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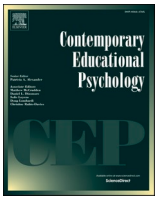

Attributional profiles: Considering multiple causal attributions for success and failure at the beginning of secondary school

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ABSTRACT

Students typically perceive their successes and failures to have multiple causes. The present study examined students' profiles of causal attributions for success and failure during the first year of secondary school. The stability of attributional profile membership was assessed across three timepoints. Furthermore, it was examined whether students characterized by different attribution profiles differed in their levels of school engagement, self-esteem, and school performance. Latent profile analyses and latent transition analyses among 657 first-year Dutch secondary school students (M_{age} = 12.6, SD = 0.4) identified four attributional profiles, which were similar across the three timepoints. The profiles were labelled *uncontrollable failure, controllable failure, uncontrollable success, and undifferentiated*. About half of the students (52 %) remained member of the same profile across the three timepoints. Students in the *uncontrollable success* profile reported significantly lower levels of school engagement and self-esteem, and performed less well in school compared to students in the other profiles. Students in the *uncontrollable failure* profile and the *controllable failure* profile did not differ from each other with regard to school engagement, self-esteem, and school performance. The findings suggest that attributional retraining interventions may want to shift their focus from changing uncontrollable failure attributions to changing students' external, uncontrollable attributions for success.

1. Introduction

The transition to secondary school is a challenging period for many students. It is a period marked by declines in self-esteem, school engagement, and school performance (Coelho et al., 2020; Evans et al., 2018; Jindal-Snape et al., 2020). After entering a new achievement setting, such as a new school environment, students' perceived causes of success and failure (i.e., causal attributions) may change substantially (Perry et al., 2005; Perry et al., 2008). Since certain attributions can be conducive to students' school engagement and academic performance (Graham, 2020; Weiner, 1985, 2010), identifying and subsequently encouraging attributions adaptive for learning may be important to help students to successfully deal with the transition to secondary education. Therefore, the current study examined students' attributions for success and failure at the beginning of secondary school.

Previous research showed that causal attributions interrelate with school engagement (i.e., students' involvement in learning; Swinton et al., 2011; Wolters et al., 2013), self-esteem (i.e., one's global worth as a person; Cheng & Furnham, 2003; Leeson et al., 2008), and school performance (Cortés-Suárez & Sandiford, 2008; Hsieh & Schallert, 2008; Wolters et al., 2013). These findings are based on studies that examined the role of different causal attributions separately. However, several studies found indications that students usually endorse more than one attribution simultaneously to explain their successes and failures (Dong et al., 2013; Leddo et al., 1984; McClure et al., 1989; McClure, 1998). It is therefore possible that specific combinations of attributions relate to school engagement, self-esteem, and performance differently. For example, a student who attributes a low grade to both a lack of ability and a lack of effort may, in a future achievement situation, behave in a different way as compared to a student who attributes a low grade only to a lack of ability. The first student may experience more control to do something to avoid future failure. To date, few studies have investigated the relation between attributional profiles (i.e., combinations of multiple attributions) and student outcomes. Moreover, longitudinal studies on attributional profiles are lacking. Therefore, it is still unclear to what extent attributional profiles are stable over time and whether the profiles

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predict changes in student outcomes over time.

In the present study, it was investigated (a) which combinations of attributions (attributional profiles) can be identified among first-year secondary school students (b) how attributional profiles develop during the schoolyear, and (c) whether students having distinct attributional profiles differ in their levels of and changes in school engagement, self-esteem, and school performance during the schoolyear. Thereby, the present study adds to the current body of knowledge on causal attributions and provides more insight into which combinations of attributions are most conducive to students' success in school.

1.1. Attribution theory

The causal attribution theory of achievement motivation (Graham, 2020; Weiner, 1985, 2010) posits that individuals try to understand why certain academic outcomes occur. Weiner and colleagues (1971) identified four common attributions used by students to explain their academic results, which are ability, effort, luck, and task difficulty. Other frequently mentioned attributions are the quality of the teacher and students' strategy use (e.g., Perry et al., 2008; Weiner, 2010). Weiner (1985) distinguished three underlying dimensions on which all causal attributions can be described: the *locus of causality* refers to whether individuals attribute their performance to an internal or external cause (e.g., ability vs teacher's quality); *stability* specifies whether causes change or do not change over time (e.g., ability vs luck); and *controllability* refers to the difference between causes that can or cannot be influenced (e.g., effort vs luck).

According to attribution theory (Graham, 2020; Weiner, 1985, 2010), causal attributions can have cognitive and affective consequences, which in turn shape people's actions and their chance of future success or failure. The theory postulates that the locus dimension has consequences for people's self-esteem. People feel better about themselves when they attribute success to internal causes and failure to external causes. The stability dimension is posited to influence people's expectancy of future success, which affects how hard people try and how long they persist in subsequent achievement situations. Attributing success to stable causes and failure to unstable causes is thought to lead to a higher engagement in similar tasks in the future, thus increasing chances of better school performance. Finally, the controllability dimension conveys whether people feel in control and feel personal responsible for their actions. Attributing failure to controllable causes is theorized to induce guilt, which can serve as a motivator to correct previous actions and try to avoid failure in similar situations in the future. To illustrate, if students believe their failure is caused by an uncontrollable and stable attribution such as their ability, they may assume that they are unable to change the situation. Consequently, it is likely that students will feel that there is nothing they can do to change their school performance and they may give up and disengage from their schoolwork. However, if students believe their failure is due to a controllable and unstable attribution like a lack of effort, they are more likely to be optimistic about future success and increase school engagement. When faced again with similar circumstances, they might try to improve their performance by increasing their effort.

1.2. The relation between attributions and school engagement, self-esteem, and performance

The present study focuses on how causal attributions relate to school engagement, self-esteem, and school performance, because together they could be considered to be reflective of students' state of mind and academic competences. School engagement and school performance provide a comprehensive picture of how much effort students put into school and whether they achieve good school results (Weiner, 1985, 2010). Self-esteem can be considered to be an indicator of students' well-being (Graham, 2020; Weiner, 1985, 2010).

Empirical studies (e.g., Swinton et al., 2011; Wolters et al., 2013) showed mixed findings as to how students' attributions are related to current and future school engagement of students. One study found, in line with attribution theory (Weiner, 1985), that the extent to which eighth grade students attributed failure to a lack of ability predicted lower math engagement three years later (Swinton, et al., 2011). Another study among high school students (Wolters et al., 2013) found a similar relation between lack of ability as explanation for failure and engagement (i.e., persistence). However, inconsistent with attribution theory, this study and another study among fifth and six grade students (Stipek & Kowalski, 1989) found that endorsing low effort as a cause of failure (an unstable, controllable cause) was correlated with *lower* levels of school engagement. Regarding success, Wolters et al. (2013) found that students who attributed success to their ability (i.e., a stable cause), their effort (an unstable, but controllable cause), or to the support of the teacher (i.e., a stable cause) showed higher levels of school engagement than those who did not endorse these attributions to a similar extent.

A consistent finding across various studies focusing on students' self-esteem is that students who perceive failure as due to internal causes report lower levels of self-esteem (Chandler et al., 1997; Cheng & Furnham, 2003; Haugen & Lund, 2002; Fielstein et al., 1985). Students who perceive success as due to internal causes report higher levels of self-esteem (Chandler et al., 1997; Cheng & Furnham, 2003; Ciarrochi et al., 2007; Haugen & Lund, 2002; Hirschy & Morris, 2002; Leeson et al., 2008; Rueger & George, 2017).

Several studies focusing on students' performance (e.g., McClure et al., 2011; O'Sullivan & Howe, 1996) showed mixed findings as to how attributions for failure are related to students' performance. In line with attribution theory, several studies showed that lower performing students attributed their failure more to uncontrollable, stable attributions, such as their ability or the teachers' quality, compared to high performing students (Gobel and Mori, 2007; McClure et al., 2011; Paker & Özkardeş-Döğüş, 2017; Soriano-Ferrer & Alonso-Blanco, 2019; Thepsiri & Pojanapunya, 2010). Students who attributed their failures to effort, a controllable, unstable cause, were found to perform better at school (McClure et al., 2011). Also, in line with attribution theory, it was found that attributing failure to uncontrollable attributions, such as task difficulty or luck was related to lower school performance (Genç, 2016; Gobel & Mori, 2007; O'sullivan & Howe, 1996). However, inconsistent with attribution theory, it was found that high performing students attribute their failures more to uncontrollable, stable attributions (i.e., ability and teacher quality) than low performing students (McClure et al., 2011; Paker and Özkardeş-Döğüş, 2017; Thepsiri and Pojanapunya, 2010).

Findings from several studies (e.g., Barros & Simão, 2018; Hsieh & Schallert, 2008; McClure et al., 2011) provided support for the link between attributing success to internal causes and higher school performance. Some studies showed that students perform better when they attribute their successes mostly to a stable, internal cause (i.e., ability; Gobel & Mori, 2007; Hsieh & Schallert, 2008; Houston, 2016), or controllable, internal causes (e.g., effort; Barros & Simão, 2018; Cortés-Suárez & Sandiford, 2008; McClure et al., 2011), instead of external causes. Accordingly, attributing success to an external, unstable, uncontrollable cause (e.g., luck; Barros, & Simão, 2018; McClure et al., 2011), or external, stable, uncontrollable cause (e.g., teachers' quality; Barros & Simão, 2018; McClure et al., 2011; Soriano-Ferrer & Alonso-Blanco, 2019; Thepsiri & Pojanapunya, 2010) was found to be a negative predictor of subsequent school performance.

The aforementioned studies showed that attributions are related to school engagement, self-esteem, and school performance. These studies, however, did not provide a clear picture of the effects of attributions on student outcomes, especially for attributions after failure. One explanation for this inconsistency in findings may be that the effect of an attribution depends on the presence or absence of other attributions.

1.3. Attributional profiles

The notion that people consider multiple causes simultaneously as

contributing to their successes and failures (i.e., having an attributional profile; Dong et al., 2013; Leddo et al., 1984; McClure et al., 1989; McClure, 1998) may serve as an explanation for the inconsistent findings of relations between individual attributions and student outcomes across studies. That is, the strength and the direction of the effects of a specific attribution may depend on its co-occurrence with other attributions (Dong et al., 2013). To illustrate: Two students both attribute their poor grade to a lack of effort to a similar extent. One of the students attributes his poor grade also to the quality of the teacher and bad luck, while the other student considers an inadequate use of strategies as an additional factor contributing to the poor grade. It is likely that, in a similar situation in the future, the first student does not feel very able to change the situation, while the other student will feel more able to turn around the situation. As a consequence, the first student might be less engaged and have lower school performance compared to the other student, whereas the second student might experience lower self-esteem, as all causes are attributed to the self.

Previous research into attributions often used a variable-centered approach, which focus on associations between specific attributions and outcomes of interest. However, by using a person-centered approach, unique and unobserved subgroups (i.e., characterized by different attributional profiles) of individuals can be identified based on their different dispositions of multiple attributions (Hayenga & Corpus, 2010). Whereas a variable-centered approach assumes that the relation between attributions and other variables (e.g., school engagement, self-esteem, and school performance) is the same for all persons, a person-centered approach assumes that the relation can be different for students with different profiles (Laursen & Hoff, 2006). Therefore, studying attributions by means of a person-centered analysis is likely to provide a more holistic understanding of how attributional thinking is related to school engagement, self-esteem, and school performance through a consideration that goes beyond the specific effect of the various attributions (Hayenga & Corpus, 2010; Lubke & Muthén, 2005).

So far, only few studies have examined attributional profiles and their impact on school engagement (or related constructs such as motivation) and school performance (Perry et al., 2008; Tsujimoto et al., 2019). Perry and colleagues (2008) examined attributional profiles among first-year university students based on six attributions for failure, namely ability, effort, strategy use, professor quality, test difficulty, and luck. They distinguished four different attributional profiles of which the first profile turned out to be least adaptive for learning. Students in the first profile attributed their failures mostly to a combination of uncontrollable internal (low ability) and uncontrollable external (test difficulty, poor teaching, bad luck) attributions. Students characterized by the second profile reported average levels of uncontrollable attributions (low ability, test difficulty, poor teaching, bad luck) and de-emphasized two internal, unstable, controllable attributions (low effort, bad strategy use) for failure. Students in the third profile emphasized one controllable attribution (low effort) and de-emphasized three uncontrollable attributions (low ability, test difficulty, poor teaching) as causes for poor performance. Students in the fourth profile adhered to a self-protective explanation for poor performance that emphasized two internal, controllable causes (low effort, bad strategy use), along with two external, uncontrollable causes (test difficulty, poor teaching). Students who attributed their failures to both internal and external uncontrollable factors (Profile 1) took less responsibility for their failures, had lower expectations for future performance, and experienced more helplessness, shame, and anger than students in all other profiles. These students also obtained lower course grades and GPAs than students in the third and fourth profile. In addition, students in the fourth profile had the best school performance of all students.

Tsujimoto and colleagues (2019) investigated reading-related attributional profiles for 8–15-year-old students based on ability and effort attributions for both success and failure. They examined the link between these profiles and reading skills, inattention, and hyperactivity. Four different attributional profiles were distinguished. Students in the first profile attributed reading success mainly to high ability and high effort and reading failure hardly to effort and ability. The second group showed the same attributions for success, but students in this profile attributed failure more to a lack of effort as well as a lack of ability. The third profile was similar to the second profile; however, the attributions were weaker; the attribution mean scores fell closer to the midpoint. Students in the fourth profile attributed reading success mostly to high effort and failure mostly to a lack of ability. Students in the first profile showed higher reading and lower inattention scores than students in the third and fourth profile. Minor variations in reading skills and attention scores were found between other attributional profiles.

Overall, the findings of both studies are in line with attribution theory (Graham, 2020; Weiner, 1985, 2010), which suggests that attributing success to internal, stable or controllable causes and failures to internal, unstable, and controllable attributions is most adaptive for learning. However, both studies have some limitations. Perry et al. (2008) identified profiles based on students' attributions for failure, while attributions for success were not considered. Another limitation of their study is the use of traditional clustering approach instead of latent profile analysis. Latent profile analysis has the advantage that stricter statistical criteria can be used to determine the number of profiles and provides information on the accuracy with which students can be classified into profiles (Magidson & Vermunt, 2002). Tsujimoto and colleagues (2019) only included two causal attributions (effort and ability). As a result, students were unable to report all attributions they considered important as contributing to their success and failure. Moreover, both studies were cross-sectional and did not examine the stability of profiles over time, while longitudinal analyses could provide insight into whether students switch between more or less adaptive attributional profiles over time. Investigating attributional profiles longitudinally could also provide more insight in the relation between attributional profiles and changes in school engagement, self-esteem, and school performance.

1.4. Stability of attributional profiles

Prior research focusing on separate attributions has examined the stability of students' causal attributions in two ways. First, mean-level stability refers to whether certain adaptive or maladaptive attributions are endorsed more or less as children grow older. Second, rank-order stability refers to the relative ordering of students over time, i.e., whether students who strongly endorse a certain attribution compared to other students, will also do so at a subsequent measurement at a later timepoint. Rank-order stability can be assessed by means of correlations between attributions at two timepoints, with higher correlations indicating higher levels of rank-order stability.

Concerning mean-level changes, most studies found that mean levels of students' attributions are considerable stable over a period of years. Kurtz-Costes and Schneider (1994) showed that out of ten attributions (five for failure and five for success), students only attributed their success more to effort and less to the difficulty of the task at the age of 10 compared to two years earlier. Furthermore, Swinton and colleagues (2011) studied attributions longitudinally for students from Grade 8 to 11. After three years, students attributed their math successes less to their abilities, their math failures more to abilities and effort, and failures in English and science more to effort attributions. Despite changes in students' attributions over time, more than half of the attributions remained very stable over a three-year period. Furthermore, other studies (Chan & Moore, 2006; Vuletich et al., 2019) reported the averages of students' attributions over time, which seems to suggest that student' attributions remained fairly unchanged over a long period of time. However, after transitions to middle and high school, it seems that students attributed their failures more to internal factors (Chan & Moore, 2006) and success less to internal factors and the quality of the teacher (Chan & Moore, 2006; Vuletich et al., 2019).

Although mean levels of attributions seem rather stable, findings with regard to rank-order changes suggest more variability over time.

Chan and Moore (2006) investigated attributions longitudinally for two cohorts of students, from Grade 5 to 7 and from Grade 7 to 9. In their study, they reported high correlations between the same attributions (e.g., internal attributions for success) over a one-year period ($r = 0.45 - r = 0.71$). Furthermore, Vuletich and colleagues (2019) studied students' attributions for success from Grade 5 to 12 and showed that most of students' attributions (i.e., ability, effort and teacher quality) were positively correlated with the same attributions over a two-year period (from Grade 5 to 7 and Grade 10 to 12) with correlations varying between small ($r = 0.12$) to large ($r = 0.51$). In contrast, Kurtz-Costes and Schneider (1994) found only non-significant correlations ($r < 0.15$) between students' attributions over a two-year period from ages 8 to 10. Notably, a significant decrease in stability of students' attributions (i.e., internal attributions for failure) was observed during the transitional period from elementary to high school (between Grades 6 and 7; Chan & Moore, 2006). Likewise, particularly during the period that the students stayed at the same school (i.e., between Grades 10 and 12), Vuletich et al. (2019) found students' attributions being strongly correlated over time. Both findings indicate more changes in individual students' attributions when they enter novel achievement settings.

1.5. The present study

The aim of the present study was to investigate whether different groups of first-year secondary school students could be distinguished based on the combinations (profiles) of six causal attributions for both failure and success. *Ability*, *effort*, *test difficulty*, and *luck* are common attributions for achievement as originally identified by Weiner et al. (1971) that differ among the underlying dimensions of locus, stability, and controllability. In his later work, *strategy use* was identified as an important additional attribution (Graham, 2020; Weiner, 1985; 2010). In research in educational settings, attributions to the teacher, such as *teacher's quality,* have been added (e.g., Glasgow et al., 1997; Hsieh & Schallert, 2008; McClure et al., 2011; Wolters et al., 2013), as the teacher is a central and influential person in this setting. Together the six attributions provide a good variation on the three underlying dimensions. As students tend to have similar attributions across domains (Vuletich et al., 2019), suggesting that attributions can be considered to be domain-general dispositions, we examined students' domain-general attributions rather than focusing on students' attributions for specific school subjects.

We used a longitudinal design with three measurement waves at the beginning (until the middle) of the schoolyear with relatively short time intervals, because we wanted to focus on students' attributions and how they develop shortly after the transition to a new achievement setting when students may re-evaluate the causes of their successes and failures (Perry et al., 2005; Perry et al., 2008). First, the stability of the structure of attributional profiles over time (*within-sample stability*; Kam et al., 2016) was investigated, which clarifies whether the same types of profiles could be found at all measurement occasions. Next to this, the consistency of students' profile membership over time (*within-person stability*; Kam et al., 2016) was investigated, which provides insight into whether students shifted between attributional profiles across all measurement waves. Finally, this study examined which profiles were most adaptive for (changes in) students' school engagement, self-esteem, and school performance. Together these outcomes provide insight in both students' well-being and their academic competences (Graham, 2020; Weiner, 1985, 2010).

As the current study is one of the first studies to examine attributional profiles, there were no specific expectations regarding the number or types of profiles that could be distinguished. Based on previous research, which focused on stability of attributions over a one to three-year period (Chan & Moore, 2006; Swinton et al., 2011), similar types of attributional profiles were expected to be found throughout the schoolyear. As students tend to re-evaluate the causes of their successes and failures when they enter a new educational context (Perry et al., 2005; Perry et al., 2008), we expected a considerable amount of students to switch between profiles across measurement occasions. In addition, more profile transitions were expected to take place at the beginning of the year, in the first months after the transition to secondary school. Furthermore, students having profiles characterized by attributing success to internal, stable and controllable causes and failure to internal, unstable and controllable causes were expected to report higher levels of and more growth in both school engagement and performance, compared to students in profiles with low scores on these attributions. In contrast, students having a combination of attributing success to external, unstable and uncontrollable causes and failure to external, stable and uncontrollable causes were expected to have lower levels of and stronger decreases in school engagement and performance, compared to students in profiles with low scores on these attributions (Perry et al., 2008; Tsujimoto et al., 2019; Weiner, 1985). Regarding self-esteem, students who attributed their success to internal causes and failure to external causes were expected to show higher levels of and a stronger increase in self-esteem, compared to students in profiles with low scores on these attributions (Weiner, 2010).

2. Method

2.1. Participants

A longitudinal data set with three measurement waves in one schoolyear has been collected as part of an attributional retraining intervention study (Poorthuis et al., 2016). For the present study, only the data of students from classes that were randomly selected for the control group were used, because their scores were not affected by participation in the intervention. The current sample consisted of 657 participants from 24 classes of the first year of six secondary schools in The Netherlands. Their mean age was 12.6 years ($SD = 0.43$) and 318 participants were female (48.3 %). In total, 14.7 % of the participants were from a non-western background.

Participating students were from all academic tracks: 8.3 % attended pre-vocational education, 34.9 % of the students attended the two highest tracks of pre-vocational or senior general secondary education track or a mixed class of both tracks and 56.8 % of the students attended the senior general education or pre-university education track or a mixed class of both tracks. Pre-vocational students were underrepresented in this sample, as around 56 % of secondary school students in the Netherlands attend pre-vocational education (Ministry of Education, Culture, and Science, 2014).

2.2. Procedure

We recruited secondary schools in different parts of the country using convenience sampling. All first-year secondary school students of the participating schools were eligible to take part in the study. Parental consent was obtained prior to data collection. Parents of two students objected to participation. At each measurement wave, students were informed that their participation in the study was completely voluntary and they were asked to indicate whether they wanted to participate or not. The current study was approved by the local Institutional Review Board. Students completed the same online questionnaire during class under supervision of research assistants at all three timepoints. The specific timing of the measurement waves fitted the purposes of the original intervention study, which included a pretest (Oct-Nov 2015), a posttest shortly after the intervention (Dec 2015), and a follow-up a few months later (March 2016). Thus, the length of the intervals was slightly different.

2.3. Measures

2.3.1. Attributions

To measure students' attributions for success, students were asked: "Think back to times that you received a grade you were satisfied with. When you get good grades, why do you tend to get them?" (see Glasgow et al., 1997; McClure et al., 2011 who used similar procedures). Students

rated six items, one for each attribution (i.e., ability, effort, strategy use, test difficulty, teacher's quality, and luck). An example item is "Because I had good luck" (see Appendix A for all items). Responses were recorded on a ten-point scale (1 = *certainly not for this reason;* 10 = *certainly because of this reason;* see Perry et al., 2010). To measure students' attributions for failure, students rated the same six attributions, this time they were asked to think back to times they received poor grades. An example item is "Because I approached studying in the wrong way". Single items were used to prevent response fatigue for the students. Single items and multi-item scales of the same construct show similar validity and reliability and have been found to be substantially correlated to each other (Bergkvist & Rossiter, 2007; Gogol et al., 2014; Robins et al., 2001; Wanous et al., 1997). In addition, single items may even be preferred if the construct refers to a concrete concept (Bergkvist & Rossiter, 2007), which is the case for causal attributions.

2.3.2. Self-esteem

Self-esteem was measured using a slightly modified version of the Dutch translation (Treffers et al., 2002) of the global self-worth scale of the self-perception profile for adolescents (Harter, 1988). This five-item scale measures how satisfied children are with themselves and the way they live their lives. As in previous research (Poorthuis et al., 2014), items were rated along a four-point scale (1 = *I am not like these students at all*; 4 = *I am exactly like these students*). An example item is "Some students are quite satisfied with themselves". Negative items were recoded, with higher scores indicating higher levels of self-esteem. The internal consistency was acceptable (α = 0.72, 0.74, 0.76 on the first, second and third measurement, respectively; Nunnally, 1978).

2.3.3. School engagement

Students' school engagement was measured using the Dutch-translated version of the Behavioral Engagement Scale by Skinner et al. (2008) consisting of five items. The scale measured students' effort, attention, and persistence during classroom learning activities. Example items are "I try hard to do well in school" and "In class, I work as hard as I can". Answers were given on a five-point Likert scale (1 = *completely disagree*; 5 = *completely agree*). The internal consistency was good (α = 0.82, 0.85 and 0.85 on the first, second and third measurement, respectively; Nunnally, 1978).

2.3.4. School performance

Average grades per school subject for each student were collected from the school administration at all measurement waves. The average grades for all school subjects students received so far were used to calculate the overall grade point average (GPA) per student. The number and content of the subjects could differ per school and per academic track. The grades could range from one to ten, with ten representing the highest possible grade. A grade below 5.5 is considered a failing grade in the Dutch school system.

2.4. Data analysis

Latent Profile Analyses (LPA) were conducted to examine which attributional profiles could be identified among first-year secondary school students. LPA is a person-centered analysis technique that includes the flexibility for model specification, and the possibility to compare models based on model fit indices, resulting in a well-considered decision about the number of profiles to be distinguished (Marsh et al., 2009). Initially, the means and variances of the attributions were allowed to vary freely between profiles, as this strategy is suggested to lead to less biased outcomes (Diallo et al., 2016; Enders & Tofighi, 2008; Peugh & Fan, 2013). However, freely estimating all parameters within each latent profile resulted in non-convergence. Therefore, the variances of the attributions were constrained to be equal across profiles, which is recommended when freely estimating all parameters converge on improper solutions or not converge at all (Bauer & Curran, 2003; Diallo et al., 2016).

Multiple criteria were used to make model comparisons and decide on the number of profiles (Geiser, 2012; Nylund et al., 2007): (i) the Akaike Information Criterion (AIC); (ii) the Bayesian Information Criterion (BIC); (iii) the sample-size-adjusted Bayesian Information Criterion (aBIC); (iv) the Vuong-Lo-Mendell-Rubin (VLMR) test; (v) the Bootstrap Likelihood Ratio Test (BLRT); (vi) the classification quality as determined by entropy values; (vii) the mean profile assignment probabilities for the most likely profile membership; and (viii) the substantive meaningfulness of the latent profiles. Smaller AIC, BIC, and aBIC values indicate better model fit. The VLMR and BLRT tests compare the estimated model to the model with one profile less. A significant p-value (i.e., < 0.05) for the VLMR or BLRT test indicates that the estimated model fits the data better than the more parsimonious model with one profile less. The entropy provides a summary of the accuracy of the classification, with values closer to 1 indicating fewer classification errors (Celeux & Soromenho, 1996). For a good profile solution, the mean profile assignment probability should be at least 0.80 for each profile (Geiser, 2012). Solutions containing profiles with very few cases (i.e., $<$ 5 % of the cases) were not considered theoretically meaningful. This was also the case for solutions containing extra profiles that were minor variations of existing profiles.

A sequence of LPA models, with an increasing number of profiles from one to eight, were estimated to determine whether more complex (i.e., more profiles) or parsimonious (i.e., fewer profiles) models provided the best description of the data. The LPA models were estimated separately for each timepoint using the six causal attributions for failure and the six attributions for success as profile indicators. Then, to examine the nested structure of the data (i.e., students within classes) Multilevel Latent Profile Analyses (MLPA) were conducted. That is, for each timepoint a parametric MLPA model was estimated for the best-fitting LPA solution. The MLPA model examined whether the probability that a student belongs to a specific attributional profile varied significantly across classes (Henry & Muthén, 2010; Mäkikangas et al., 2018).

To examine how the attributional profiles developed during the schoolyear, Latent Transition Analyses (LTA) were conducted. LTA is a longitudinal extension of LPA in which movements between profiles by individuals over time are identified. After identifying the best latent profile solution, it was verified whether the attributional profiles were similar over time (i.e., measurement invariance). This aids the interpretation of students' transitions between attributional profiles (Nylund, 2007). Changes in profile membership over time were evaluated by estimating transition probabilities, which are probabilities of profile membership at time t given profile membership at time $t - 1$. A three-step method was used to avoid the formation of the attributional profiles at one timepoint being influenced by the attributional profiles of the other timepoints (see Asparouhov & Muthén, 2014; Nylund-Gibson et al., 2014).

To examine whether students' levels of school engagement, self-esteem, and school performance differed between attributional profiles and whether changes in these variables across the schoolyear differed between attributional profiles, a three-step BCH method was used (Asparouhov & Muthén, 2014). For each timepoint, the scores on school engagement, self-esteem, and school performance were compared between each attributional profile by means of a Chi-Squared test. The BCH method excludes the possibility that attributional profiles change when including the outcome variables in the model (Asparouhov & Muthén, 2014). In addition, this method corrects for the classification error of students' most likely profile membership while estimating differences between profiles (Bolck et al, 2004; Vermunt, 2010). Cohen's d was used as a measure for effect size (Cohen, 1988). The three-step BCH method was also used to examine whether rank-order changes in school engagement, self-esteem, and school performance across the schoolyear differed between the profiles. Thereto, differences in the scores on school engagement, self-esteem, and school performance at Time 3 were compared between attributional profiles by means of a Chi-Squared Wald test, while controlling for school engagement, self-

esteem, and school performance at Time 1. Effect sizes were calculated based on the formula for repeated measures designs (dppc2) presented by Morris (2008). Effect sizes from 0.2 to 0.5 were considered as small, between 0.5 and 0.8 as moderate, and ≥ 0.8 as large.

All analyses were conducted using Mplus 8.3 (Muthén & Muthén, 1998–2017). The model parameters were estimated using maximum likelihood estimator (MLR) that is robust to nonnormality with full information maximum likelihood (FIML) estimation to handle missing data (Enders, 2010). In total, 629 students completed the questionnaire at Time 1 (4.6 % missing data), 609 students at Time 2 (7.6 % missing data), and 610 students at Time 3 (7.4 % missing data). FIML includes all cases with available data (Enders, 2010). Thereby, data of all respondents who completed at least one measurement were included in the longitudinal models ($N = 657$).

3. Results

Table 1 shows the descriptive statistics of the attributions for success and failure, students' school engagement, self-esteem, and school performance for all three timepoints. Table 2 shows the correlations between students' attributions and their school engagement, self-esteem, and school performance for each timepoint. Internal attributions for success (i.e., ability, effort, strategy use) were positively related to school engagement, self-esteem, and school performance. Other attributions for success showed that luck was negatively related, teacher's quality was positively related, and test difficulty was not related to school engagement, self-esteem, and school performance. The correlations regarding attributions for failure showed that students who attributed their failures to low ability (i.e., an internal, stable, and uncontrollable attribution), tend to report lower levels of school engagement and self-esteem than students who do not attribute failure to low ability. Furthermore, students who attributed their failure to bad luck showed lower levels of school engagement. Inconsistent with attribution theory, attributing failure to low effort was negatively correlated with Table 2 students' school engagement. Appendix B shows the correlations between all attributions. Attributions for success and failure were moderately to strongly correlated with the corresponding attribution at subsequent timepoints ($r = 0.29 - r = 0.57$).

Table 1
Descriptive statistics for all study variables at each timepoint.

	Time 1 $N = 629$		Time 2 $N = 609$		Time 3 $N = 610$	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*
SA Ability	7.39	1.67	7.16	1.56	7.11	1.57
SA Effort	7.69	1.72	7.68	1.58	7.70	1.62
SA Strategy use	7.18	1.89	7.19	1.74	7.07	1.78
SA Test difficulty	6.16	2.23	5.88	2.13	5.68	2.05
SA Teacher's quality	7.20	1.86	7.03	1.79	7.00	1.73
SA Luck	3.93	2.36	3.81	2.30	3.78	2.23
FA Ability	5.73	2.56	5.60	2.34	6.04	2.15
FA Effort	5.24	2.70	5.69	2.50	6.00	2.50
FA Strategy use	5.13	2.61	5.25	2.45	5.62	2.31
FA Test difficulty	6.45	2.32	6.43	2.05	6.54	2.00
FA Teacher's quality	4.34	2.57	4.58	2.43	4.93	2.37
FA Luck	3.83	2.35	3.85	2.24	4.09	2.36
School engagement	3.79	0.59	3.75	0.59	3.68	0.59
Self-esteem	3.56	0.46	3.57	0.48	3.16	0.45
School performance	7.09	0.75	7.09	0.68	7.00	0.68

Note. SA = success attribution; FA = failure attribution. The response scale ranged from 1 to 10 for attributions, from 1 to 5 for school engagement, from 1 to 4 for self-esteem and from 1 to 10 for school performance.

3.1. Latent profile solutions

The criteria of model fit did not provide a clear picture of the number of optimal profile solutions (see Appendix C). After inspecting the correlations between all attributions (see Appendix B), test difficulty was found to be associated with other attributions in an unexpected way. Test difficulty was intended to measure an external attribution. However, the results of the current study showed that participants may have interpreted this in a different way. Moderate positive relations ($r = 0.29 - r = 0.42$) were found between test difficulty and ability, which suggests that part of the students may have considered test difficulty as the difficulty they experienced during the test (e.g., due to their ability) rather than the test itself being difficult. Given that test difficulty did not appear to measure what it was supposed to measure, it was decided to remove test difficulty and to conduct the LPAs with the remaining ten attributions.

The fit indices for the one- to eight-profile solutions (without test difficulty) at each timepoint are reported in Table 3. Across all three timepoints, the values of AIC, BIC, and aBIC decreased, up to the solutions with six profiles, suggesting that solutions with six profiles were the best solution. However, almost all solutions with five or more profiles contained profiles representing a very small proportion of cases (1.1–3.3 %), which therefore were considered to be not substantively meaningful. Exceptions were the five-profile solution at Time 1 (smallest profile 7.4 %) and the six-profile solution at Time 2 (smallest profile 5.9 %), but these solutions included profiles that were minor variations of the first four profiles.

Based on a significant VLMR value (indicating a better fit than the more parsimonious three-profile solution) and a high entropy value (indicating well separated profiles), the four-profile solution was

Table 2
Correlations between attributions and school engagement, self-esteem, and school performance.

	Time 1			Time 2			Time 3		
	School engagement	Self-esteem	School performance	School engagement	Self-esteem	School performance	School engagement	Self-esteem	School performance
SA Ability	0.13**	0.10*	0.11**	0.09*	0.11**	0.10*	0.07	-0.01	0.15**
SA Effort	0.32**	0.12**	0.18**	0.38**	0.13**	0.13**	0.23**	0.13**	0.16**
SA Strategy use	0.33**	0.22**	0.27**	0.41**	0.19**	0.17**	0.25**	0.18**	0.18**
SA Test difficulty	-0.04	0.03	0.05	-0.11**	-0.02	0.06	-0.08*	-0.14**	0.09*
SA Teacher's quality	0.23**	0.10*	0.26**	0.25**	0.15**	0.14**	0.18**	0.06	0.12**
SA Luck	-0.25**	-0.16**	-0.10*	-0.22**	-0.16**	-0.06	-0.17**	-0.16**	-0.08*
FA Ability	-0.13**	-0.17**	-0.05	-0.11**	-0.15**	-0.08*	-0.19**	-0.16**	-0.04
FA Effort	-0.21**	-0.06	-0.01	-0.18**	-0.11**	0.03	-0.16**	-0.05	0.07
FA Strategy use	-0.12**	-0.09*	-0.08*	-0.02	-0.13**	0.00	0.00	-0.04	0.02
FA Test difficulty	0.00	-0.11**	0.01	-0.07	-0.04	0.01	-0.08	-0.10*	0.16**
FA Teacher's quality	-0.05	-0.08*	0.05	-0.11**	-0.09*	0.04	-0.03	-0.06	0.04
FA Luck	-0.15**	-0.13**	-0.01	-0.18**	-0.08	0.00	-0.11**	-0.05	0.00

Note. SA = success attribution; FA = failure attribution. School engagement, self-esteem, and school performance at each timepoint are correlated with the attributions of the same timepoint.

Table 3
Fit indices for latent profile models estimating 1 to 8 attributional profiles.

Number of profiles	AIC	BIC	aBIC	VLMR (p value)	BLRT (p value)	Entropy	Smallest class probability	Smallest profile
Time 1								
1	27,765	27,854	27,791	–	–	–	1.000	629 (100.0 %)
2	27,368	27,506	27,408	0.004	<0.001	0.693	0.900	271 (43.0 %)
3	27,033	27,220	27,086	0.009	<0.001	0.778	0.894	67 (10.7 %)
4	26,910	27,146	26,977	0.036	<0.001	0.791	0.851	63 (10.0 %)
5	26,819	27,103	26,900	0.128	<0.001	0.752	0.781	47 (7.4 %)
6	26,773	27,107	26,869	0.506	<0.001	0.769	0.766	7 (1.1 %)
7	26,726	27,108	26,835	0.739	<0.001	0.780	0.764	8 (1.3 %)
8	26,671	27,102	26,794	0.190	<0.001	0.799	0.771	8 (1.3 %)
Time 2								
1	26,110	26,198	26,135	–	–	–	1.000	609 (100.0 %)
2	25,796	25,933	25,834	0.000	<0.001	0.734	0.905	192 (31.5 %)
3	25,574	25,760	25,626	0.309	<0.001	0.723	0.805	134 (22.0 %)
4	25,395	25,629	25,461	0.222	<0.001	0.757	0.819	98 (16.0 %)
5	25,311	25,593	25,390	0.303	<0.001	0.762	0.809	20 (3.3 %)
6	25,258	25,589	25,351	0.640	<0.001	0.766	0.783	36 (5.9 %)
7	25,210	25,590	25,317	0.243	<0.001	0.786	0.790	18 (3.1 %)
8	25,166	25,593	25,286	0.679	<0.001	0.806	0.790	8 (1.3 %)
Time 3								
1	26,001	26,089	26,026	–	–	–	1.000	610 (100.0 %)
2	25,674	25,811	25,712	0.007	<0.001	0.682	0.890	276 (45.2 %)
3	25,436	25,622	25,488	0.089	<0.001	0.769	0.883	29 (4.7 %)
4	25,280	25,514	25,345	0.016	<0.001	0.749	0.816	26 (4.2 %)
5	25,158	25,440	25,237	0.216	<0.001	0.757	0.828	19 (3.2 %)
6	25,106	25,437	25,199	0.553	<0.001	0.790	0.830	16 (2.7 %)
7	25,052	25,431	25,158	0.685	<0.001	0.812	0.837	8 (1.3 %)
8	25,007	25,435	25,127	0.372	<0.001	0.822	0.812	8 (1.3 %)

Note. AIC = Aikaike Information Criterion; BIC = Bayesian Information Criterion; aBIC = Sample-size Adjusted Bayesian Information Criterion; VLMR = Vuong-Lo–Mendell–Rubin likelihood Ratio Test; BLRT = Bootstrapped Likelihood Ratio Test.

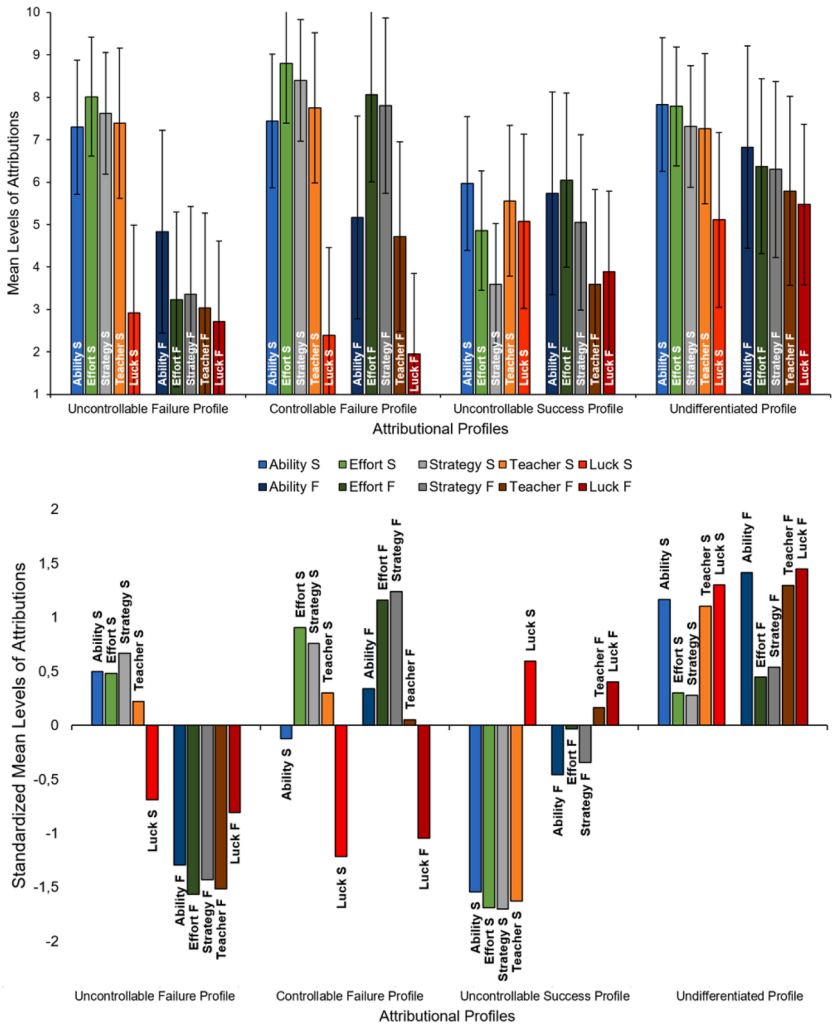

Fig. 1. Means for attributions in the attributional profiles resulting from the four-profile solution at Time 1 with unstandardized (top) and standardized scores (bottom). Error bars represent standard deviations.

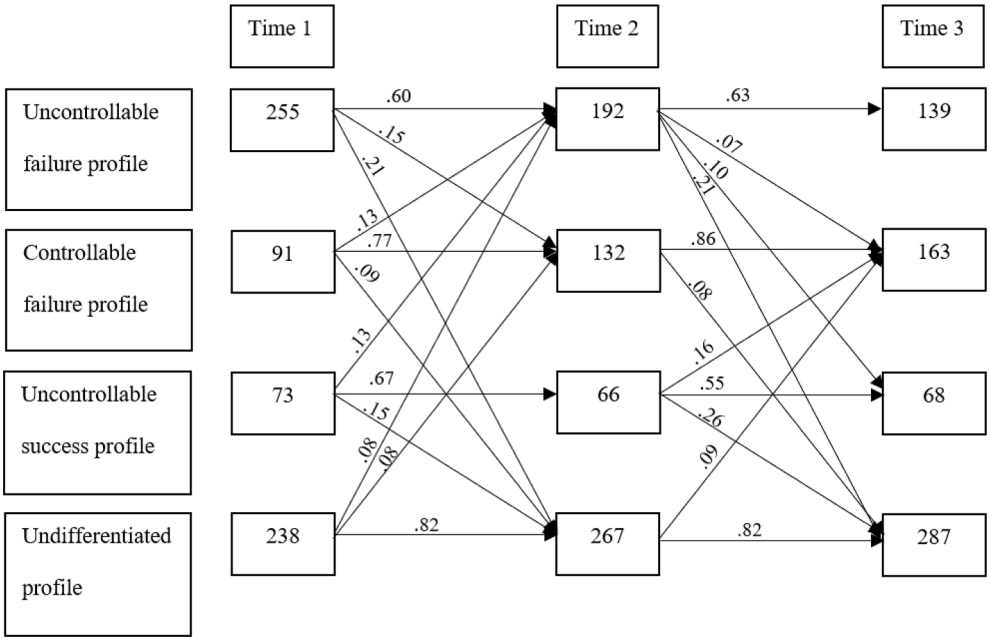

Fig. 2. Transitions between attributional profiles across the three timepoints. Numbers in the squares represent the amount of students in each attributional profile. Numbers on the arrows represent transition probabilities (%). Transition probabilities $\leq$ 0.05 are not reported.

preferred for both Time 1 and Time 3. Since the entropy value and class assignment probability indicated good classification accuracy and since the same number of profiles over time would aid the interpretation of the profiles over time (Collins & Lanza, 2010), the four-profile solution was also preferred at Time 2.

A graphical representation of both the standardized and unstandardized scores of the four-profile solution, as recommended by Meyer and Morin (2016), is presented in Fig. 1. By presenting both standardized and unstandardized scores, differences between profiles as well as within profiles (between variables) are made visible. Given the great similarities between the attributional profiles over time, only the attributional profiles at Time 1 are presented in Fig. 1. For the graphical representations of the profile-solutions at Time 2 and 3, see Appendix D and E.

The first profile (41 %, 26 %, 38 % of students, at Time 1, 2, and 3, respectively) characterized students who attributed their success to a combination of internal attributions and teacher quality. The attributions for failure were relatively low, with failure being attributed mostly to ability. This profile was labeled the *uncontrollable failure* profile because these students mostly attributed failure to a factor (i.e., ability) beyond their control. The second profile (10 %, 18 %, and 22 % of students, at Time 1, 2, and 3, respectively) was characterized by students attributing success to a combination of internal attributions and teacher quality, combined with high levels of internal controllable attributions for failure. As these students mostly attributed failure to factors within their control (i.e., effort and strategy use), this profile was labelled the *controllable failure* profile. The third profile (10 %, 16 %, and 4 % of students, at Time 1, 2, and 3, respectively) described students with relatively low scores on all attributions, who attributed success less to internal, unstable attributions and more to luck compared to the first two profiles, and failure to internal attributions. Since these students mostly attributed success to factors beyond their control this profile was labeled the *uncontrollable success* profile. The fourth profile (39 %, 40 %, and 36 % of students, at Time 1, 2, and 3, respectively) described students with average to high levels on all attributions for success and failure. This profile was labelled the *undifferentiated* profile because these students did not differentiate between the relative importance of each attribution.

Intraclass correlation coefficients (ICCs) and design effects showed that for all attributions students within the same class showed some degree of similarity compared to students in other classes (ICC = 0.014 – 0.098, design effect = 1.37 – 3.58). Consequently, MLPA models were estimated to determine if the size of attributional profiles varied between classes. The MLPA models, which held the parameters fixed to the results from the LPAs, did not converge. Subsequently, the MLPA models were estimated with random start values, resulting in small changes in parameters (<0.23). The results of the MLPAs showed that the size of the four latent profiles did not vary between classes for all three timepoints (z = 0.56 – 1.60, p >.05). That is, the frequency of each of the four attributional profiles did not significantly vary from class to class. Therefore, the multilevel structure of the data was not taken into account in further analyses.

3.2. Transitions between profiles across timepoints

A Latent Transition Analysis was conducted to examine how many students kept the same attributional profile between timepoints and how many students transitioned from profile to profile. First, measurement invariance across timepoints was established. The Likelihood Ratio Test (LRT) indicated a significant difference in fit between models ($\chi 2$ (80) = 134.25, p <.001), with the model not assuming invariance over time having a higher fit. The model assuming invariance did however have lower AIC and BIC values (AIC = 77622; BIC = 77976) than the model not assuming invariance (AIC = 77635; BIC = 78348), suggesting a higher fit. Furthermore, the interpretation of the profiles between the timepoints was similar. Therefore, the measurement parameters were constrained to be invariant across time (Collins & Lanza, 2010).

Fig. 2 displays probabilities of moving from one profile to another. Since the LTA was performed by assuming measurement invariance, the percentages of students in each profile in the LTA differ slightly from the LPA. In addition, the larger sample size of the LTA might also explain the minor differences. The vast majority of students (71.3 %) were likely to keep the same profile between Time 1 and 2 as well as between Time 2 and 3 (71.6 %). In addition, slightly more than half of the students (52.2 %) kept the same profile during all three points in time. The results showed that membership of the controllable failure profile (77–86 %) and undifferentiated profile (82 %) was the most stable over time. Students in one of these profiles were likely to keep this profile over time. Students from the controllable failure profile who did transition to another profile, most often moved to the undifferentiated profile (8–9 %). Those students who were likely to move from the undifferentiated profile, transitioned most often to the controllable failure profile (8–9 %).

Students from the uncontrollable failure and uncontrollable success profiles were most likely to transition to another profile (37–40 %, and 33–45 %, respectively). When transitions occurred for students from the uncontrollable failure (21 %) and uncontrollable success (15–26 %) profiles, they mainly involved moving to the undifferentiated profile. Notably, almost none of the students who initially had an uncontrollable failure (5 %), a controllable failure (1 %), or an undifferentiated (2 %) profile transitioned to the uncontrollable success profile at Time 2. Finally, students had a higher likelihood of moving to the uncontrollable failure profile from all the other profiles between the first two timepoints (8–13 %) as students had between the subsequent points in time (2–4 %).

3.3. Cross-sectional and longitudinal associations of profile membership with school engagement, self-esteem, and school performance

Subsequent analyses using the three-step BCH method were performed to investigate whether students characterized by different attributional profiles showed differences in school engagement, self-esteem, and school performance at each timepoint and whether students in different profiles differed with regard to changes in school engagement, self-esteem, and school performance across the schoolyear. Given the large number of students remaining in the same profile and the large number of possible transitions, the groups of students for each possible transitional pattern (e.g., from Profile 1 to 2 to 4) were too small to make a comparison between groups who transitioned from one profile to another in terms of (changes in) school engagement, self-esteem, and school performance. Therefore, we compared the four profiles on school engagement, self-esteem, and school performance at each timepoint and examined how profile membership at Time 1 was related to changes in engagement, self-esteem, and school performance across the school year, without taking transitions into account. Fig. 3 shows the levels of school engagement, self-esteem, and school performance for each attributional profile and indicates significant differences between the groups (see Appendix F, G, H and I for the descriptive statistics, Chi-Squared Wald test statistics, and effect sizes). Fig. 4 shows the changes in these variables across the schoolyear for each of the four profiles based on profile membership at Time 1.

Overall, results showed that students in the uncontrollable success profile reported the lowest levels of school engagement, self-esteem, and school performance compared to the other three groups at all three timepoints. For school engagement, the effect sizes for the significant differences between the uncontrollable success profile and the other

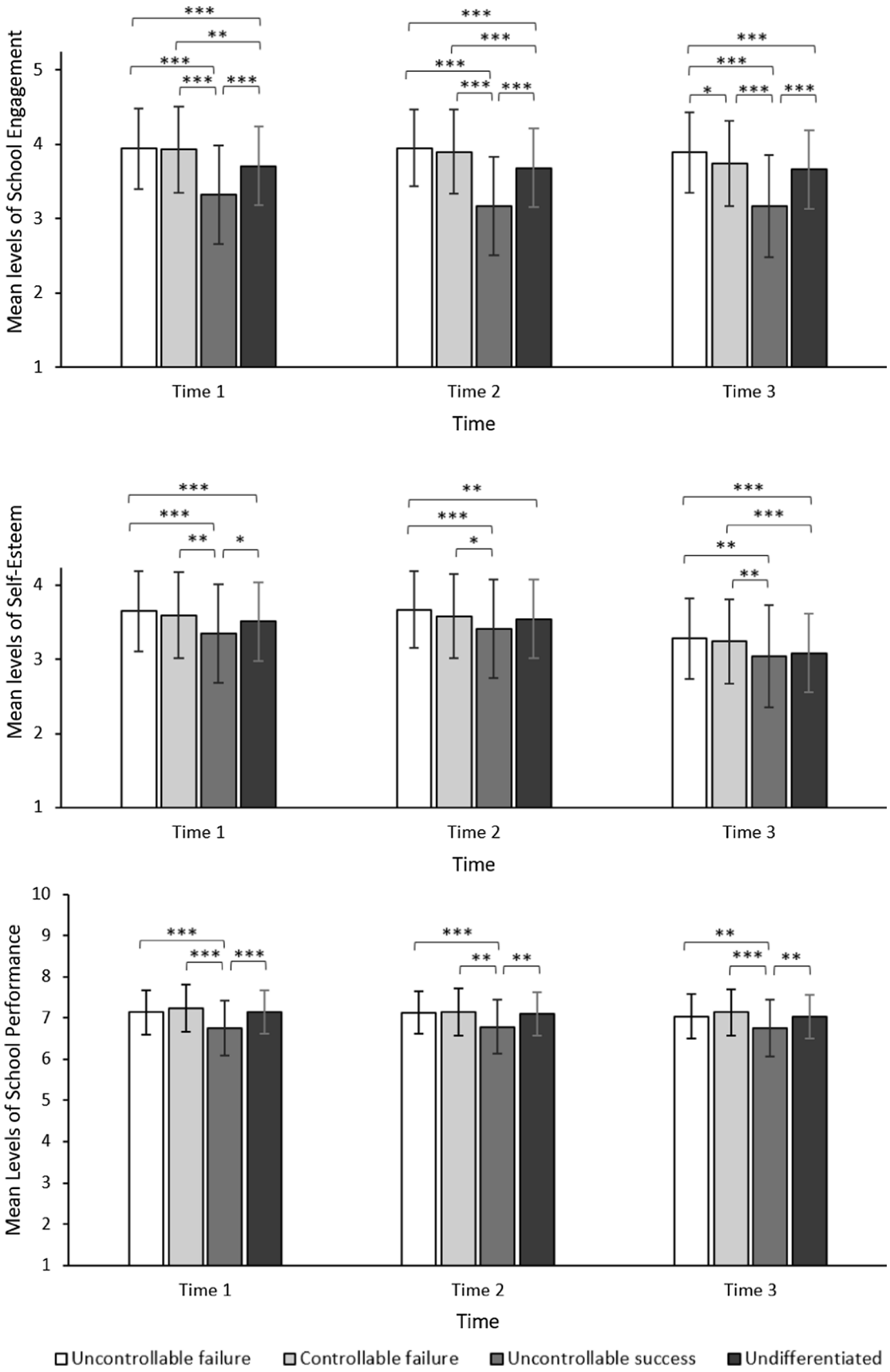

Fig. 3. Mean levels of school engagement, self-esteem, and school performance for each attributional profile. Error bars represent standard deviations. * $p < .05$, ** $p < .01$, *** $p < .001$.

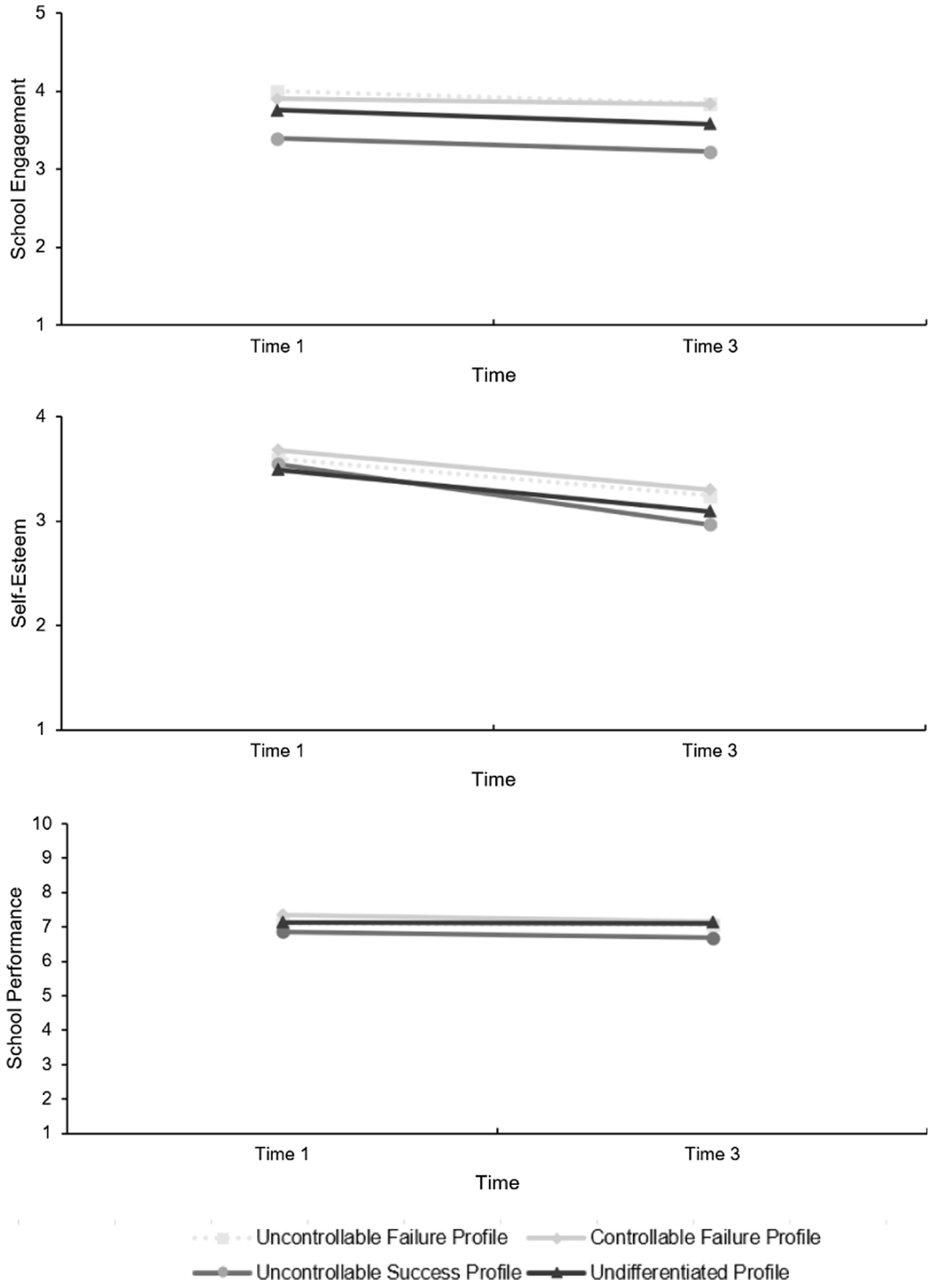

Fig. 4. Change in school engagement, self-esteem, and school performance (Time 1-Time 3) for students in different attributional profiles.

profiles were medium to large for school engagement ($d = 0.61 - d = 1.30$), small to medium for self-esteem ($d = 0.31 - d = 0.67$) and medium for school performance ($d = 0.47 - d = 0.67$) (Cohen, 1988). Students in the uncontrollable success profile also had a significantly steeper decline in school engagement across the schoolyear compared to students in the uncontrollable failure profile ($\chi2$ (1) = 6.394, p =.012, $d_{ppc2} = 0.26$) and in self-esteem compared to students in the controllable failure profile ($\chi2$ (1) = 6.286, p =.012, $d_{ppc2} = 0.07$), with small effect sizes.

Furthermore, the findings indicate that students in the uncontrollable failure and controllable failure profiles reported the most beneficial outcomes regarding school engagement and self-esteem. Surprisingly, between the uncontrollable failure and controllable failure profiles no significant differences in school engagement, self-esteem, and school performance were found. Students with an undifferentiated profile reported less school engagement and self-esteem compared to these two profiles. For school engagement ($d = 0.41 - d = 0.52$) and self-esteem ($d = 0.28 - d = 0.47$), the effect sizes for the significant differences were small to medium (Cohen, 1988). Students in the undifferentiated profile also had a significantly steeper decline in self-esteem across the schoolyear compared to students in the controllable failure profile ($\chi2$ (1) = 5.962, p =.015, $d_{ppc2} = 0.14$), with a small effect size. These three profiles did not significantly differ from one another in school performance and showed similar changes in school engagement and school performance across the schoolyear.

4. Discussion

Students experience the transition from primary to secondary school as a major change (Coelho et al., 2020; Evans et al., 2018; Jindal-Snape et al., 2020), not only because more emphasis is placed on performance and grades, but also because students' position in the classroom relative to others has changed. After this transition, many students experience a decrease in school engagement and school performance, and their perceived causes of success and failure may also change substantially (Chan & Moore, 2006; Perry et al., 2005; Perry et al., 2008). The present study therefore focused on identifying students' attributional profiles for success and failure and how these changed in the first months after entering secondary education, as well as their relation to school engagement, self-esteem, and school performance. Although attributions are typically studied separately, the present study focused on attributional profiles to account for the fact that students are likely to use combinations of attributions in trying to explain their successes and failures in achievement settings (e.g., Dong et al., 2013).

The findings of this study revealed that first-year secondary school students indeed used combinations of attributions to explain their successes and failures. First, four distinct attributional profiles could be identified among students: *uncontrollable failure, controllable failure, uncontrollable success, and undifferentiated*. Second, similar profiles were found at three timepoints across the schoolyear and about half of the students (52 %) remained in the same profile over a six-month period. Third, the attributional profiles differed in their adaptivity for learning, with the uncontrollable failure and controllable failure profiles being most adaptive in terms of school engagement, self-esteem, and school performance, and the uncontrollable success profile being least adaptive.

4.1. Attributional profiles and their adaptivity for learning

Around 20–40 % of students were most likely to have an uncontrollable failure profile, which describes students who explain their successes by ability, effort, strategy use, and teacher's quality, and their failure mostly by a lack of ability. Around 14–25 % of students were most likely to have a controllable failure profile. These students endorsed similar attributions for success as students in the former profile, but they attributed their failure more to low effort and inadequate strategy use. Students in both profiles attributed their good grades mostly to internal attributions, with external factors (in particular luck) having less influence on their success outcomes. The striking difference between these two profiles is the pattern of attributions for failure. While students in the uncontrollable failure profile attributed their worst grades mostly to a lack of ability, which is considered as a less controllable attribution (Graham, 2020; Weiner, 1985, 2010), students in the controllable failure profile attributed their worst grades to low effort and inadequate strategy use, which can be considered controllable causes (Graham, 2020; Weiner, 1985, 2010). The success attributions of both these profiles seem to be adaptive for learning, as previous research (e.g., Chandler et al., 1997; McClure et al., 2011) showed that attributing success to internal and stable causes (e.g., ability) or internal and controllable causes (e.g., effort) relates to higher students' school engagement, self-esteem, and school performance. Yet, based on the attributions for failure, according to Weiner's theory (1985, 2010), students in the controllable failure profile would be likely to be more engaged at school and perform better as they attribute their failures to unstable, controllable causes, while students in the uncontrollable failure profile would be likely to report higher levels of self-esteem as they were less likely to attribute their failures to internal factors. However, no differences in school engagement, self-esteem, or school performance between the uncontrollable failure and controllable failure profiles were found. What the uncontrollable failure profile and the controllable failure profile have in common are their attributions for success, while the attributions for failure are very different from one another. Hence, the differences we found in outcomes between these two (adaptive) profiles and the other profiles seem due to differences in students' attributions for success rather than differences in attributions for failure. This finding might suggest that the factors by which students explain their successes may be more important for the outcomes assessed in this study than the factors by which students explain their failures.

Students in the uncontrollable success profile, which comprised around 10 % of students, explain success mainly by uncontrollable attributions (i.e., ability, teacher's quality, and luck) and failure by internal attributions (i.e., ability, effort, and strategy use). Students with this profile attribute their good grades to attributions which are mostly seen as factors they could not influence themselves, while they feel that their failures are their own fault. If students believe their success is caused by external factors, they are expected to have a decreased self-esteem and school engagement as they feel they will not be able to be successful in the future (Weiner, 1985, 2010). The findings of this study regarding this profile are in line with Weiner's theory (1985, 2010) and showed that the uncontrollable success profile is least adaptive in terms of school engagement, self-esteem, and school performance across all three timepoints, with mostly medium to large effect sizes.

Finally, around 36–43 % students were most likely to have an undifferentiated profile.

These students reported relatively high levels of all attributions for both success and failure, which suggests that they feel that both their successes and failures are due to many different causes. This profile in particular showed the added value of using a person-centered approach in attribution research, because this profile clearly indicates that many students endorse multiple causes to explain both their success and failure outcomes. Furthermore, the findings regarding this profile show that examining combinations of attributions together provides a clearer picture of the relation between attributions and school engagement, self-esteem, and school performance. That is, our findings indicated that student outcomes are less favorable for students who endorse many

different attributions, with mostly medium effect sizes. With a variable-centered approach, this finding would not have emerged. Nevertheless, the presence of the undifferentiated profile is a bit remarkable since it seems surprising that students simultaneously consider attributions with opposite dimensions as most important reasons for their success and failure. One explanation may be that these students did not know exactly what caused their success and failure, so they endorsed all possible causes. Future research is needed to examine whether the same profile would emerge in other samples and what caused the presence of the undifferentiated profile.

4.2. The stability of attributional profiles

The same four attributional profiles were found across the three timepoints, which suggests that the structure of the attributional profiles was relatively stable over a six-month period. Furthermore, a sizeable amount of students (52 %) kept the same attributional profile during this time period. For others, the beginning of secondary school was marked by changes in attributions, with a substantial group of students changing from attributional profile in just a few months' time. Specifically, between two consecutive points in time, 29 % of students changed their attributional profile. Contrary to expectations, shortly after the transition to secondary education, students did not transition more often to another attributional profile than later in the schoolyear. However, the longer time interval between Time 2 and 3 (3 months) showed the same percentage of profile stability (71 %) as the shorter interval between Time 1 and 2 (1.5 months). In theory, shorter time intervals lead to higher stability coefficients as the period to transition is shorter. Hence, the absence of differences in profile stability between the two time intervals might align with our expectations and indicate that students are most likely to transition to another profile just after the school transition.

Among the students that transitioned between profiles, most of them moved to the undifferentiated profile from any of the other attributional profiles. For students from the uncontrollable and controllable failure profiles, this implied moving to a less adaptive profile, while students from the uncontrollable success profile changed to a more adaptive profile for learning. Fortunately, the least frequent transitions included students moving from a more adaptive attributional profile to the uncontrollable success profile, the least adaptive profile. It is remarkable that the amount of students with an undifferentiated profile grew over time, especially since it seems that students in this profile did not know exactly what caused their success and failure. A possible explanation could be that some students, when they have just entered secondary education, first still adhere to their old attributions from primary school, but over time, when they have experienced more achievement situations in the new school context, start to re-evaluate their attributions. This could cause these students to be more differentiated in their attributions at first, but then becoming more uncertain of the reasons of their successes and failures later on. Consequently, they start to endorse all possible attributions at the later time points. Future research could investigate what exactly causes students to move from other attributional profiles to the undifferentiated profile and whether students with an undifferentiated profile will move to more differentiated profiles later on in secondary school.

4.3. Limitations and future research

There are some limitations to consider when interpreting the results of the present study and in designing future research. First, it is important to note that this study used a convenience sample in which students in the highest educational tracks were overrepresented. Furthermore, research in other contexts is necessary to find out whether the results are generalizable to other educational contexts beyond the Dutch context.

Second, there may be some ambiguity of the causal dimensions of each attribution. We cannot be certain that the causal dimensions assigned to attributes are actually experienced as such by students. For example, ability is generally considered to be a relatively stable attribution, but students may differ in the extent to which they consider their ability to be stable (Dweck & Yeager, 2019; Weiner, 1985, 2010). Therefore, some researchers (e.g., Brun et al., 2021; Dong et al., 2013) have proposed to focus only on the dimensions of locus, stability, and controllability rather than on specific attributions. Not taking into account how the participants perceived dimensional properties of the attributions could cause a mismatch between the subjective perception of individuals and the theoretical dimensional properties of the attributions. This may also have consequences for the interpretation of the stability of the attributional profiles. Although our results indicated that for many students their attributional profile was stable in the first half year of secondary education, it is still possible that the dimensional properties as they were perceived by students did change during this period.

Third, there may be other attributions which students believed that caused their success and failure, next to the six attributions that were included in the present study. For example, students may also attribute their successes and failures to other causes, such as family or peers (McClure et al., 2011). Future research may include other attributions, such as social factors, or provide the opportunity for students to include their own attributions, for example in an open-ended format.

Fourth, we excluded test difficulty from the analyses as the relatively high correlation between this attribution and ability indicated that students may have interpreted test difficulty as an indicator of their ability, rather than an external factor based on the environment. Fortunately, as we included other external, uncontrollable attributions (i.e., teacher's quality and luck) the variation of attributions on the three underlying dimensions was still ensured after excluding test difficulty. Future research could examine how test difficulty can be measured more validly, for example, by rephasing this item. For students, it should be clear that the item relates to the difficulty of the test in relation to other tests, not in relation to the competences of the student. For example the item could be rephrased as: 'because the test was more difficult than usual'.

Fifth, we were interested in students' general attribution style at the first year of secondary school as previous research suggests that attributions are mostly similar across domains (Vuletich et al., 2019). Nevertheless, students' attributions can still show variations across domains or situations (Boekaerts et al., 2003; Vispoel & Austin, 1995). Future research could examine attributional profiles per domain or situation, to examine whether such an approach would lead to different attributional profiles.

Finally, the findings of the present study indicate that although many students remained in the same profile across time points, almost half of the students did change profiles during the first year of secondary school. Future research could study attributions before and after the transition to secondary education to determine to what extent profiles remain stable across the school transition. When students enter a new school environment their causal attributions may change substantially (Perry et al., 2005; Perry et al., 2008), but it is not known how attributional profiles change across the school transition.

4.4. Implications for practice and conclusion

Educators can learn from this study that students often will endorse

more than one reason when trying to explain their performance. When aiming to identify those students at risk for low school engagement, low self-esteem, and low school performance, it seems most helpful to look at students' attributions for success. Based on the distribution across profiles, it is estimated that in each classroom one or a few students tend to explain their good performance on school tests by factors outside of their control, including luck. These students do not seem to see their own effort and approach to learning as valid reasons for their successes. Attribution retraining techniques (Haynes et al., 2009) may be used to help them reconsider their attributions. However, so far, most attribution retraining treatments, including our own intervention (Poorthuis et al., 2016) focused on encouraging students to reconsider their maladaptive attributions for their failures instead of trying to change attributions for success (Haynes et al., 2009). This study showed very few differences in engagement, self-esteem and school performance between students attributing their failures to controllable factors or not, as long as students did attribute their successes to internal factors. In case the results would be replicated in other studies, this could have implications for attributional retraining interventions. That is, attribution retraining may be more effective when focusing on changing attributions for success. The transition to a new achievement setting can be a challenge for students. Helping them to see that their own effort and learning strategy impacts their performance may help them to experience that they have control over their success in school.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix A

Table A1
Items to measure attributions for success and failure.

Attribution	Items for success	Items for failure
	Think back to times that you received a grade you were satisfied with. When you get good grades, why do you tend to get them? *Denk eens terug aan cijfers voor proefwerken waar je tevreden mee was. Als je een goed cijfer haalt, waar komt dat dan meestal door?*	Think back to times that you received a grade you were unsatisfied with. When you get bad grades, why do you tend to get them? *Denk eens terug aan cijfers voor proefwerken waar je NIET tevreden mee was. Als je een slecht cijfer haalt, waar komt dat dan meestal door?*
Ability	Because I am good at the subject *Omdat ik goed ben in dit vak*	Because I am bad at the subject *Omdat ik slecht ben in dit vak*
Effort	Because I studied a lot for the test *Omdat ik veel heb geleerd voor de toets*	Because I did not study enough for the test *Omdat ik weinig geleerd heb voor de toets*
Strategy use	Because I approached studying in the right way*Omdat ik het leren op de goede manier heb aangepakt*	Because I approached studying in the wrong way *Omdat ik het leren op de verkeerde manier heb aangepakt*
Test difficulty	Because it was an easy test *Omdat de toets makkelijk was*	Because it was a difficult test *Omdat de toets moeilijk was*
Teacher's quality	Because the teacher explained the material well *Omdat de docent goed heeft uitgelegd*	Because the teacher did not explain the material well *Omdat de docent niet goed heeft uitgelegd*
Luck	Because I had good luck *Omdat ik geluk heb gehad*	Because I had bad luck *Omdat ik pech heb gehad*

Note. Original items used in the study were in Dutch (shown in italics). Responses were given on a 10-point scale (1 = certainly not for this reason; 10 = certainly because of this reason. In Dutch: 1 = zeker niet hierdoor; 10 = zeker wel hierdoor).

Appendix B

Table B1
Correlations between all attributions.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Time 1																		
1. SA Ability	—																	
2. SA Effort	0.18**	—																
3. SA Strategy use	0.23**	0.53**	—															
4. SA Test difficulty	0.35**	-0.03	0.11**	—														
5. SA Teacher's quality	0.24**	0.22**	0.37**	0.20**	—													
6. SA Luck	0.03	-0.16**	-0.16**	0.22**	-0.01	—												
7. FA Ability	0.18**	-0.00	-0.10**	0.15**	-0.02	0.16**	—											
8. FA Effort	0.04	-0.09*	-0.06	0.17**	-0.06	0.19**	0.12**	—										
9. FA Strategy use	0.02	0.07	-0.04	0.02	-0.02	0.17**	0.23**	0.48**	—									
10. FA Test difficulty	0.13**	0.17**	0.04	0.06	-0.04	0.10*	0.42**	0.15**	0.30**	—								
11. FA Teacher's quality	0.06	0.09*	0.03	0.22**	-0.07	0.17**	0.30**	0.29**	0.27**	0.41**	—							
12. FA Luck	0.09*	-0.07	-0.06	0.13**	-0.10*	0.42**	0.26**	0.18**	0.20**	0.16**	0.32**	—						
Time 2																		
13. SA Ability	0.37**	0.05	0.05	0.28**	0.16**	0.07	0.15**	0.05	-0.05	0.06	0.11**	0.16**	—					
14. SA Effort	0.07	0.48**	0.34**	-0.05	0.17**	-0.11**	-0.01	−05	0.04	0.15**	0.04	-0.14**	0.15**	—				
15. SA Strategy use	0.15**	0.42**	0.51**	0.00	0.22**	-0.17**	-0.04	-0.8	-0.08	0.07	0.02	-0.10*	0.15**	0.56**	—			
16. SA Test difficulty	0.13**	-0.09*	0.06	0.41**	0.09*	0.24**	0.09*	0.13**	0.06	0.04	0.08	0.19**	0.29**	0.01	0.01	—		
17. SA Teacher's quality	0.23**	0.11**	0.20**	0.14**	0.41**	0.02	-0.04	-0.00	-0.05	-0.00	-0.04	0.00	0.26**	0.18**	0.28**	0.28**	—	
18. SA Luck	-0.00	-0.18**	-0.11**	0.14**	-0.04	0.57**	0.11*	0.13**	0.16**	0.06	0.13**	0.37**	0.11**	-0.16**	-0.15**	0.34**	0.09*	—
19. FA Ability	0.10*	0.03	-0.07	0.09*	-0.07	0.08*	0.44**	0.11**	0.21**	0.26**	0.17**	0.17**	0.20**	-0.01	-0.01	0.09*	0.00	0.08
20. FA Effort	-0.04	-0.02	-0.02	0.06	-0.02	0.06	0.10*	0.47**	0.23**	0.13**	0.17**	0.09*	0.06	0.04	-0.02	0.18**	0.05	0.10*
21. FA Strategy use	-0.04	0.09*	-0.02	-0.02	0.04	0.05	0.14**	0.26**	0.43**	0.20**	0.17**	0.13**	-0.01	0.15**	0.08*	0.06	0.10*	0.11**
22. FA Test difficulty	0.10*	0.14**	0.02	0.10*	0.01	0.04	0.23**	0.14**	0.21**	0.36**	0.17**	0.09*	0.11**	0.14**	0.06	0.15**	0.12**	0.08
23. FA Teacher's quality	0.01	0.10*	0.01	0.11**	-0.05	0.09*	0.21**	0.17**	0.26**	0.27**	0.42**	0.14**	0.05	0.00	-0.03	0.15**	-0.09*	0.16**
24. FA Luck	0.04	-0.07	-0.06	0.13**	0.01	0.30**	0.13**	0.11**	0.17**	0.13**	0.13**	0.41**	0.05	-0.10*	-0.11**	0.21**	0.11**	0.45**
Time 3																		
25. SA Ability	0.29**	0.08	0.07	0.16**	0.15**	0.06	0.16*	-0.01	0.02	0.11*	0.03	0.07	0.30**	0.05	0.08	0.28**	0.20**	0.16**
26. SA Effort	0.05	0.38**	0.23**	-0.02	0.04	-0.18**	0.03	-0.01	0.09	0.09*	0.06	-0.09*	-0.06	0.38**	0.35**	-0.10*	0.07	-0.13**
27. SA Strategy use	0.11**	0.27**	0.33**	0.01	0.15**	-0.19**	-0.00	-0.00	0.03	0.02	0.01	-0.10*	-0.04	0.28**	0.43**	-0.07	0.17**	-0.17**
28. SA Test difficulty	0.08	-0.09*	-0.08	0.32**	0.06	0.27**	0.16**	0.16**	0.10*	0.08	0.11**	0.18**	0.18**	-0.04	-0.12**	0.45**	0.14**	0.32**
29. SA Teacher's quality	0.16**	0.08	0.07	0.04	0.29**	-0.01	0.05	0.01	-0.05	-0.02	-0.05	-0.04	0.11**	0.11*	0.15**	0.05	0.42**	-0.02
30. SA Luck	-0.08*	-0.16**	-0.20**	0.11**	-0.09*	0.50**	0.14**	0.12**	0.16**	0.08	0.11**	0.38**	0.08*	-0.15**	-0.20**	0.25**	0.09*	0.57**
31. FA Ability	0.06	-0.07	-0.14**	0.12**	-0.09*	0.19**	0.32**	0.11*	0.18**	0.24**	0.15**	0.19**	0.08	-0.07	-0.11*	0.16**	-0.05	0.20**
32. FA Effort	0.00	-0.05	-0.02	0.07	-0.02	0.07	0.08*	0.42**	0.20**	0.01	0.07	0.07	0.02	-0.01	-0.02	0.17**	0.06	0.08
33. FA Strategy use	-0.01	0.07	0.04	0.03	0.08	0.11	0.06	0.19**	0.34**	0.09*	0.12**	0.06	-0.02	0.09*	0.05	0.05	0.9*	0.16**
34. FA Test difficulty	0.04	0.07	0.02	0.11**	-0.08*	0.13**	0.12**	0.09*	0.11**	0.33**	0.26**	0.19**	0.06	0.03	-0.02	0.16**	0.03	0.19**
35. FA Teacher's quality	-0.00	0.08	0.03	0.17**	-0.07	0.13**	0.16**	0.16**	0.20**	0.20**	0.39**	0.16**	-0.02	0.08	-0.01	0.10*	-0.05	0.14**
36. FA Luck	-0.09*	-0.09*	-0.07	0.075	-0.10*	0.31**	0.08	0.05	0.10*	0.09*	0.13**	0.37**	0.03	-0.14**	-0.13**	0.16**	0.08*	0.39**

	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
19. FA Ability	—																
20. FA Effort	0.10*	—															
21. FA Strategy use	0.21**	0.53**	—														
22. FA Test difficulty	0.41**	0.24**	0.29**	—													
23. FA Teacher's quality	0.21**	0.22**	0.25**	0.29**	—												
24. FA Luck	0.18**	0.13**	0.20**	0.18**	0.23**	—											
Time 3																	
25. SA Ability	0.11**	0.04	0.06	0.12**	0.05	0.09*	—										
26. SA Effort	-0.03	0.04	0.14**	0.11**	0.08	-0.02	0.13**	—									
27. SA Strategy use	-0.05	0.07	0.12**	0.06	-0.00	-0.02	0.09*	0.63**	—								
28. SA Test difficulty	0.08	0.13**	0.07	0.10*	0.15**	0.24**	0.35**	0.02	0.04	—							
29. SA Teacher's quality	-0.03	0.03	0.06	0.05	-0.08*	0.03	0.25**	0.22**	0.31**	0.19**	—						
30. SA Luck	0.12**	0.08*	0.10*	0.08	0.41**	0.11**	0.11**	-0.10*	-0.14**	0.43**	0.05	—					
31. FA Ability	0.43**	0.07	0.11**	0.29**	0.20**	0.20**	0.23**	-0.03	-0.10*	0.18**	0.01	0.22**	—				
32. FA Effort	0.04	0.51**	0.26**	0.12**	0.17**	0.08	0.05	0.09*	0.08*	0.23**	0.11**	0.17**	0.11**	—			
33. FA Strategy use	0.04	0.26**	0.45**	0.12**	0.20**	0.16**	0.07	0.15**	0.19**	0.18**	0.14**	0.21**	0.12**	0.46**	—		
34. FA Test difficulty	0.18**	0.11**	0.15**	0.35**	0.28**	0.23**	0.18**	0.09*	0.04	0.27**	0.05	0.22**	0.36**	0.19**	0.28**	—	
35. FA Teacher's quality	0.15**	0.12**	0.13**	0.16**	0.43**	0.19**	0.06	0.09*	-0.02	0.26**	-0.03	0.22**	0.26**	0.23**	0.28**	0.39**	—
36. FA Luck	0.13**	0.05	0.07	0.12**	0.11**	0.50**	0.04	-0.11**	-0.10*	0.24**	-0.02	0.55**	0.22**	0.09*	0.15**	0.34**	0.27**

Appendix C

Table C1
Fit indices for latent profile models estimating 1 to 8 attributional profiles with test difficulty.

Number of profiles	AIC	BIC	aBIC	VLMR (*p* value)	BLRT (*p* value)	Entropy	Smallest class probability	Smallest profile
Time 1								
1	33,410	33,516	33,440	–	–	–	1.000	629 (100.0 %)
2	32,895	33,060	32,942	0.000	<0.001	0.705	0.910	307 (48.8 %)
3	32,539	32,761	32,602	0.006	<0.001	0.799	0.888	63 (10.1 %)
4	32,420	32,700	32,500	0.176	<0.001	0.770	0.792	64 (10.2 %)
5	32,313	32,651	32,409	0.751	<0.001	0.785	0.782	40 (6.4 %)
6	32,239	32,634	32,352	0.244	<0.001	0.789	0.786	39 (6.2 %)
7	32,172	32,625	32,301	0.195	<0.001	0.822	0.819	27 (4.3 %)
8	32,115	32,626	32,261	0.440	<0.001	.	.	
Time 2								
1	31,367	31,473	31,396	–	–	–	1.000	609 (100.0 %)
2	30,956	31,119	31,001	0.019	<0.001	0.711	0.897	210 (34.5 %)
3	30,741	30,961	30,803	0.327	<0.001	0.737	0.825	110 (18.1 %)
4	30,541	30,819	30,619	0.073	<0.001	0.765	0.840	88 (14.5 %)
5	30,423	30,758	30,517	0.056	<0.001	0.799	0.855	34 (5.6 %)
6	30,336	30,728	30,446	0.317	<0.001	0.793	0.832	32 (5.2 %)
7	30,275	30,725	30,401	0.418	<0.001	0.812	0.835	11 (1.8 %)
8	30,221	30,729	30,363	0.710	<0.001	0.806	0.805	11 (1.8 %)
Time 3								
1	31,186	31,292	31,216	–	–	–	1.000	610 (100.0 %)
2	30,666	30,829	30,712	0.000	<0.001	0.685	0.900	277 (45.4 %)
3	30,413	30,633	30,475	0.051	<0.001	0.790	0.893	30 (4.9 %)
4	30,264	30,542	30,343	0.407	<0.001	0.748	0.828	22 (3.7 %)
5	30,117	30,452	30,211	0.042	<0.001	0.753	0.821	22 (3.7 %)
6	30,042	30,434	30,152	0.489	<0.001	0.785	0.829	13 (2.1 %)
7	29,962	30,412	30,088	0.703	<0.001	0.799	0.824	15 (2.5 %)
8	29,888	30,395	30,030	0.581	<0.001	0.810	0.800	14 (2.3 %)

Note. AIC = Aikaike Information Criterion; BIC = Bayesian Information Criterion; aBIC = Sample-size Adjusted Bayesian Information Criterion; VLMR = Vuong-Lo–Mendell–Rubin likelihood Ratio Test; BLRT = Bootstrapped Likelihood Ratio Test.

Appendix D

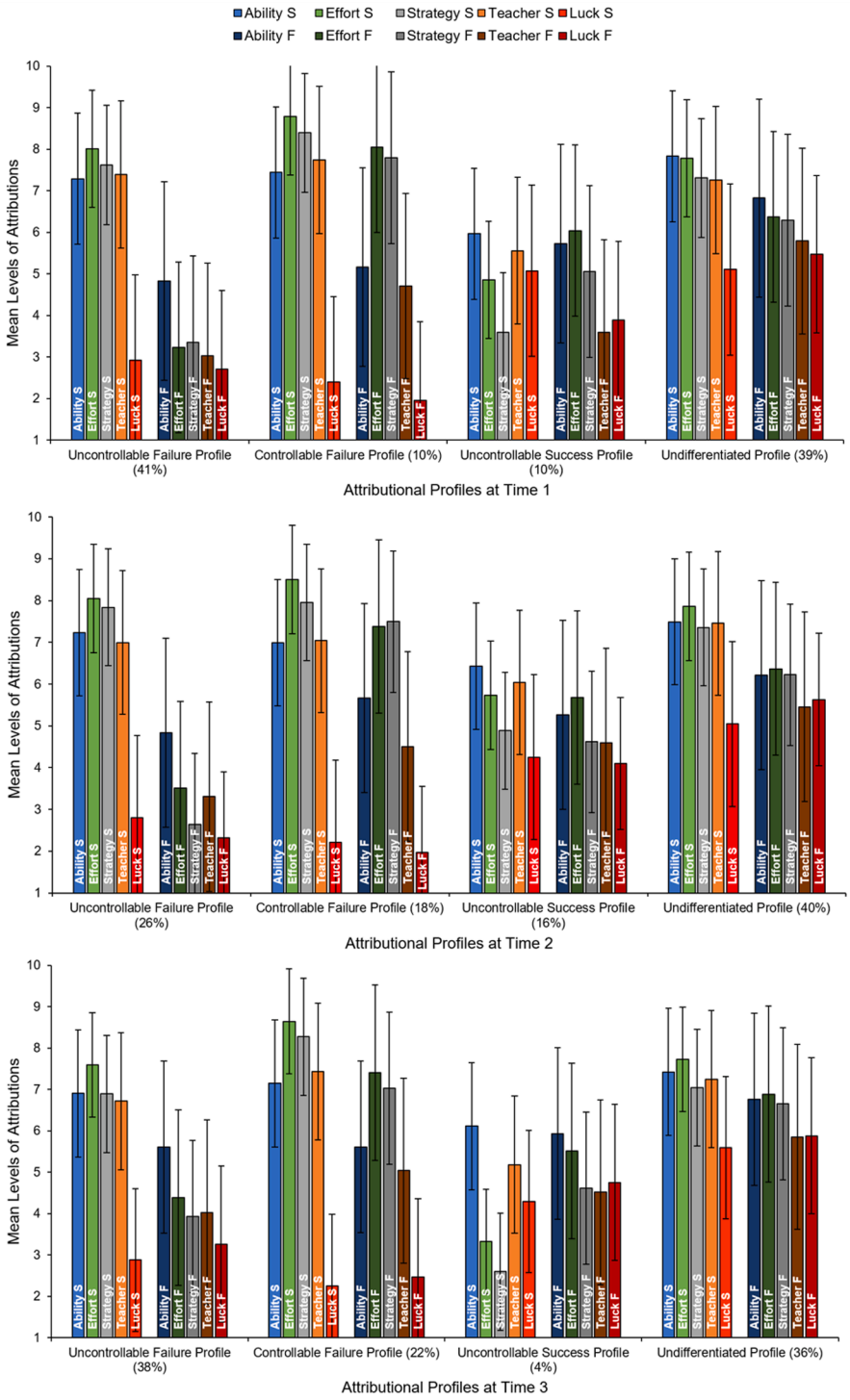

Fig. D1. Unstandardized mean levels of the attributions for each attributional profile at Time 1, 2 and 3. Error bars represent standard deviations.

Appendix E

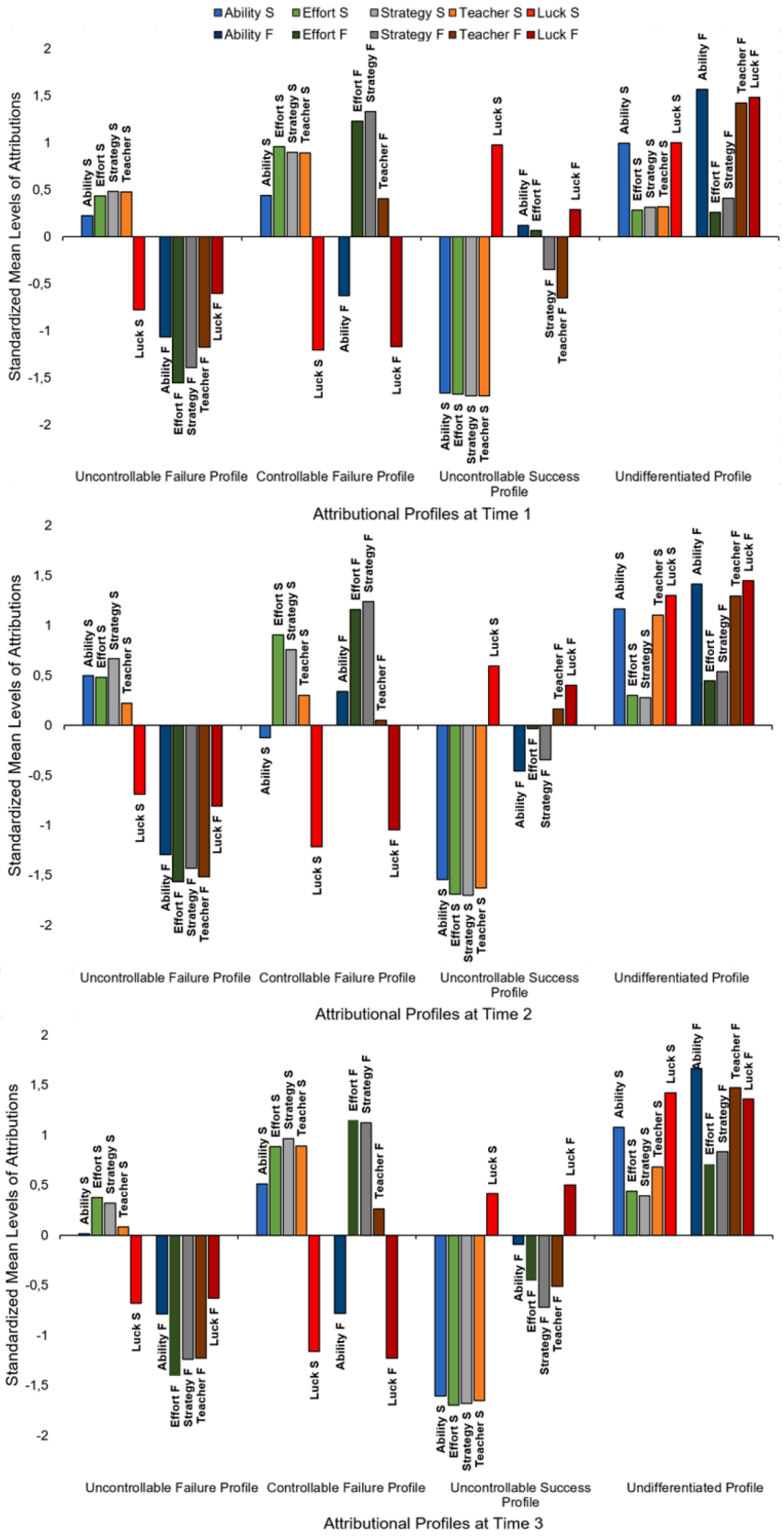

Fig. E1. Standardized mean levels of the attributions in each attributional profile at Time 1, 2 and 3.

Appendix F

Table F1
Descriptive statistics of the four attributional profiles for school engagement, self-esteem, and school performance at each timepoint.

		Uncontrollable Failure Profile		Controllable Failure Profile		Uncontrollable Success Profile		Undifferentiated Profile	
		M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
School engagement	Time 1	3.97	0.62	3.96	0.71	3.25	0.78	3.68	0.64
	Time 2	3.98	0.60	3.93	0.69	3.08	0.77	3.66	0.62
	Time 3	3.93	0.64	3.76	0.71	3.04	0.90	3.66	0.61
Self-esteem	Time 1	3.66	0.47	3.61	0.62	3.32	0.54	3.49	0.54
	Time 2	3.69	0.54	3.57	0.61	3.38	0.58	3.54	0.54
	Time 3	3.30	0.48	3.26	0.51	3.01	0.64	3.06	0.53
School performance	Time 1	7.15	0.81	7.27	0.91	6.67	0.87	7.15	0.92
	Time 2	7.14	0.70	7.16	0.82	6.73	0.74	7.12	0.84
	Time 3	7.03	0.73	7.18	0.85	6.65	0.88	7.04	0.74

Note. The response scale ranged from 1 to 5 for school engagement, from 1 to 4 for self-esteem and from 1 to 10 for school performance.

Appendix G

Table G1
Test statistics of the Chi-Squared Wald test for comparing school engagement between each attributional profile for all timepoints.

			Uncontrollable Failure Profile				Controllable Failure Profile				Uncontrollable Success Profile			
		N	Wald $\chi 2$	*df*	*p*	Cohen's *d*	Wald $\chi 2$	*df*	*p*	Cohen's *d*	Wald $\chi 2$	*df*	*p*	Cohen's *d*
Time 1	Uncontrollable Failure Profile	250												
	Controllable Failure Profile	76	0.01	1	0.918	0.01								
	Uncontrollable Success Profile	68	48.31	1	<0.001	1.03	32.24	1	<0.001	0.95				
	Undifferentiated Profile	235	23.05	1	<0.001	0.46	7.95	1	0.005	0.41	16.71	1	<0.001	0.61
Time 2	Uncontrollable Failure Profile	175												
	Controllable Failure Profile	121	0.388	1	0.533	0.08								
	Uncontrollable Success Profile	59	65.38	1	<0.001	1.30	51.01	1	<0.001	1.16				
	Undifferentiated Profile	254	26.56	1	<0.001	0.52	11.49	1	<0.001	0.41	27.44	1	<0.001	0.83
Time 3	Uncontrollable Failure Profile	120												
	Controllable Failure Profile	156	4.12	1	0.043	0.25								
	Uncontrollable Success Profile	62	46.87	1	<0.001	1.14	31.27	1	<0.001	0.89				
	Undifferentiated Profile	272	15.05	1	<0.001	0.43	1.89	1	0.170	0.15	24.93	1	<0.001	0.81

Appendix H

Table H1
Test statistics of the Chi-Squared Wald test for comparing self-esteem between each attributional profile for all timepoints.

			Uncontrollable Failure Profile				Controllable Failure Profile				Uncontrollable Success Profile			
		N	Wald $\chi 2$	*df*	*p*	Cohen's *d*	Wald $\chi 2$	*df*	*p*	Cohen's *d*	Wald $\chi 2$	*df*	*p*	Cohen's *d*
Time 1	Uncontrollable Failure Profile	250												
	Controllable Failure Profile	76	0.54	1	0.464	0.09								
	Uncontrollable Success Profile	68	21.30	1	<0.001	0.67	8.45	1	0.004	0.50				
	Undifferentiated Profile	235	12.35	1	<0.001	0.34	1.73	1	0.188	0.21	4.86	1	0.028	0.31
Time 2	Uncontrollable Failure Profile	175												
	Controllable Failure Profile	121	2.83	1	0.093	0.21								
	Uncontrollable Success Profile	59	12.68	1	<0.001	0.55	3.96	1	0.047	0.32				
	Undifferentiated Profile	254	7.79	1	0.005	0.28	0.20	1	0.657	0.05	3.33	1	0.068	0.29
Time 3	Uncontrollable Failure Profile	120												
	Controllable Failure Profile	156	0.38	1	0.540	0.08								
	Uncontrollable Success Profile	62	9.32	1	0.002	0.51	7.44	1	0.006	0.43				
	Undifferentiated Profile	272	18.77	1	<0.001	0.47	13.56	1	<0.001	0.38	0.25	1	0.616	0.09

Appendix I

Table I1
Test statistics of the Chi-Squared Wald test for comparing school performance between each attributional profile for all timepoints.

			Uncontrollable Failure Profile				Controllable Failure Profile				Uncontrollable Success Profile			
		N	Wald $\chi2$	*df*	*p*	Cohen's *d*	Wald $\chi2$	*df*	*p*	Cohen's *d*	Wald $\chi2$	*df*	*p*	Cohen's *d*
Time 1	Uncontrollable Failure Profile	250												
	Controllable Failure Profile	76	1.04	1	0.308	0.14								
	Uncontrollable Success Profile	68	15.56	1	<0.001	0.57	15.97	1	<0.001	0.67				
	Undifferentiated Profile	235	0.00	1	0.986	0.00	0.89	1	0.345	0.13	14.22	1	<0.001	0.54
Time 2	Uncontrollable Failure Profile	175												
	Controllable Failure Profile	121	0.05	1	0.825	0.03								
	Uncontrollable Success Profile	59	13.30	1	<0.001	0.57	12.10	1	<0.001	0.55				
	Undifferentiated Profile	254	0.06	1	0.807	0.03	0.17	1	0.679	0.05	11.47	1	<0.001	0.49
Time 3	Uncontrollable Failure Profile	120												
	Controllable Failure Profile	156	1.97	1	0.161	0.19								
	Uncontrollable Success Profile	62	8.38	1	0.004	0.47	16.04	1	<0.001	0.61				
	Undifferentiated Profile	272	0.00	1	0.961	0.01	2.49	1	0.115	0.18	9.78	1	0.002	0.48

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