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Adolescents' stress and depressive symptoms and their associations with psychological flexibility before educational transition

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Abstract

Introduction: Relatively little is known about individual differences in adolescent psychological flexibility and its associations with symptoms of stress and depression. This study examined different profiles of adolescent stress and depressive symptoms and their associations with developing psychological flexibility before the critical educational transition.

Methods: The data were derived from a general sample of 740 Finnish ninth-grade adolescents (M_{age} = 15.7 years, 57% female) who were assessed twice during the final grade of their basic education. The data were analyzed using growth mixture modeling.

Results: Four profiles of stress and depressive symptoms were identified during a school year: (1) *no stress and no depressive symptoms* (None; 69%); (2) *mild and decreasing stress and depressive symptoms* (Decreasing; 15%); (3) *low but increasing stress and depressive symptoms* (Increasing; 6%); and (4) *high and stable levels of stress and depressive symptoms* (High; 10%). The adolescents in these profiles differed from each other in their initial levels and changes of psychological flexibility. The initial level of psychological flexibility was highest in the no-symptom profile group. We observed simultaneous change trends in symptoms and psychological flexibility during a school year. When symptoms decreased, psychological flexibility increased, and when symptoms increased, psychological flexibility decreased.

Conclusions: A bidirectional pattern of relationships between psychological flexibility and psychological symptoms was found. Despite initially high level of skills in psychological flexibility, some adolescents, unexpectedly, experienced increased symptoms of stress and depression during the school year. The results call for further studies to explore in-depth the developmental diversity in adolescents' well-being and its antecedents.

KEYWORDS

adolescents, depressive symptoms, development of psychological flexibility, profiles, stress

1 | INTRODUCTION

Mental ill-being in adolescents may have broad and long-lasting individual effects and societal costs. Therefore, it is important to identify core psychological processes that prevent or mitigate symptoms of stress and depression in adolescents and increase the likelihood of success at school (Avison, 2010; Lee et al., 2014; Liu & Alloy, 2010). The last grade of basic

education, when most adolescents are between 15 and 16 years old, is a major turning point for adolescents in Finland. Many face multiple individual and social challenges in different life domains simultaneously because of changes in their cognitive development, biological maturation, evolving sexuality, and social relationships (e.g., Denham et al., 2009). They are also expected to make critical educational choices regarding an academic versus vocational track. Many adolescents experience this period of life as stressful. Indeed, an alarming number of teens (30%–40%) report that they are constantly stressed or depressed (American Psychological Association [APA], 2014; Organization for Economic Co-operation and Development [OECD], 2017). Heightened stress levels also increase the risk of depression and vice versa (Salmela-Aro et al., 2009; Tóth-Király et al., 2021). At the same time, studies (Polanczyk et al., 2015; Shore et al., 2018) have shown that there is substantial individual variation in stress and depressive symptoms. These findings call for an examination of the antecedents and individual differences in these symptoms. An enhanced understanding of these mechanisms could provide means for the early identification of adolescents with a risk of psychological symptoms that might benefit from preventive interventions. The aim of the current study is twofold. It aims to explore, first, what kind of profiles of adolescent stress and depressive symptoms can be found before the critical educational transition and, second, how these profiles differ regarding the development of psychological flexibility.

1.1 | The role of psychological flexibility in stress and depression in adolescents

One example of core psychological processes that are assumed to play a crucial role in mental health is *psychological flexibility*. The theoretical background of psychological flexibility as a concept is rooted in acceptance and commitment therapy (ACT), a third-wave cognitive behavioral therapy approach (Hayes et al., 1999; see also Hayes et al., 2006). Psychological flexibility refers to the ability to constructively handle thoughts and emotional reactions and to come into full contact with these ongoing experiences, whether they are unpleasant or not, while consciously choosing to act and engage in a meaningful life (Hayes et al., 2012). This ability can be perceived as consisting of a broad set of developing and learnable skills, including mindfulness and acceptance, and the clarification of personal values, as well as concrete actions based on those values (Hayes et al., 2012). The ACT approach proposes that diverse psychological symptoms are associated with each other, and they are also connected with psychological flexibility, which has been found to be a common mediator of psychological change (Ren et al., 2019; Stockton et al., 2019). Thus, this view suggests that psychological symptoms have common roots in individual psychological processes and skills (Hayes & Hofmann, 2017; Hayes et al., 2012). In their process-based approach, Hofmann and Hayes (2019) present the core evidence-based processes to alleviate the suffering and promote the psychological well-being of individuals (see also Hayes & Hofmann, 2021). Recently, related constructs have been used also within the neuropsychological literature. Psychological flexibility has been associated, for example, with executive function capacities and the self-management skills used in psychological processes driven by emotions (Allen et al., 2019; Nigg, 2017). There is also abundant research in the fields of emotion regulation, mindfulness and acceptance processes, developmental psychology, personality, and neuropsychology that underlines the value of psychological flexibility (Kashdan & Rottenberg, 2010).

Previous studies with adults have consistently shown the connections between psychological flexibility and well-being (A-Tjak et al., 2015; Flaxman et al., 2013; Kashdan & Rottenberg, 2010) and have indicated that psychological flexibility-interventions are effective in the treatment of diverse psychological conditions, including stress, depression, and anxiety (Powers et al., 2009). Results of previous, but still rare, intervention studies also support the notion of a close connection between psychological flexibility and well-being in adolescents (Halliburton & Cooper, 2015; Swain et al., 2015). The links between stress, depression, and psychological flexibility were demonstrated in an intervention study of adolescents (aged 12–18 years old) in Sweden and Australia by Livheim et al. (2015). Similarly, Lappalainen et al. (2021) found a link between psychological flexibility and depression in an intervention study of 15-year-old adolescents in Finland.

Although numerous intervention studies have demonstrated the links between psychological flexibility and well-being, very few have examined the related associations in community samples of adolescents (Doorley et al., 2020). Many previous studies have also shown that heightened psychological stress levels tend to increase the risk of depression (Hammen, 2015; Salmela-Aro et al., 2009), whereas other studies have shown reciprocal links between prolonged and severe stress and depressive symptoms (Liu & Alloy, 2010; Tóth-Király et al., 2021). Thus, it is an unsolved question why some people become stressed or depressed and in which order. To the best of our knowledge, no previous studies have investigated adolescents' and their diverse profiles based on both symptoms of stress and depression and their association with psychological flexibility.

1.2 | Developmental profiles of stress and depressive symptoms in adolescents

Shore et al. (2018) recently conducted a systematic review and meta-analysis that included 20 longitudinal studies focusing on the trajectories of adolescents with depressive symptoms and their predictors and found multiple heterogeneous trends.

Higher stress reactivity was among the most important individual factors that differentiated adolescents with higher and lower depressive symptoms over time. Herbison et al. (2015) examined the role of stress events in adolescence and observed that the number of stress events predicted membership in profiles with high depression and anxiety in early adulthood (see also Ge et al., 1994; Meadows et al., 2006). Chaiton et al. (2013) reported that adolescents with diverse profiles of depressive symptoms differed from each other in terms of experienced stress. Previous research suggests, therefore, that heightened stress symptoms are related to profiles characterized by high depressive symptoms. However, as far as we know, no study has yet investigated the simultaneous profiles of stress and depressive symptoms in the 15-to-16-year-old adolescent population before the critical educational transition.

1.3 | The current study

Previous studies have proposed that symptoms of stress and depression are reciprocally linked, especially in the case of prolonged and severe stress in life (Liu & Alloy, 2010; Salmela-Aro et al., 2009; Tóth-Király et al., 2021). Childhood symptoms of prolonged stress and depression are known to be signs of later risk of mental disorders (Lee et al., 2014; Lewis et al., 2016). It is crucial, therefore, to explore adolescents' coping mechanisms and resilience—that is, skills related to psychological flexibility—and the role they play in the development of symptoms of stress and depression. The concurrent assessment of symptoms of stress and depression validates the assumptions based on ACT approach, which claims that psychological flexibility and changes in it are reversely related to different psychological symptoms and changes in them (Hayes & Hofmann, 2017; S. C. Hayes et al., 2012). Notably, the assumption is also supported in the current neuropsychological approaches (de Kloet et al., 2019; Yang et al., 2015). To overcome the limitations of previous research and provide a novel understanding of the combined profiles of stress and depressive symptoms and their associations with adolescents' psychological flexibility during the final grade of basic education, this study investigated the following research questions.

Q1: What kind of profiles can be identified based on *levels of and changes in symptoms of stress and depression* from ninth grade fall to ninth grade spring?

In line with the earlier studies presented above, we expected (*Hypothesis 1*) to find diverse subgroups (e.g., Shore et al., 2018) showing high to low levels of symptoms of depression that demonstrate increasing, decreasing, or stable patterns of change. Based on the findings of Shore et al. (2018) and the ACT approach (Dindo et al., 2017; Hayes & Hofmann, 2017), we also expected that the developmental patterns (i.e., initial levels and changes of symptoms) of stress within the profiles would be similar to those of depressive symptoms.

Q2: Do the adolescents with different profiles of stress and depressive symptoms during ninth grade differ from one another in terms of *their initial levels of psychological flexibility*?

Based on the theoretical view of ACT (e.g., Dindo et al., 2017; Hayes & Hofmann, 2017; Hayes et al., 2012), we expected to find (*Hypothesis 2*) that adolescents with profiles with an initially higher level of symptoms of stress and depression would also have a lower initial level of psychological flexibility than adolescents without symptoms at the initial level.

Q3: How are *changes in symptoms associated with changes in psychological flexibility within* the identified profiles?

Based on the results of previous intervention studies (e.g., Livheim et al., 2015; Puolakanaho et al., 2019) and ACT views (e.g., Dindo et al., 2017; Hayes & Hofmann, 2017; Hayes et al., 2012), we also propose (*Hypothesis 3*). that the profiles showing decreases in stress and depression indicate an increasing trend in psychological flexibility. At the same time, we propose an opposite trend between these constructs and, therefore, also predict that profiles showing increases in stress and depression indicate a decreasing trend in psychological flexibility.

2 | METHODS

2.1 | Participants and the study design

This study is part of a broader longitudinal research project that aims to provide research-based information on the individual and environment-related factors that promote learning, well-being, and successful educational transitions. The project has followed a community sample of students (N = ~900, here called the "basic sample") through their transition from

primary school to lower secondary school in two medium-sized towns in central Finland with a combined population of 130,000. In one of the towns, all lower secondary schools were recruited for the study, whereas in the other town, the participating schools covered approximately 75% of the targeted age group. The ninth-grade students came from 59 classes in 13 schools. This study was conducted in compliance with APA ethical standards. Informed consent was obtained from both the adolescents and their parents, and the study was approved by the Ethics Committee of the University of Jyväskylä.

A subsample of students from the basic sample was selected for the present study. Of the adolescents in the basic sample, 249 participated in an ACT intervention during the fall semester (see Puolakanaho et al., 2019) and, thus, were not included, which left 740 participants in the current study. Of the participants, 57% were female, and 43% were male, with a mean age of 15.7 years old (standard deviations [SD] 39). The mother tongue of most of the participants (97%) was Finnish, and most of the adolescents (71%) lived in two-parent households. Baseline demographic and sample characteristics are provided in Table 1.

The educational levels of the participants' mothers and the family structures of the participants in the sample were compared to those of the general Finnish population. In comparison with same-age women in Finland (Official Statistics of Finland, 2018a), the sample included fewer mothers with vocational upper-secondary education or lower and more mothers with a bachelor's degree or higher. This suggests that the mothers of the participating adolescents were slightly more educated than the national average for women of the same age. Compared to all Finnish families with children under the age of 18 (Official Statistics of Finland, 2018b), two-parent families were somewhat overrepresented, and single-parent households were underrepresented in the study sample.

2.2 | Measurement points

Two assessments took place. The first (Time 1) occurred at the start of the school year (September and October), and the second (Time 2) at the end of the school year (February–May). Participants were invited to complete a range of demographic questions during Time 1. Adolescents' symptoms of stress and depression, and psychological flexibility were assessed with questionnaires during Times 1 and 2.

TABLE 1 Sample characteristics in the study.

	All ($n = 740$)	Female group ($n = 413$)	Male group ($n = 304$)
Participants (%)	100%	57%	43%
Age *M* (SD)	15.74 (.38)	15.72 (.33)	15.77 (.44)
Mother tongue			
Finnish	656 (96.5%)	379 (96.4%)	277 (87.9%)
Language other than Finnish	16 (2.4%)	8 (2.0%)	8 (2.8%)
Bilingual (Finnish + another language)	8 (1.2%)	6 (1.5%)	2 (0.7%)
Missing information	60	32	28
Living with			
Mother and father	484 (70.9%)	267 (67.6%)	217 (75.3%)
Mother or father	69 (10.1%)	42 (10.6%)	27 (9.4%)
Alternately with mother and father	67 (9.8%)	42 (10.6%)	25 (8.7%)
Other[a]	63 (9.2%)	44 (11.1%)	19 (6.6%)
Missing information	57	30	27
Parental education			
Mother: A/B/C (%)[b]		35/22/44 (%)	32/21/47 (%)
Missing cases[3]		107	81
Father: A/B/C (%)[b]		49/16/35 (%)	46/16/38 (%)
Missing cases		176	130

[a]Living with mother and stepfather, with father and stepmother, in foster care, or an approved home.

[b]Parental education level: A, vocational upper secondary education or lower; B, vocational college degree, C, bachelor's degree or higher.

2.3 | Measures

2.3.1 | Symptoms of stress

Symptoms of stress were assessed using a single-item stress measure and its original instruction form (Elo et al., 2003). The general definition of stress was first explained to the participants in written form: "Stress refers to a situation in which people feel tense, restless, nervous, or anxious and have difficulties sleeping due to the things wandering in their mind." Using a 6-point scale (1 = *not at all*, 2 = *only a little*, 3 = *to some extent*, 4 = *quite a bit*, 5 = *a lot*, and 6 = *very much*), the participants were asked to answer the following question: "Do you feel this kind of stress at the moment?" The test–retest reliability was 79. The validation study by Elo et al. (2003) showed that the single-item stress measure is closely connected to other measures of stress and to psychological symptoms and sleep disturbances, which can be considered as early signs of stress. The findings are in line with other studies using adult samples (e.g., Hayward et al., 2012; Littman et al., 2006) and adolescents (Kirbiš & Tement, 2014; Puolakanaho et al., 2019).

2.3.2 | Symptoms of depression

To measure depressive symptoms, adolescents completed the depression scale (DEPS; Salokangas et al., 1995). This instrument consists of 10 self-reported items describing depressive symptoms during the past month (e.g., "I feel sad," "I feel that my future is hopeless"). The responses of the DEPS range from 0 (not at all) to 3 (very much). Sum scores were calculated across the 10 questions to measure the adolescents' depressive symptoms (range of scale: 0–30). Higher scores on the DEPS correspond to more depressive symptoms. Salokangas et al. (1995) reported that a cut-off score of 9 or higher correctly identified 85% of depression cases and that the percentage of correctly diagnosed clinical depression cases was 74%. In the present study, Cronbach's α reliability coefficient was 95 for Times 1 and 2.

2.3.3 | Psychological flexibility

The Avoidance and Fusion Questionnaire for Youth (AFQ-Y8; Greco et al., 2008) is a measure assessing psychological inflexibility. The 8-item short version of the AFQ-Y used in the present study was validated by Greco et al. (2008). Livheim et al. (2016) and García-Rubio et al. (2020) argued that the short form of the measure reliably assesses adolescents' ACT processes. While measures of symptoms of stress and depression (DEPS) ask participants to report how much or how often they experience symptoms (such as "I feel sad"), the AFQ asks participants to report how they deal with these emotional reactions or symptoms. Sample items include questions such as "My life won't be good until I feel happy" and "I must get rid of my worries and fears so I can have a good life." The questions are evaluated using a 5-point Likert scale with responses ranging from 0 (not true at all) to 4 (very true). The total score is derived by summing the responses, yielding a total possible score of 32. The Cronbach's α for this sample was 90 for Time 1 and 87 for Time 2. For our study, the original scores were reversed to provide a measure of psychological flexibility. (On using a reversed scale to assess psychological flexibility, see Williams et al., 2012; for a definition of psychological flexibility vs. inflexibility, see Hayes et al., 2012.)

2.4 | Statistical analysis

First, descriptive statistics, that is, the general levels of all study constructs, their correlations with each other at Times 1 and 2, and the differences between the genders (two-tailed *t* test scores) in the measures were explored using IBM SPSS Statistics 24. Second, we used the growth mixture modeling (GMM) technique (McArdle & Nesselroade, 2013; Muthén & Muthén, 1998–2015) in Mplus to identify combined profiles of symptoms of stress and depression. GMM is a probabilistic method in which the relative position of an individual at each time is modeled as a function of an underlying growth process. It is a longitudinal analysis technique used to estimate growth latent variables, called intercepts and slopes (here named "levels" and "changes," respectively, in this paper). During the analyses, each individual had their own values in terms of these variables, and they could be categorized into underlying latent classes (here named "profiles"; McArdle & Nesselroade, 2003).

The GMM analyses were carried out in the three following steps: (1) a latent growth model (LGM) was conducted for the whole sample; (2) mixture analyses were used to identify the different number of latent profiles based on the mean of levels and changes in symptoms of stress and depression; and (3) the identified latent profiles were compared in terms of the adolescents' levels of and changes in psychological flexibility. In the model used, the mean level and change values were freely estimated, but the covariances and variances were set as equal for each profile. Because the data in the current study were drawn from only two measurement phases, the residuals of the measures were fixed at zero, which enabled us to use GMM to

model linear changes across two measurement points (Kiuru et al., 2008). Finally, the profiles were interpreted and named based on the means of the latent variables (levels and changes).

We also considered the interpretability of the profiles to ensure that they would make theoretical sense. For reasons of parsimony, solutions with too many latent profiles were avoided; thus, we considered a maximum of six profiles. Different models were explored and evaluated using statistical indicators; the Vuong–Lo–Mendell–Rubin likelihood test (VLMR) and the Bootstrap likelihood ratio test (BLRT) were performed to evaluate the k profile solution compared with the $k - 1$ profile solution. For these tests, a significant result suggested the superiority of a model over a model with one less profile in it. A better fit was also indicated by low values for the Akaike information criterion (AIC) and the sample size-adjusted Bayesian information criterion (BIC). Entropy was used to measure the accuracy of the classification, with higher values of entropy indicating a better classification.

In the final step, we examined whether the distinct latent profiles differed in terms of the external measures—that is, in the *initial levels of and changes in psychological flexibility*. The *levels* of the measures *were defined as observed values at Time 1, while change scores were defined by subtracting the Time 1 scores from the Time 2 scores*. The analyses of this phase were conducted using a three-step method with the auxiliary command "DU3STEP" in Mplus (Muthén & Muthén, 1998–2015). This method uses the information of the most likely classes obtained in the GMM analyses and takes into account the measurement error in them when the auxiliary variables are included in the analysis. The three-step method was used for the external variables (here, levels of and changes in psychological flexibility), and they were treated as distal outcomes with unequal means and variances. In the case of gender, the variable was treated as a distal outcome with equal variances (Muthén & Muthén, 1998–2015).

The overall differences between the latent profiles and their levels and changes were evaluated using the Wald test. The pairwise comparisons were explored using latent variables and linear modeling. The overall differences between the profiles and external measures were evaluated using χ^2 tests, as were the pairwise comparisons between external measures. All analyses were conducted in Mplus version 8.4 (Muthén & Muthén, 1998–2015). All analyses included the selected 740 participants, with only a few missing values taken into consideration with full-information maximum likelihood (FIML) estimation, which accounts for missing values at random (MAR) and included all the available data. The minimum covariance coverage matrix value was 918 for a pair of variables.

3 | RESULTS

3.1 | Descriptive statistics

Descriptive statistics were investigated first for the full sample ($n = 740$). The mean (M) scores and SDs, as well the correlations between measures at Times 1 and 2, are presented in Table 2.

3.2 | Developmental profiles based on stress and depressive symptoms

First, we were interested in whether developmental profiles can be identified based on levels of and changes in symptoms of stress and depression among adolescents. Both the solutions with four and five profiles fitted the data (see Table 3 for the fit measures). The solution with four profiles was chosen as the final model because it was interpretable, the latent group sizes were large enough, and the goodness-of-fit indices unanimously suggested that four profiles were sufficient.

Figure 1 illustrates the four profiles of the final GMM based on the levels of and changes in symptoms of stress and depression between Times 1 and 2. These combined profiles of stress and depressive symptoms were labeled as follows: *no stress and no depressive symptoms (None; n* = 513, 69% of all participants); *mild and decreasing stress and depressive symptoms (Decreasing*; $n = 110$, 15%*); low and increasing stress and depressive symptoms (Increasing*; $n = 42$, 6%); and *high and stable levels of stress and depressive symptoms* (*High*; $n = 75$, 10%). Notably, males were overrepresented in the None and Increasing profiles ($\chi^2[3] = 39.02$; $p < .001$). However, an additional analysis showed that gender did not moderate the associations between profiles and initial level of psychological flexibility [Wald ($df = 3$) = 3.80, $p = .284$], and changes in psychological flexibility [Wald ($df = 3$) = 3.62, $p = .362$].

The results (Table 4) indicated that adolescents' initial levels of symptoms of both stress ($\chi^2[3] = 188.68$; $p < .001$) and depression ($\chi^2[3] = 999.11$; $p < .001$) in the four groups differed from each other. Changes in symptoms of depression also showed significantly different change directions in the four profile groups ($\chi^2[3] = 100.54$; $p < .001$) between Times 1 and 2 (see Figure 1). The initial levels of stress and depressive symptoms followed each other in a constant manner: the higher the stress, the higher the depression, and vice versa. While in the None, Decreasing, and Increasing profiles, the developmental patterns of stress and depression followed each other, statistically significant changes were noticed only in depression. As Table 4 indicates, the changes in symptoms of depression in the Decreasing and Increasing profile groups were larger than

TABLE 2 Means, standard deviations, and pearson correlations of the study constructs.

	M	SD	*n*	Min–max	1	2	3	4	5	6	Gender
Symptoms											
1. Stress T1	3.08	1.39	717	1–6							
2. Stress T2	3.25	1.43	700	1–6	.65**						
3. Depressive symptoms T1	6.59	7.32	717	0–30	.63**	.52**					
4. Depressive symptoms T2	7.32	7.61	706	0–30	.46**	.59**	.67**				
Psychological flexibility											
5. Psychological flexibility T1	23.91	6.35	717	0–32	−.54**	−.45**	−.74**	−.56**			
6. Psychological flexibility T2	22.51	6.42	708	0–32	−.37**	−.47**	−.48**	−.62**	.58**		
Gender	1.43	0.49	740	1 = female 2 = male	−.26**	−.31**	−.27**	−.19**	.19**	.04	.17**

Note. T1 = Time 1, T2 = Time 2.
*$p < .05$; **$p < .01$.

TABLE 3 The fit measures of the 2-, 3-, 4-, and 5- latent profile models.

Number of profiles (number of adolescents in each profile)	AIC	BIC	BLRT (*p*)	VLMR (*p*)	Entropy	Classification probabilities
1 (740)	13472.940	13537.433				
2 (613; 127)	13157.478	13245.004	.0000	.0000	.921	.989, .932
3 (118; 61; 651)	13043.502	13154.061	.0000	.3980	.900	.839, .918, .984
4 (42; 513; 110; 75)	**12918.212**	**13051.804**	**.0000**	**.0099**	**.897**	**.824, .975, .840, .975**
5 (33; 25; 132; 459; 91)	12852.159	13008.785	.0000	.0161	.900	.928, .822, .854, .968, .943

Note. Sample sizes $n = 740$; Results are based on symptoms of both stress and depression measured at T1 and T2 using GMM in Mplus. The fit information supporting the chosen solution is bolded.

Abbreviations: AIC, Akaike information criterion; BIC, Bayesian information criterion; BLRT, bootstrap likelihood ratio test; Entropy, accuracy of overall the classification.GMM, growth mixture modeling; VLMR, Vuong–Lo–Mendell–Rubing likelihood ratio test.

the changes in the two other profiles, but the direction of the changes in these profiles was opposite (Figure 1). The increase of symptoms of depression in the Increasing profile group was particularly large.

3.3 | Profile differences in initial level of psychological flexibility

The overall model results (Table 4) showed that the adolescents in all four profiles differed from one another significantly at their initial level of psychological flexibility ($\chi^2[3] = 419.48$; $p < .001$) at Time 1. The pairwise comparisons also indicated that the four profiles differed from one another ($p < .01$) in terms of initial psychological flexibility. Adolescents in the High profile ($M = 12.8$) had the lowest psychological flexibility, followed by those in the Decreasing ($M = 19.0$) profile. By comparison, adolescents in the Increasing ($M = 24.3$) and None profiles ($M = 26.6$) had the highest psychological flexibility (see Table 4). The results were consistent with Hypothesis 2.

3.4 | Associations between changes in symptoms and psychological flexibility within the profiles

The overall model results (Table 4) indicated that adolescents in all four profiles differed significantly from one another with regard to changes in psychological flexibility skills ($\chi^2[3] = 60.29$; $p < .001$) during ninth grade. The pairwise comparisons showed that the four profiles differed from one another ($p < .01$) in most of the change scores, except in ($p > .05$) psychological flexibility change scores between profiles Decreasing and High.

As Table 4 illustrates, the most prominent change occurred in the Increasing profile, which showed a significant decrease in psychological flexibility ($M = -9.02$) followed by decreases in None ($M = -1.56$). An opposite trend—that is, a significant

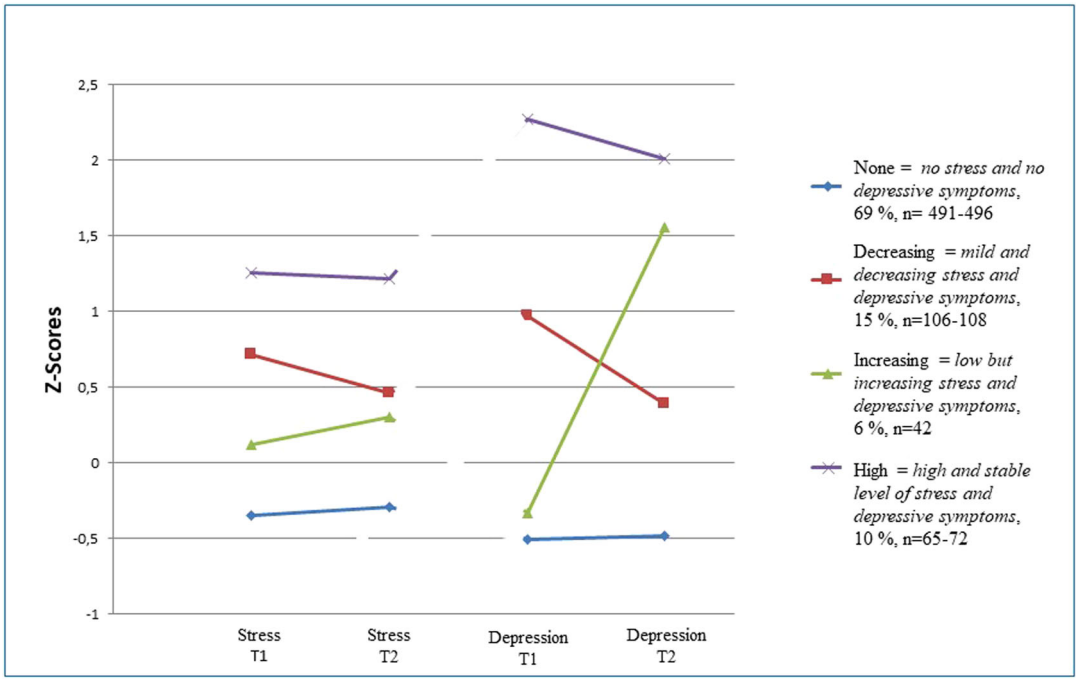

FIGURE 1 Profiles based on stress and depressive symptoms at Times 1 and 2. The lines represent adolescents and their symptoms of stress and depression at two time points (T1 and T2) in the four profiles. Symptoms are illustrated using *Z*-scores (averaged across the study sample, $n = 740$) and post hoc classification results in GMM. GMM, growth mixture modeling. [Color figure can be viewed at wileyonlinelibrary.com]

increase—was displayed in psychological flexibility in the Decreasing ($M = 0.69$) and High ($M = 1.48$) profiles. Notably, in the Increasing and the None profiles, symptoms of stress and depression increased, while in the Decreasing and the High profiles, symptoms decreased over the same period. The results confirmed the set hypotheses. Figure 2 illustrates the simultaneous, although reverse changes in psychological flexibility and symptoms of stress and depression in the Increasing and Decreasing profiles, in which the change trends of the study constructs were most prominent.

4 | DISCUSSION

During the past few decades, a significant number of studies have explored psychological flexibility and its connections to well-being using clinical samples and intervention designs. However, surprisingly little is known about the development of psychological flexibility, individual differences, and their associations with well-being (Doorley et al., 2020). The analyses in this paper indicated that the 15-to-16-year-old adolescents ($n = 740$), who were assessed during their final comprehensive school year, could be categorized into four profiles based on their developmental patterns of stress and depressive symptoms. The profiles differed from each other in terms of the level of the symptoms as well as change trends during the school year. As anticipated, the findings indicated that adolescents in the profiles indicating decreases in stress and depression showed simultaneous increases in psychological flexibility. However, an opposite trend was also observed as a minority of adolescents showed a rapid increase in symptoms of depression accompanied by a simultaneous decrease in psychological flexibility. The findings showed that both the level of and changes in psychological flexibility skills are closely connected (although in a reversed manner) with the level and change patterns of symptoms of depression. The antecedents of these changes should be studied more closely in the future.

While it has been argued that stress and depression may have similar origins, this relationship has rarely been explicitly examined in studies. In the current paper, adolescents were divided into the four following profiles based on their levels of and changes in symptoms of both stress and depression: *no stress and no depressive symptoms* (None); *mild and decreasing stress and depressive symptoms* (Decreasing); *low and increasing stress and depressive symptoms* (Increasing); and *stable and high levels of stress and depressive symptoms* (High). The developmental patterns of stress and depression (initial level and changes) followed each other in a constant manner in the None, Decreasing, and Increasing profiles, but statistically significant changes were noticed only in depression. In the Increasing profile, there was a significant increase in the adolescents' depressive symptoms over time, and in the Decreasing profile, there was a significant decrease.

TABLE 4 Test Results of the differences between profiles.

Profiles		1. None *M* (SE)	2. Decreasing *M* (SE)	3. Increasing *M* (SE)	4. High*M* (SE)	Overall model			Pairwise comparisons
n (%)		513 (69)	110 (15)	42 (6)	75 (10)				
Symptoms of stress and depression						*Wald*	*df*	*p*	
Stress T1		2.59 (0.08)	4.08 (0.17)	3.15 (0.23)	4.81 (0.16)	188.68	3	.000	4 > 2 > 3 > 1
Depressive symptoms T1		2.87 (0.24)	13.59 (1.22)	4.07 (0.81)	23.22 (0.68)	999.11	3	.000	4 > 2 > 3 > 1
Stress change	(T2–T1)	0.22 (0.06)	−0.14 (0.16)	0.52 (0.27)	0.24 (0.14)	6.094	3	ns	
Depressive symptoms change	(T2–T1)	0.75 (0.26)	−3.27 (1.03)	14.82 (2.22)	−0.36 (1.22)	100.54	3	.000	3 > 2, 3 > 4
Note: The four profiles differed from each other in all the symptom scores above, except in stress change scores between the profiles, initial depressive symptom scores between Decreasing and High, and depressive symptom change scores between None and High and between Decreasing and High.									
Psychological flexibility						χ^2	*df*	*p*	Pairwise comparisons
Psychological flexibility T1		26.6 (0.21)	19.0 (0.50)	24.3 (0.76)	12.8 (0.87)	419.48	3	.000	1 > 3 > 2 > 4
Psychological flexibility-change	(T2–T1)	−1.56 (0.32)	0.69 (0.61)	−9.02 (1.45)	1.48 (0.87)	60.29	3	.000	4,2 > 1 > 3
Note: The four profiles differed from each other in most of the psychological flexibility measures above, except in psychological flexibility change scores between Decreasing and High.									
1 = Female, 2 = Male		1.49 (0.02)	1.23 (0.02)	1.49 (0.02)	1.24 (0.05)	39.02	3	.000	1,3 > 2,4
Female, *n*/Male, *n*		264/249[a]	82/28[b]	22/20	57/18[b]				

[a]In the None profile, there were more males than expected.

[b]In the Decreasing and High groups, there were fewer males than expected. An additional analysis showed that gender did not moderate the associations between profiles and psychological flexibility.

Note: The profiles were defined by the mean levels of the latent variables and the mean changes in them based on symptoms of stress and depression. The initial level of the psychological flexibility was defined as an observed value at Time 1, while the change score was defined by subtracting the Time 1 score from the Time 2 score. The scores above represent mean initial score and mean change score (*M*) values and their standard error (SE) values in each profile, based on the results of the GMM analyses. Profiles: None = *no stress and no depressive symptoms*, Decreasing = *mild and decreasing stress and depressive symptoms*, Increasing = *low but increasing stress and depressive symptoms*, High = *high and stable level of stress and depressive symptoms*.

In their large-scale study based solely on the depressive symptoms of 12-to-16-year-old adolescents, Brière et al. (2015) identified five distinct profiles, four of which (stable-low, increasing, decreasing, and stable-high) resemble the profiles found in our study. The results of the current study, therefore, provide restricted support for the indications that symptoms of stress and depression are reciprocally linked (Liu & Alloy, 2010; Salmela-Aro et al., 2009; Tóth-Király et al., 2021). The findings also give some support for ACT views (e.g., Hayes & Hofmann, 2017) and recent neurobiological research that suggests that the mechanisms underlying stress and depression may be similar. This similarity would be interesting to study further using modern neurobiological tools (e.g., de Kloet et al., 2019; Yang et al., 2015) and longer follow-up designs.

A positive finding in the current study was that the majority of the adolescents (84%) felt psychologically well and fell into the None or Decreasing profiles at the end of the school year, while in their initial state, only 75% showed signs of well-being. The amount is comparable to results from a large etiologic longitudinal study by Costello et al. (2008) that examined developmental profiles of depression in adolescents. By contrast, more than 20% of the adolescents showed significant changes in their well-being (in the Decreasing and Increasing groups) during the school year, a trend that has also been observed in earlier studies. For example, Brière et al. (2015) showed that 20% of adolescents belonged to nonlinear depression-based profiles (see also other studies cited in Shore et al., 2018). In the current study, stable experiences of ill-being were observed for 10% of participants in the profiles with the highest degree of stress and depressive symptoms (High). Based on the normative data of the depression scale used (DEPS; Salokangas et al., 1995), the results mean that more than half of the adolescents belonging to the High group (i.e., more than 37 adolescents) had clinically significant symptoms of

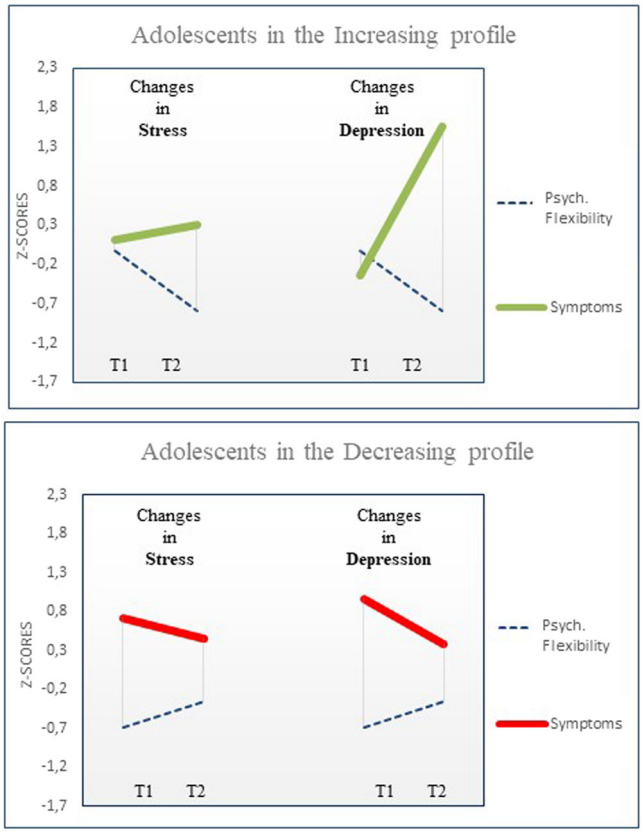

FIGURE 2 Simultaneous change trends in symptoms and psychological flexibility. These figures illustrate simultaneously the reverse change trends between symptoms of stress and depression and psychological flexibility in two profiles: When symptoms decreased (Decreasing), psychological flexibility increased, and when symptoms increased (Increasing), psychological flexibility decreased. The figures also illustrate that the developmental patterns of stress and depressive symptoms were similar within profiles. The lines represent mean values of *Z*-scores (averaged across the study sample using SPSS, $n = 740$ with some missing values; see Table 2) in two profiles at Time 1 (T1) and Time 2 (T2) based on post hoc results from GMM analyses. Decreasing = *mild and decreasing stress and depressive symptoms;* Increasing = *low but increasing stress and depressive symptoms*. GMM, growth mixture modeling. [Color figure can be viewed at wileyonlinelibrary.com]

depression. Based on the short follow-up of the current study, we assume that the symptoms of these adolescents would not diminish without specific actions, such as aid provided by an intervention.

In the second step, we examined whether the adolescents in the four profiles differed from one another in terms of their initial levels of psychological flexibility. We found that adolescents in profiles with no stress or depression (None) or with low symptoms at the beginning of the study (Increasing) had higher initial psychological flexibility skills than adolescents in profiles with more symptoms of stress and depression (Decreasing and High) in the initial measurement phase. Thus, the initial level of adolescents' psychological flexibility was closely connected to the initial level of their symptoms of stress and depression. The results were consistent with the set hypothesis and suggested that psychological flexibility skills were closely connected to adolescents' experiences of stress and depression when they were assessed at the same time.

We also examined how changes in psychological flexibility were connected to changes in well-being demonstrated in the four profiles. The results demonstrated that profiles showing increasing trends of symptoms (noticed in the Increasing and, to a lesser extent, None profiles) were connected to decreasing psychological flexibility. However, profiles illustrating decreasing trends of symptoms (observed in the Decreasing and, to a lesser extent, High profiles) were connected to a pattern of increasing psychological flexibility (shown in Figure 2). In other words, developmental skills related to psychological flexibility may increase or decrease in relation to changes in well-being, with these changes occurring in opposite directions. The findings are consistent with intervention studies that have argued for connections between enhanced psychological flexibility and decreased stress (Livheim et al., 2015; Puolakanaho et al., 2019) and depression (Lappalainen et al., 2021; Livheim et al., 2015). They are also consistent with a study by Williams et al. (2012), showing that adolescents differ in their developmental paths of psychological flexibility. The findings also fit well with the ACT view of a close connection between psychological flexibility and diverse well-being outcomes (Flaxman et al., 2013; Hayes et al., 2012; Hofmann & Hayes, 2019). However, as far as we are aware, this bidirectional developmental pattern of relationships between psychological flexibility and psychological symptoms has not been previously studied.

The initial level of symptoms and change trends in the Increasing and Decreasing profiles are worth examining in more detail. In the Increasing profile, in the initial phase, the adolescents demonstrated low symptoms of depression and stress. Unexpectedly, the adolescents in this group showed a substantial increase in depressive symptoms toward the end of the school year. These adolescents also initially demonstrated high psychological flexibility skills, nearly as good as those with adolescents with no symptoms (profile None). The other unexpected finding was a decreasing trend regarding the symptoms in participants in the Decreasing profile. While at the beginning of the study, the adolescents in this profile had lower scores in psychological flexibility than participants in the Increasing and None profiles and higher scores in both stress and depression, they showed a decrease in symptoms over time. These findings suggest that there may be reasons other than initial psychological flexibility for the development of stress and depression. From an ACT viewpoint, these patterns of findings may point to contextual factors (Hayes et al., 2012; Hofmann & Hayes, 2019; Williams et al., 2008), such as school demands and changes in family and peer relations. Such factors may have challenged the participants' individual skills related to psychological flexibility and led to the increased depressive symptoms seen in the Increasing profile. In other words, some adolescents may not apply their initially high levels of flexibility skills in challenging life situations. However, a reverse pattern is also possible: contextual support may lead to decreased symptoms (observed in the Decreasing profile; see Williams et al., 2020).

An important consideration is why some people become stressed or depressed and in which order. This question has been raised in relation to modern stress theories and in research findings (e.g., de Kloet et al., 2019; C. Hammen, 2016; Yang et al., 2015). However, psychological flexibility, meaning the acceptance of and openness to experience, and other emotion regulation processes have also been found to be associated with executive functioning (DeYoung et al., 2005; Kalisch et al., 2005; Ochsner & Gross, 2008). For example, neuroimaging studies have found that people who exhibit less openness and receptivity to ongoing thoughts and feelings show activation in the limbic system when they label thoughts and feelings as either negative or positive (Creswell et al., 2007). In contrast, people who are high in mindfulness (i.e., observe their thoughts and feelings in an open and curious manner) exhibit a different pattern in limbic system structures. The present study can also be linked with recent views on neurocognitive deficits and "the hot executive functions" linked to the self-management skills used in psychological processes driven by emotions (Allen et al., 2019; Nigg, 2017). It is possible that these functions form elementary underlying processes influencing adolescents' acquisition of psychological flexibility. In the future, integrative approaches exploring psychological flexibility and self-regulation are needed to increase knowledge about the health- and risk-related psychological development of adolescents.

The results in the current paper are based on a person-centered study approach, which allowed for the identification of diverse developmental patterns of 15-to-16-year-old adolescents. The analyses showed that both the levels of and changes in adolescents' experiences of well-being can vary considerably. The person-centered approach also enabled the discovery of bidirectional relations between changes in symptoms of stress and depression and psychological flexibility. These findings were more convincing because the expected change patterns were found to occur simultaneously in the four explored profiles. However, the findings also highlighted unexpected change patterns in profiles, drawing attention to the need for further studies to examine the developmental patterns and antecedents of well- and ill-being more thoroughly. The findings corroborate recent research proposals that have called for the use of study methods other than variable-centered methods to enhance the understanding of variability in the explored issues (e.g., Hofmann & Hayes, 2019; Nolen-Hoeksema & Watkins, 2011).

4.1 | Practical implications of the study

The findings of our study suggest that psychological flexibility could be a promising means of recognizing and supporting adolescents' individual ways of reacting to and coping with everyday challenges and stress (see also Dawson & Golijani-Moghaddam, 2020). Our results corroborate the abovementioned findings and suggest that adolescents with initial stress or depression scores that are one SD above the normal range for their age are at high risk of the continuation of psychological symptoms (observed in the High profile). These cases can be identified using standardized measures. However, there are also adolescents who are difficult to identify (Increasing) at the beginning of the school year, which underscores the need for additional screening later in the school path.

To prevent health problems, intervention programs with the aim of improving psychological flexibility could be targeted to adolescents at risk of ill-being. Fortunately, recent brief intervention programs (studies) for youth have shown that psychological flexibility skills can be learned to enhance well-being and decrease stress (Livheim et al., 2015; Puolakanaho et al., 2019) and depression (Lappalainen et al., 2021; Petts et al., 2017). This instruction may occur through relatively short training programs and practices (Ciarrochi et al., 2012; L. L. Hayes & Ciarrochi, 2015), in the school context (Burckhardt et al., 2016), or independently, using self-help web- or mobile-based programs (Puolakanaho et al., 2019). In addition, the positive results of such training in adolescents are not restricted to stress and depression but may influence a variety of symptoms (Halliburton & Cooper, 2015; Swain et al., 2015). In line with these findings, recent ACT theoretical views have

emphasized that psychological flexibility skills reflect core psychological skills, which can be applied to enhance well-being and decrease various symptoms in any domain of life (Dindo et al., 2017; S. C. Hayes & Hofmann, 2017; Hofmann & Hayes, 2019). It is also relevant to consider how to support the positive continuum of well-being by, for example, using happiness-promoting strategies (Marmarchinia & Zoghi Paidar, 2017). This area of study is important as students with higher happiness have also been found to have better mental health and school performance (Heizomi et al., 2015).

4.2 | Limitations and future directions

All the measures used in the current study were based on adolescents' self-reports. In future studies it would be useful to complement self-reports with observations, interviews, and physiological measures. It would be useful to investigate also the role of other factors than psychological flexibility, such as comorbid psychiatric symptoms, substance use, medication, and problems in peer and parental relationship in adolescents' well-being outcomes.

In addition, in line with previous findings (see e.g., Brière et al., 2015; Herbison et al., 2015; Meadows et al., 2006), we found gender imbalances in the various profiles: the profiles with the most symptoms at the beginning of the year and profiles with a decreasing trend contained more female participants, whereas the profile without stress and depressive symptoms contained more male participants. However, the gender difference did not moderate the associations between profiles and psychological flexibility. In the future, it would be useful to study how early, even neonatal, stress influences later symptoms of stress and depression (Gobinath et al., 2015) and how biological and hormonal differences (Ge et al., 1996) influence gender differences and the emergence of different symptoms of stress and depression (Gobinath et al., 2015). Notably, in the current study the gender was defined using binary male/female option, which is also a limitation in the current study. We recommend that future studies will provide the opportunity to report gender also other than girl or boy.

The measures of psychological flexibility and depression showed good internal consistency and similar associations with the profiles, suggesting that they were reliable and valid measures. Stress was measured using a single-scale measure with satisfactory test-retest reliability (for the validity of the stress measure, see Elo et al., 2003; Puolakanaho et al., 2019), which could possibly also reduce the sensitivity of the scale. It is possible that the instruction of the stress-scale led participants to reflect temporary experiences rather than longer term experiences, which, in turn, might have produced decreased sensitivity and smaller changes in the stress scale compared to changes in the depressive symptoms scale. The results may reflect a developmental pattern for stress and depressive symptoms, but the interaction between these conditions is not yet understood (Liu & Alloy, 2010; Meadows et al., 2006; Salmela-Aro et al., 2009; Tóth-Király et al., 2021). Finally, the sample in the current paper was large enough to be considered representative of Finnish adolescents aged 15 to 16 years old, and the results can be generalized for adolescents living in a similar life context. Because these observations were made based on a large sample of adolescents ($n = 740$) observed in their normal school context, the results have practical implications. However, future studies are needed to confirm the findings with in other educational systems and cultures and with, more heterogeneous samples.

5 | CONCLUSIONS

In the current paper, we showed that adolescents could be categorized into four profiles based on their symptoms of stress and depression. We also demonstrated that the course of psychological flexibility followed the course of symptoms in each profile, though in a reversed manner. The findings corroborate the theoretical views of ACT (Hayes et al., 2012; Hofmann & Hayes, 2019) and suggest that psychological flexibility may protect adolescents from psychological symptoms, such as stress and depression. However, the unexpected changes in symptoms identified in this sample call for new studies to explore youth samples, their developmental patterns, and causal directions of change in depth, and individual and contextual factors affecting well-being. Our findings also support the view that brief interventions aimed at improving psychological flexibility skills are worth pursuing to enhance well-being. Such interventions may be especially important for adolescents who struggle with psychological symptoms and ill-being, although they may also work to prevent psychological symptoms of stress and depression.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author, [AP]. The data are not publicly available due to the fact that we are using data for additional analyses and publications.

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