (34) 1.4864	2083.795	2247.039	2139.060	0.1101	0.1137	0.88, 0.99	857, 42	0.922
3	-928.743(43) 1.5879	1943.486	2149.941	2013.380	0.3228	0.3290	0.88, 0.98, 0.99	43, 842, 14	0.931
4	-854.752(52) 1.7660	1813.505	2063.172	1898.028	0.1626	0.1672	0.86, 0.92, 0.87, 0.99	222, 604, 59, 14	0.818
5	-803.203 (61) 1.6736	1728.406	2021.284	1827.559	0.6927	0.6947	0.93, 0.85, 0.78, 0.99, 0.84	524, 54, 201, 14, 106	0.805
6	-760.367 (70) 1.5609	1660.734	1996.824	1774.516	0.3197	0.3213	0.80, 0.99, 0.81, 0.93, 0.84, 0.87	532, 208, 52, 60, 11, 36	0.828
7	-726.793(79) 1.4210	1611.587	1990.888	1739.998	0.4284	0.4300	0.96, 0.86, 0.79, 0.81, 0.80, 0.93., 0.99	13, 53, 64, 39, 195, 531, 4	0.838

Note: The row in bold marks the indices based on which the number of groups were chosen.

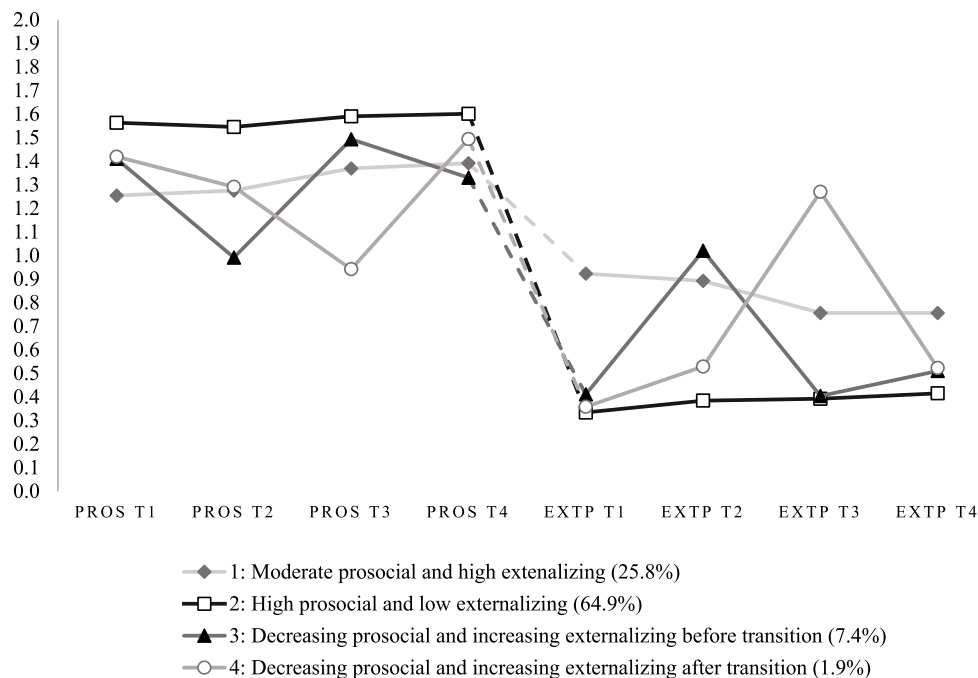


Fig. 2. Four latent groups based on prosocial behavior and externalizing problems at four time points.

Note. PROS = prosocial behavior; EXTP = externalizing problems; T1 = Grade 9 fall; T2 = Grade 9 spring; T3 = Grade 1 fall of upper secondary education; T4 = Grade 1 spring of upper secondary education.

increasing externalizing problems before the transition had the second lowest effortful control and were significantly different from all other groups. Adolescents from Groups 2 (high prosocial and low externalizing) and 4 (decreasing prosocial and increasing externalizing after transition) had the highest effortful control and were significantly different from Groups 1 (moderate prosocial and high externalizing) and 3 (decreasing prosocial and increasing externalizing before transition). Regarding temperamental surgency, there were no statistically significant differences between the groups.

3.3. Developmental trajectories in terms of relationship quality

To answer the third research question, the role of adolescents' relationship quality with parents and teachers on distinct trajectories was examined (see Table 6). Regarding relationship closeness with parents, the adolescents in Group 1 (moderate prosocial and high externalizing) reported the lowest closeness with both parents before the transition, which was significantly different from all other groups. Adolescents in Group 3 (decreasing prosocial and increasing externalizing before transition) had a lower closeness with their mothers than did those in Group 2 (high prosocial and low externalizing), and lower closeness with

their fathers than those in Group 4 (decreasing prosocial and increasing externalizing after transition), which indicates that the adolescents in Groups 2 and 4 perceived the highest closeness with their parents. Parent reports on relationship closeness before the transition did not statistically significantly predict the trajectories of adjustment behaviors. For conflict, Group 1 (moderate prosocial and high externalizing) adolescents had the most conflict with their mothers and fathers, which was significantly different from all other groups. Group 3 (decreasing prosocial and increasing externalizing before transition) adolescents reported (significantly different from all other groups) the second highest conflict with mothers and, together with Group 2 (high prosocial and low externalizing), with fathers (significantly different from Groups 1 and 4). Regarding adult reports, parents perceived the least conflict at the beginning of the transition with Group 4 (decreasing prosocial and increasing externalizing after transition) adolescents (significantly different from all other groups) and more conflict with Group 1 (moderate prosocial and high externalizing) adolescents than with Group 2 (high prosocial and low externalizing).

Regarding relationship closeness with teachers, adolescents in Group 1 (moderate prosocial and high externalizing) reported significantly lower closeness with teachers than adolescents in Groups 2 (high prosocial and

Table 5
Differences in changes of adjustment behaviors between time points in each class.

Difference between time points	Prosocial behavior		Externalizing problems	
	Wald's test	Diff (p)	Wald's test	Diff (p)
<i>Group 1</i>	17.360(3), $p < .001$		33.529(3), $p < .001$	
T1 and T2		-0.021 (.578)		0.031 (.613)
T2 and T3		-0.094 (.004)		0.136 (<.001)
T3 and T4		-0.022 (.475)		0.000 (.985)
T1 and T4		-0.137 (.001)		0.167 (.005)
<i>Group 2</i>	18.528(3), $p < .001$		30.593(3), $p < .001$	
T1 and T2		0.018 (.123)		-0.049 (.022)
T2 and T3		-0.045 (.001)		-0.008 (.542)
T3 and T4		-0.011 (.499)		-0.023 (.03)
T1 and T4		-0.038 (.022)		-0.080 (<.001)
<i>Group 3</i>	17.626(3), $p < .001$		111.523(3), $p < .001$	
T1 and T2		0.419 (<.001)		-0.609 (<.001)
T2 and T3		-0.502 (<.001)		0.617 (<.001)
T3 and T4		0.163 (.072)		-0.106 (.083)
T1 and T4		0.080 (.404)		-0.099 (.087)
<i>Group 4</i>	10.158(3), $p = .017$		757.436(3), $p < .001$	
T1 and T2		0.128 (.260)		-0.171 (.116)
T2 and T3		0.349 (.005)		-0.742 (<.001)
T3 and T4		-0.551 (.002)		0.747 (<.001)
T1 and T4		-0.074 (.555)		-0.165 (.133)

Note. T1 = Grade 9 fall; T2 = Grade 9 spring; T3 = Grade 1 fall of upper secondary education; T4 = Grade 1 spring of upper secondary education.

low externalizing) and 4 (decreasing prosocial and increasing externalizing after transition). Teacher-reported relationship closeness did not statistically significantly predict the trajectories of adjustment behaviors. For conflict, Group 1 (moderate prosocial and high externalizing) adolescents reported the highest conflict with their teachers before the transition which was significantly different from all other groups. In addition, Group 3 (decreasing prosocial and increasing externalizing before transition) adolescents perceived more conflict with their teachers at the beginning of the transition than Group 2 (high prosocial and low externalizing) adolescents did. Teachers perceived that they had more conflicting relationship with Group 1 (moderate prosocial and high externalizing) adolescents than with Group 2 (high prosocial and low externalizing) adolescents.

Regarding the additional variables, gender, achievement, and educational track differences were found between groups. There were more girls in Group 2 (high prosocial and low externalizing) than boys in comparison to the other three groups and more boys in Group 3 (decreasing prosocial and increasing externalizing before transition) than in Group 1 (moderate prosocial and high externalizing). In addition, adolescents in Groups 2 (high prosocial and low externalizing) and 4 (decreasing prosocial and increasing externalizing after transition) had higher achievement than adolescents in the remaining two groups. Finally, more adolescents chose the vocational track in Groups 1 (moderate prosocial and high externalizing) and 3 (decreasing prosocial and increasing externalizing before transition) than the other two groups, and more adolescents chose the academic track in Groups 2 (high prosocial and low externalizing) and 4 (decreasing prosocial, increasing externalizing after transition) than the other two groups.

3.4. Additional analyses

Due to the discontinuity of teacher-adolescent relationship when adolescents switch from lower secondary school to upper secondary education, the present study also examined the role of teacher-adolescent relationship after the transition (T3) on adjustment behaviors trajectories. There were no significant differences between groups in terms of closeness with teachers, however, there were significant differences in terms of conflict with teachers. Adolescents who followed the trajectory of moderate prosocial behavior and high externalizing problems (Group 1) had higher conflicts with teachers at T3 than adolescents who followed either the trajectory of high prosocial behavior and low externalizing problems (Group 2) or the trajectory of decreasing prosocial behavior and

increasing externalizing problems before the transition (Group 3).

4. Discussion

The current study applied a person-oriented approach to obtain further knowledge on the differences between distinct trajectories of adolescents in terms of their adjustment behaviors across the critical transition from lower to upper secondary education. In particular, this is one of the first attempts to investigate the role of individual and environmental factors on combined adjustment behaviors trajectories across this specific transition. Results have shown that adolescents fell into four distinct developmental trajectories: moderate prosocial and high externalizing (25.8 %); high prosocial and low externalizing (64.9 %); decreasing prosocial and increasing externalizing before the transition (7.4 %); and decreasing prosocial and increasing externalizing after the transition (1.9 %). In addition, developmental trajectories of adjustment behaviors differed in terms of adolescents' temperamental negative affectivity, effortful control, and relationship with parents and teachers.

4.1. Developmental trajectories of adjustment behaviors across the transition to upper secondary education

The first aim of the study was to investigate the combined developmental trajectories of adolescents' prosocial behavior and externalizing problems during the transition from lower to upper secondary education. A person-oriented approach was applied to the data and four distinct trajectories in combined adjustment behaviors were found. As expected (Hypothesis 1a), the largest group of adolescents had high prosocial behavior and low externalizing problems across the transition (Group 2, 64.9 %). Despite slight variation in means between subsequent measurement points, the overall pattern of results was that prosocial behavior was high and relatively stable, and externalizing problems were low and relatively stable. Previous studies that applied a person-oriented approach also found that the majority of adolescents showed positive adjustment patterns (e.g., Jambon et al., 2019; Shi et al., 2021). The results indicate that the adolescents from the largest group successfully cope with challenges brought on by the transition to upper secondary education. Moreover, as expected (Hypothesis 1b) and in accordance with the previous studies (e.g., Flynn et al., 2015; Padilla-Walker et al., 2018), the second-largest group of adolescents (Group 1, 25.8 %) had lower prosocial behavior and higher externalizing problems than Group 2. Follow-up analyses showed that prosocial behavior

Table 6

Differences between the adjustment behaviors trajectories in terms of relationship quality and adolescents' temperament.

Variable names	Group 1: Moderate prosocial and high externalizing (25.8 %)	Group 2: High prosocial and low externalizing (64.9 %)	Group 3: Decreasing prosocial and increasing externalizing before transition (7.4 %)	Group 4: Decreasing prosocial and increasing externalizing after transition (1.9 %)	Overall test		Pairwise comparison
	M (S.E.)	M (S.E.)	M (S.E.)	M (S.E.)	χ^2	<i>p</i>	
Temperament							
Surgency T2 (youth report)	3.33 (0.05)	3.42 (0.03)	3.40 (0.06)	3.30 (0.14)	2.655	.448	
Negative affectivity T2 (youth report)	3.00 (0.04)	2.61 (0.03)	2.65 (0.07)	2.56 (0.15)	70.047	<.001	1 > 2,3,4
Effortful control T2 (youth report)	2.85 (0.04)	3.46 (0.02)	3.06 (0.07)	3.35 (0.08)	180.804	<.001	1 < 2,3,4 3 < 2,4
Closeness							
Mother-adolescent closeness T1 (youth report)	3.06 (0.09)	3.92 (0.05)	3.56 (0.14)	3.97 (0.29)	64.204	<.001	1 < 2,3,4 2 > 3
Father-adolescent closeness T1 (youth report)	2.65 (0.07)	3.48 (0.05)	3.35 (0.14)	3.94 (0.29)	96.546	<.001	1 < 2,3,4 4 > 3
Parent-adolescent closeness T1 (parent report)	3.91 (0.07)	4.04 (0.04)	4.03 (0.11)	4.24 (0.15)	4.721	.193	
Teacher-student closeness T1 (youth report)	1.69 (0.06)	2.00 (0.04)	1.81 (0.11)	2.13 (0.21)	26.281	<.001	1 < 2,4
Teacher-student closeness T3 (youth report)	1.92 (0.09)	1.95 (0.05)	1.78 (0.10)	1.73 (0.22)	2.190	.534	
Teacher-student closeness T2 (teacher report)	2.92 (0.14)	3.02 (0.10)	3.23 (0.14)	3.40 (0.32)	3.211	.360	
Conflict							
Mother-adolescent conflict T1 (youth report)	2.69 (0.08)	1.86 (0.04)	2.15 (0.14)	1.64 (0.16)	78.740	<.001	1 > 2,3,4 3 > 2,4
Father-adolescent conflict T1 (youth report)	2.54 (0.08)	1.73 (0.04)	1.88 (0.13)	1.45 (0.13)	91.781	<.001	1 > 2,3,4 4 < 3,2
Parent-adolescent conflict T1 (parent report)	2.52 (0.10)	1.94 (0.04)	2.14 (0.16)	1.59 (0.15)	46.851	<.001	4 < 1,2,3 1 > 2
Teacher-student conflict T1 (youth report)	2.49 (0.07)	1.41 (0.03)	1.96 (0.15)	1.73 (0.21)	198.363	<.001	1 > 2,3,4 3 > 2
Teacher-student conflict T3 (youth report)	1.88 (0.08)	1.31 (0.03)	1.37 (0.10)	1.70 (0.16)	48.960	<.001	1 > 2,3
Teacher-student conflict T2 (teacher report)	1.87 (0.15)	1.30 (0.05)	1.50 (0.24)	1.91 (0.47)	12.892	<.01	1 > 2
Control variables							
Gender (1 = girl, 2 = boy)	1.53 (0.04)	1.35 (0.02)	1.83 (0.08)	1.72 (0.11)	46.865	<.001	2 < 1,3,4 3 > 1
Mother education	4.27 (0.12)	4.48 (0.09)	4.32 (0.23)	4.27 (0.42)	2.156	.541	
Father education	3.77 (0.14)	4.13 (0.10)	3.79 (0.37)	3.55 (0.36)	5.663	.129	
Achievement (GPA)	7.59 (0.08)	8.56 (0.05)	7.89 (0.15)	8.33 (0.17)	136.763	<.001	2 > 1,3 4 > 1,3 1,3 < 2,4
Track (1 = vocational, 2 = academic)	1.39 (0.05)	1.76 (0.02)	1.30 (0.08)	1.79 (0.11)	107.890	<.001	

Note. T1 = Grade 9 fall; T2 = Grade 9 spring; T3 = Grade 1 fall of upper secondary education; T4 = Grade 1 spring of upper secondary education.

slightly increased and externalizing problems slightly decreased during the transition (from T2 to T3), yet adolescents in Group 1 still had lower prosocial behavior and elevated externalizing problems across the transition to upper secondary education.

Finally, in accordance with the previous studies (e.g., Benner et al., 2017; Shi et al., 2021), the results showed groups of adolescents who were more susceptible to the changes across the transition to upper secondary education (Hypothesis 1c). The remaining two smallest groups had the strongest fluctuation in their adjustment behaviors across the four time points. In Group 3 (7.4 %), the prosocial behavior of

adolescents dropped, and externalizing problems increased right before the transition, whereas in Group 4 (1.9 %) prosocial behavior of adolescents dropped, and externalizing problems increased right after the transition. This is a new and important finding that identifies sensitive groups of adolescents concerning the transition to upper secondary education. The results indicate that even though a majority of adolescents successfully transition to upper secondary education, some might face challenges that should not be ignored. Some adolescents face difficulties preparing for the next stage of their school career, while others face challenges adjusting to changes brought about by upper secondary

education.

4.2. The role of temperament

The second aim of the study was to examine the role of individual factors on adjustment behaviors trajectories during the transition to upper secondary education. In line with the bioecological approach (Bronfenbrenner, 1979), both individual and environmental factors played a significant role in adolescents' adjustment behaviors across the transition. In particular, adolescents' temperament was associated with groups of trajectories of prosocial behavior and externalizing problems. First, adolescents who manifested the highest effortful control were more likely to fall into the trajectory of *high prosocial behavior and low externalizing problems* (Group 2), or the trajectory of *decreasing prosocial behavior and increasing externalizing problems after the transition* (Group 4). As expected, (Hypothesis 2a) and in accordance with the previous studies (e.g., Olson et al., 2017), higher effortful control was associated with the trajectory of adolescents with high prosocial behavior and low externalizing problems across the transition. Adolescents with high effortful control can focus their attention, and control their behavior, and emotions (Rothbart, 2007; Rothbart et al., 2001). Therefore, such adolescents can engage in successful social interactions and obey social and classroom norms. In addition, adolescents with high effortful control may show more consistent adjustment behaviors shown by relatively stable high prosocial behavior and low externalizing problems across the transition. However, contrary to our expectations (Hypothesis 2b), even some adolescents with high effortful control had a decline in prosocial behavior and an increase in externalizing problems after the transition. This is an important finding that indicates that even those adolescents who excel in focusing their attention and controlling their behavior can have difficulties in adjusting to changes after the transition. One of the possible explanations is that adolescents face higher academic demands when they enter upper secondary education and may lose peers or teachers to whom they feel connected. When adolescents enter a new classroom it may become difficult to feel like they belong, which disrupts their need for relatedness (Ryan & Deci, 2000). In addition, most of the adolescents who followed the trajectory of *decreasing prosocial behavior and increasing externalizing problems after the transition* (Group 4) chose the academic track. The academic track in Finland is highly demanding which may become stressful and difficult to handle (Salmela-Aro et al., 2008). Therefore, high effortful control may not be enough for some adolescents, to successfully adjust to upper secondary education.

Second, adolescents who fell into a trajectory of *decreasing prosocial behavior and increasing externalizing problems before the transition* (Group 3) had lower effortful control than the groups with the highest effortful control (Groups 1 and 2). Adolescents, who had a bit lower effortful control, had some difficulties before the transition, however, they had some self-regulatory resources to regain their ability to adjust well to upper secondary education. However, adolescents who had the lowest effortful control did not have such resources and followed the trajectory of *moderate prosocial behavior and high externalizing problems* (Group 1) across the transition. When adolescents have a lower ability to control their behavior and emotions, they are less keen on being prosocial and engage in more externalizing problems throughout the transition from lower to upper secondary education. Previous research has shown that low effortful control was associated with the trajectories with elevated levels of externalizing problems (Olson et al., 2017). Adolescents with low effortful control have difficulties in regulating their behavior and emotions (Rothbart, 2007; Rothbart et al., 2001) which can contribute to the difficulties in adjusting across the transition (Rothbart et al., 2001; Symonds, 2015).

Finally, adolescents with the highest negative affectivity were more likely to have *moderate prosocial behavior and high externalizing problems* (Group 1) across four time points. The results indicate that when adolescents have heightened negative emotions and irritability, they engage

less in prosocial behavior and show elevated externalizing problems both before and after the transition from lower to upper secondary education. Higher negative affectivity may cause discomfort for adolescents and difficulties in distancing themselves from their negative emotions (Rothbart, 2007; Rothbart et al., 2001), which may predict difficulties in adjustment behaviors already before the transition and continue across the transition.

4.3. The role of relationship quality with parents and teachers

To address the third aim of the study, parent- and teacher-adolescent relationships were investigated as environmental factors that were associated with the trajectories of combined adjustment behaviors across the transition to upper secondary education. First, in terms of relationship with parents, the results of the current study showed that when adolescents felt a low closeness with both mothers and fathers, they were more likely to follow the *moderate prosocial behavior and high externalizing problems* trajectory (Group 1). The transition from lower to upper secondary education is a challenging time when adolescents may need social support (Eccles & Roeser, 2009; Virtanen et al., 2022). During this time parents may form the only constant relationship with adolescents (Virtanen et al., 2022). If adolescents do not feel close to their parents their need for relatedness is unsatisfied (Ryan & Deci, 2000), which prevents them from engaging in successful social interactions and manifests in poor adjustment outcomes. Second, adolescents who followed the *decreasing prosocial behavior and increasing externalizing problems trajectory before the transition* to upper secondary education (Group 3), reported the second lowest closeness with mothers and fathers. The results may indicate that for some adolescents lower closeness with parents may have been detrimental when preparing for upper secondary education. However, when they entered a new educational setting it aligned to their needs and assisted in successful adjustment (Eccles & Roeser, 2009). It is possible to speculate that such needs may have been related to new friendships, more supportive teachers, or increased closeness to parents. In addition, some adolescents who did not feel confident with their academic path might have felt more confident choosing the vocational path and showed successful adjustment when entered vocational school. As expected, the largest group with successful adjustment behaviors had one of the closest relationships with parents (Group 2; Hypothesis 3a). Previous studies have also shown that positive parenting was associated with adolescents belonging to the largest group with the most prosocial behavior and least externalizing problems (e.g., Jambon et al., 2019; Shi et al., 2021). When adolescents have a closer relationship with their parents, they are keener to internalize social norms and behave according to the expectations of their parents (Shi et al., 2021). However, in addition to the expected findings, the closeness with parents of Group 2 (*high prosocial and low externalizing*) did not differ from a small group of adolescents who experienced drops in their adjustment behaviors upon entering upper secondary education (Group 4). Some adolescents, even with support from parents, may feel too much pressure to successfully start upper secondary education, which may lead to stressful experiences and a decline in adjustment behaviors after the transition. It may also imply that the changed context of school after the transition did not fit the expectations of some adolescents (Eccles & Roeser, 2009). Changes in the classroom composition and higher academic demands may encourage some adolescents to act out even though they perceive a close relationship with their parents.

On the other hand, parents' perceptions of closeness with their children did not predict the trajectories of adjustment behaviors. Results indicate that adolescents' perceptions of their closeness with parents are important in understanding the development of their adjustment behaviors across the transition. Parents should be aware that adolescents' perceptions of closeness may be detrimental to their successful adjustment across the transition to upper secondary education.

In terms of conflict with parents, adolescents who perceived high

conflict with their mothers and fathers followed the *moderate prosocial behavior and high externalizing problems* trajectory (Group 1). Conflicts bring tension between parents and adolescents. When adolescents feel tense, they may sense a lack of safety in their homes (Eccles & Roeser, 2009; Grolnick et al., 2009). Such an environment does not fit their need for relatedness, which brings adjustment difficulties (Eccles et al., 1993; Ryan & Deci, 2000). In addition, adolescents who followed the trajectory of *decreasing prosocial behavior and increasing externalizing problems before the transition* (Group 3) had less conflict with parents than those in the *moderate prosocial behavior and high externalizing problems* group (Group 1), and more conflict than the remaining two groups. The findings may indicate that these adolescents who had some unresolved conflicts with their parents acted out before the transition and did not feel safe expressing their worries to their parents (Branje, 2018; Branje et al., 2009; Grolnick et al., 2009). However, if these conflicts were successfully resolved after the transition and upper secondary education fit the expectations of adolescents, they were able to show successful adjustment (Branje, 2018; Eccles & Roeser, 2009). Finally, as expected (Hypothesis 3a), and in line with the previous research (Jambon et al., 2019), adolescents in the *high prosocial and low externalizing* trajectory (Group 2) had one of the least conflicting relationships with their parents. This study indicates that to ensure the successful adjustment of adolescents, it is important to make sure that adolescents do not perceive their relationship with parents as tense and conflicting. However, Group 2 (*high prosocial and low externalizing trajectory*) did not differ from adolescents who had a *decrease in prosocial behavior and an increase in externalizing problems after the transition* (Group 4) in terms of conflict with parents. This is an important finding that shows that even though adolescents would have little conflict with their mothers and fathers, changes after the transition may not fit their expectations, which may add to the adjustment difficulties to a new school environment (Eccles et al., 1993).

In addition, parents reported more conflict with Group 1 adolescents than those who later developed either *high prosocial behavior and low externalizing problems* (Group 2) or those who had a *decrease in prosocial behavior and an increase in externalizing problems after the transition* (Group 4). Some parents may strongly react to their adolescents' expressions of worry and unfulfilled expectations regarding the transition. Such reactions may lead to conflicting situations. If conflicts are not successfully resolved, it can disrupt adolescents' perspective-taking and socialization skills (Branje, 2018; Branje et al., 2009), which is detrimental to lower prosocial behavior and higher externalizing problems. The results have shown that both adult- and youth-reported conflict were detrimental for the adolescents who later developed moderate prosocial behavior and elevated externalizing problems across the transition. To our surprise (Hypothesis 2d), parents reported the least conflicting relationship with adolescents who had a *decrease in prosocial behavior and an increase in externalizing problems after the transition* (Group 4). Both adolescents' and parents' perceptions of their relationship showed that a small group of adolescents (1.9 %) experienced difficulties in adjusting to a new school environment despite relatively high support from their parents. When adolescents enter upper secondary education, their school context changes. Some changes (e.g., teachers, peers, academic demands, track choices), may have disrupted the adjustment of some adolescents despite the supportive parents. This is an interesting finding, which should be investigated further.

The home context is important in shaping adolescents' adjustment behaviors across the transition because experiences at home are brought to the school context (Bronfenbrenner, 1979). When adolescents have less close and more conflicting relationship with their parents, they may feel less supported and not feel obliged to behave according to their expectations, and engage less in prosocial behavior, and more elevated externalizing problems (Shi et al., 2021).

In terms of relationship with teachers, the results of the current study showed that when adolescents felt low closeness with teachers, they were more likely to develop *moderate prosocial behavior and high*

externalizing problems trajectory (Group 1). When adolescents have less close relationship with teachers, they may not feel the need to behave according to the teachers' expectations, which may result in less prosocial behavior and more elevated externalizing problems (Shi et al., 2021). However, the perceptions of Group 1 adolescents about their closeness with teachers did not differ from those who followed the trajectory of *decreasing prosocial behavior and increasing externalizing problems before the transition* (Group 3). One of the possible explanations lies in the discontinuity of teacher-adolescent relationship across transitions (Virtanen et al., 2022). When adolescents switch to upper secondary education, their teachers change. Therefore, even though some adolescents had conflicting relationship with their lower secondary school teachers, such relationship may have changed when they entered upper secondary education.

Regarding teacher-reported closeness, there were no significant differences between distinct trajectories. Teachers did not perceive their closeness with adolescents as significantly different. The results showed that the perceptions of relationship closeness may be perceived differently by teachers and adolescents. This indicates the strength of our study in investigating multiple reports on relationship quality.

In terms of conflict with teachers, the results of the current study showed that when adolescents felt elevated conflict with their teachers, they were more likely to develop stable *moderate prosocial behavior and high externalizing problems* trajectory (Group 1). When adolescents perceive conflicts with their teachers, they may feel rejected and less safe in a school environment (Eccles & Roeser, 2009; Wentzel, 2009). This finding indicates that when adolescents feel more distant from their teachers, they do not feel obliged to behave in the expected manner and may lack support during the transition, resulting in lower levels of prosocial behavior and elevated externalizing problems (e.g., Shi et al., 2021). Second, adolescents who followed the *decreasing prosocial behavior and increasing externalizing problems before the transition* to upper secondary education trajectory (Group 3) had less conflict than Group 1 adolescents did, but more than Group 2 (*high prosocial and low externalizing*). The results are in line with a previous study that showed conflict with teachers as an antecedent for a trajectory with lower externalizing problems (Shi et al., 2020). The relationship quality with parents and teachers may not have fit the needs of adolescents before the transition, thereby promoting declines in successful adjustment and inclines in poor adjustment behaviors (Eccles et al., 1993). However, when adolescents switched to upper secondary education, their teachers may have also changed. Therefore, it could be possible to speculate that adolescents who followed the trajectory of *decreasing prosocial behavior and increasing externalizing problems before the transition* (Group 3), had less conflicting relationship with their new teachers in upper secondary education. The additional analyses also showed that when adolescents entered a new educational setting, the Group 3 adolescents had less conflict with their teacher. This may partially explain why Group 3 adolescents had better adjustment outcomes after the transition than before.

Regarding teacher-reported conflict, teachers felt they have had more conflict with Group 1 adolescents than with those adolescents who followed the trajectory of *high prosocial behavior and low externalizing problems* across the transition. The results may indicate that teachers felt the need to give more attention and discipline to those adolescents who have moderate prosocial behavior and high externalizing problems than to those who have high prosocial behavior and low externalizing problems. In addition, when teachers perceive tension with their students, they may show less care and less encouragement for them to engage in classroom activities (Eccles & Roeser, 2009; Wentzel, 2009). If adolescents sense that teachers care less about their learning and react with discontent instead of understanding and encouragement, they may show lower prosocial behavior and more externalizing problems.

School context as well as home context contribute to shaping the behavior of adolescents (Bronfenbrenner, 1979). Adolescents spend a significant amount of time at school, meaning teachers become

important nonfamilial adult figures that shape the adjustment behaviors of adolescents, especially across the transition to upper secondary education (Eccles & Roeser, 2009). Low conflict and high closeness with parents and teachers provide a supportive home and school environment that allows adolescents to engage in more successful adjustment behaviors across the transition (high prosocial behavior and low externalizing problems).

4.4. Limitations and future implementations

The current study has several limitations. First, a person-oriented approach to longitudinal data was applied, but the direction of associations between antecedents and trajectories of adjustment behaviors should be interpreted with caution. Second, both adjustment behaviors and temperament dimensions were reported by the same adolescents. Common-method bias may have affected the associations between temperament and trajectories of combined adjustment behaviors. To mitigate this bias regarding the associations between relationship quality and adjustment behaviors, multiple parent, teacher, and adolescent reports on the close and conflicting relationship were included. Third, only a small sample of teachers reported their relationship with adolescents, which had a large proportion of missing data (67.3 %). This sample is much smaller compared to parent reports or adolescent reports on relationship quality. To mitigate this limitation, both teacher and adolescent reports on teacher–adolescent relationship were added. However, the results should be interpreted while keeping in mind that teachers reported their relationships with only a part of adolescents. In addition, home classroom teachers reported about their relationships with their class students. Some teachers met their class students more often than others depending on their taught subject, thus related results should be interpreted with caution. Fourth, the *decreasing prosocial behavior and increasing externalizing problems after the transition trajectory* was very small (1.9 %). Therefore, interpretations regarding this group should be made with caution. Future studies could investigate this further and replicate the study in order to see if the smallest group of adolescents may have difficulties in their adjustment behaviors only after the transition. Fifth, the study aimed to investigate only observable adjustment behaviors such as prosocial behavior and externalizing problems. However, future studies could also benefit from investigating the trajectories of inner experiences such as internalizing problems across the transition. Sixth, only self-reports on adjustment behaviors were used in the present study. Combining self-reports with parent or teacher reports could add strength to our findings. Finally, future studies could benefit from investigating the role of interaction between adolescents' temperament and their relationships with parents and teachers on trajectories of adolescents' adjustment behaviors across the transition from lower secondary school to upper secondary education.

Moreover, different adolescents may have different adjustment behaviors across the transition. Some momentary changes in behavior can appear right before the transition and others right after the transition for some adolescents. This should be carefully monitored to identify what help adolescents require before and after the transition. By observing classroom students and their temperamental characteristics, teachers can identify students who need the most support for successful adjustment during the transition. The results of this study suggest parents and teachers should note that even adolescents with high effortful control may have difficulties adjusting to the challenges of upper secondary education. In addition, some adolescents are more sensitive to environmental factors than others. For example, low closeness and high conflict with parents and teachers may create difficulties throughout the whole transition for some adolescents (Group 1). It becomes especially important for teachers and parents to observe adolescents' behavior and reflect on their relationship with and reactions to adolescents with potentially poor adjustment behaviors.

4.5. Conclusions

The results of the current study showed that most adolescents adjusted well to educational transition (64.9 %). However, some adolescents showed adjustment difficulties across the transition (25.8 %), and some either during the period before (7.4 %) or after the transition to upper secondary education (1.9 %). Teachers and parents should note that all adolescents with different temperaments may need additional support at some point during the transition. For instance, adolescents with higher negative affectivity may be more susceptible to educational transitions thus showing some adjustment difficulties across the transition. However, even adolescents with high effortful control may face challenges after the transition, thus requiring additional encouragement. Therefore, providing a safe home and school environment by avoiding conflict and maintaining close relationship with adolescents can help parents and teachers to provide the necessary support for adolescents during the transition.

CRedit authorship contribution statement

Vilija Jaruseviciute: Writing – review & editing, Writing – original draft, Visualization, Methodology, Funding acquisition, Formal analysis, Conceptualization. **Gintautas Silinskis:** Writing – review & editing, Supervision, Methodology, Funding acquisition, Conceptualization. **Joona Muotka:** Writing – review & editing, Methodology. **Noona Kiuru:** Writing – review & editing, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization.

Declaration of competing interest

We have no conflicts of interest to disclose.

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