# Profiles of Anxious and Depressive Symptoms Among Adolescent Boys and Girls: Associations with Coping Strategies

Elizabeth Olivier [1] · Alexandre J. S. Morin[2] · Kristel Tardif-Grenier[3] · Isabelle Archambault[4] · Véronique Dupéré[4] · Corinne Hébert[4]

## Abstract

Most existing studies investigating profiles of anxious and depressive symptoms in adolescent boys and girls do not consider the high cooccurrence between them, which prevents from identifying how heterogeneous groups might distinctly use coping strategies. To address this gap, the current study relies on a sample of 976 adolescents (56.0% girls (n = 547), aged 12–15 y.o., $M = 12.92$, $SD = 0.75$) to identify profiles of self-reported internalizing symptoms while properly disaggregating youth's global levels of internalizing symptoms from their specific levels of anxious and depressive symptoms. The study also assesses whether similar profiles will be identified with the same frequency among boys and girls, as well as the associations between profile membership and coping strategies (problem-solving, social support, cognitive restructuring, cognitive avoidance, and behavioral avoidance) and whether these associations vary between sexes. Bifactor-confirmatory factor analyses confirmed the presence of a global internalizing factor and six specific factors reflecting anxious and depressive symptoms. Latent profile analyses identified three similar profiles among boys and girls but with different prevalence: Low internalizing symptoms (29.97% (n = 164) girls; 70.77% (n = 304) boys), Internalizing and specific anxious symptoms (40.15% (n = 220) girls, 14.75% (n = 63) boys), and Internalizing and specific depressive symptoms (29.86% (n = 163) girls, 14.48% (n = 62) boys). Girls in the Internalizing and specific anxious profile reported more frequent use of four coping strategies compared to boys (problem-solving, social support, cognitive restructuring, and cognitive avoidance). Among boys and girls, the Internalizing and specific depressive profile was associated with the least strategic use of coping strategies (low problem-solving, social support, and cognitive restructuring, and high cognitive and behavioral avoidance). The Internalizing and specific anxious profile was associated with high levels of all coping strategies (except behavioral avoidance). Overall, the study demonstrates that disaggregating global and specific internalizing symptoms allow identifying qualitatively distinct profiles, which then raised questions on the efficacy of the coping strategies used by youth with an Internalizing and specific anxious profile. These results support the adoption of a transdiagnostic approach of treatment based on a holistic representation of all aspects of adolescent boys' and girls' internalizing symptoms to better accompany them in the selection of their coping strategies.

**Keywords** Internalizing symptoms · Anxiety · Depression · Coping strategies · Sex differences · Latent profile analysis

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These authors contributed equally: Elizabeth Olivier, Alexandre J. S. Morin

✉ Elizabeth Olivier
  elizabeth.olivier@umontreal.ca

[1] Département de psychopédagogie et d'andragogie, Université de Montréal, Montréal, QC, Canada

[2] Substantive-Methodological Synergy Research Laboratory, Concordia University, Montreal, QC, Canada

[3] Département de psychoéducation et de psychologie, Université du Québec en Outaouais, Montréal, QC, Canada

[4] École de Psychoéducation, Université de Montréal, Montréal, QC, Canada

## Introduction

Adolescence represents a turning point in the development of internalizing problems, such as general anxious and depressive symptoms (Nivard et al., 2017). Indeed, boys

and girls both tend to report increases in the occurrence of some of these symptoms when entering adolescence, an increase that is particularly marked among girls (Wang et al., 2018). Given the high rates of cooccurrence reported between these two types of symptoms, it is not surprising that many studies indicate that adolescents tend to report matching levels of symptoms of general anxiety and depression (e.g., Wang et al., 2021). However, grouping them under the common umbrella of internalizing symptoms (e.g., Caspi et al., 2014) might interfere with the ability to achieve a fine-grained understanding of the different ways in which these two types of symptoms can be experienced by adolescent boys and girls. In this regard, recent statistical advances indicate that disaggregating global levels of internalizing symptoms from the specific aspects uniquely associated with anxious and depressive symptoms could help achieve a more accurate identification of the various profiles of internalizing symptoms observed among adolescents (Morin et al., 2016). As these symptoms are closely tied to youth's use of various coping strategies (i.e., problem-solving, seeking social support, cognitive restructuring, cognitive and behavioral avoidance; Ng et al., 2012), achieving a clearer representation of internalizing profiles might also help to better understand how heterogeneous groups of youth cope with stressors. For instance, a few rare studies demonstrate that after accounting for the cooccurrence between anxious and depressive symptoms, only youth displaying depressive symptoms rely on suboptimal coping strategies compared to those displaying anxious symptoms (Garnefski & Kraaij, 2018). In addition to reporting higher levels of anxious and depressive symptoms, adolescent girls seem to rely more frequently on some coping strategies (e.g., social support) compared to boys. Thus, this study seeks to identify profiles of internalizing symptoms and how corresponding to these profiles might predispose boys and girls to rely on some coping strategies instead of others.

## A Holistic Perspective on Internalizing Symptoms

Anxiety entails worrying about oneself and others, physiological symptoms such as sweating, nausea, shortness of breath, and sometimes posttraumatic stress, including fears and flashbacks (APA, 2013). Depression encompasses negative emotional symptoms such as sadness and hopelessness, somatic symptoms like eating and sleeping disorders, and anhedonia (i.e., a lack of positive emotions) (APA, 2013). Manifestations of anxiety and depression are often grouped under the umbrella of internalizing symptoms (Achenbach & Edelbrock, 1978). Recent studies support this classification, showing that children (Caci et al., 2015), adolescents (Jovanović et al., 2019; Olivier et al., 2020), and adults (Caspi et al., 2014): (1) often present overlapping

levels of anxious and depressive symptoms which can be summarized by their global levels of internalizing symptoms; and (2) might also present specific (non-cooccurring) levels of anxious or depressive symptoms not captured by this global level.

From a holistic perspective (e.g., Bergman & Magnusson, 1997), these results also suggest that different subpopulations (or profiles) of adolescents might be characterized by qualitatively distinct configurations of anxious or depressive symptoms. For instance, one large profile could display high levels of internalizing symptoms across both types of manifestations. The existence of such a profile would explain the high rates of comorbidity typically observed between anxious and depressive symptoms. In contrast, other profiles might be dominated by a single type of symptoms (e.g., anxious or depressive), which would explain that comorbidity rates are not 100%. Contrasting with these expectations, studies having assessed profiles of internalizing symptoms among adolescents consistently refuted the possibility that some youth might experience one, but not the other, type of internalizing symptoms (e.g., Ferdinand et al., 2005). Rather, these studies identified profiles characterized by low, medium, or high levels of both types of symptoms. Such results were found in cross-sectional studies among younger (Van Lang et al., 2006; Zdebik et al., 2019) and older adolescents (Wadsworth et al., 2001), in longitudinal studies among younger (Olino et al., 2014; Songco et al., 2020) and older adolescents (Lallukka et al., 2019; Songco et al., 2020), as well as in studies conducted among youth exposed to traumatic events (Lai et al., 2015; Wang et al., 2021). A detailed literature review of studies assessing profiles of internalizing symptoms among adolescents is provided in Table S1 of the online supplements. Together, these results suggest that it might not be necessary, or even useful, to separately consider participants' levels of depressive and anxious symptoms beyond their global level of internalizing symptoms.

However, these studies all relied on separate measures of anxious and depressive symptoms without simultaneously considering that these symptoms share a common core (i.e., internalizing symptoms; Caspi et al., 2014). More precisely, each of these separate measures includes variance related to this common core of internalizing symptoms, together with variance uniquely related to the specificity of participants' anxious or depressive symptoms. Statistical research has shown that failure to properly disaggregate these two (global and specific) sources of variability before estimating profiles was likely to lead to an overestimation of the role played by the global construct underlying the measures (i.e., global levels of internalizing symptoms) and an underestimation of the role of the unique characteristics associated with each measure (i.e., specific levels of anxious and depressive symptoms; Morin et al., 2016). Accounting for

the high cooccurrence, or shared variance, between both types of symptoms is necessary to determine whether some individuals present specific levels of symptoms limited to anxiety or depression in adolescents (e.g., Jovanović et al., 2019). This is the approach taken in the current study.

## Development of Internalizing Symptoms and Sex Differences

In childhood, boys and girls share the same risk of feeling depressed (Garber & Rao, 2014) or anxious (Vasey et al., 2014). Likewise, puberty and the challenges associated with adolescence usually result in an increase in internalizing symptoms among boys and girls (Nivard et al., 2017). Yet, girls report steeper increases than boys in anxious and depressive symptoms during adolescence (Hankin, 2009; Wang et al., 2018). Along with biological factors (Costello et al., 2011), this higher risk possibly stems from their greater sensitivity to stressful life events (Oldehinkel & Bouma, 2011) and interpersonal stressors (Zimmer-Gembeck & Skinner, 2015), which are especially prevalent in the lives of adolescent girls. Studies assessing profiles of internalizing symptoms (see Table S1 of the online supplements) also reflect these sex differences, as girls are usually more numerous among profiles displaying higher levels of internalizing symptoms in early (e.g., Van Lang et al., 2006) and late adolescence (e.g., Songco et al., 2020; Wadsworth et al., 2001). Apart from these differences in prevalence, boys and girls follow similar trajectories of anxious and depressive symptoms during adolescence (Lallukka et al., 2019; Zdebik et al., 2019). Also, when asked to rate their symptoms, boys and girls also seem to report similar severity of anxious or depressive symptoms (Jovanović et al., 2019; Young et al., 2021). What remains uncertain is whether adolescent boys and girls display different profiles, or configurations, of internalizing symptoms. For instance, a subsample of girls could display a unique configuration of symptoms (e.g., high anxious and low depressive symptoms) not found among boys, which could also impact how they cope with various stressors.

## Internalizing Symptoms and Coping Strategies

The Diathesis-Stress Model (Abela, 2001; Lewinsohn et al., 2001) suggests that individuals characterized by distinct levels of vulnerability (i.e., diathesis) might be more or less likely to develop specific types of problems (such as internalizing symptoms) when exposed to stressful life events. Due to the multiple biopsychosocial transformations occurring during this critical developmental period (i.e., puberty, school transitions, search for identity, seeking autonomy from parents), adolescents are particularly at risk for the development of depressive (Garber & Rao, 2014)

and anxious symptoms (Vasey et al., 2014). Yet, different adolescents may also have different thresholds (i.e., the diathesis) delimiting when and under which circumstances these symptoms will appear. These thresholds are notably determined by youth's ability to cope with these situations.

Adolescents who skillfully maneuver this developmental period might rely on more effective coping strategies, thus retaining an adaptive level of psychological functioning (Ng et al., 2012). Coping refers to conscious and unconscious thoughts or actions that allow a person to deal with a stressful situation (Lazarus & Folkman, 1984). Coping is not, however, a monolithic process. Most individuals rely on a variety of coping strategies and alternate between them to best cope with various life circumstances and stressors (Herres, 2015). Coping strategies are often classified into the following three categories (Connor-Smith et al., 2000; Evans et al., 2015). Primary control engagement coping strategies seek to directly change the situation (e.g., problem-solving), or one's emotional reaction to the situation (e.g., seeking social support). Secondary control engagement coping strategies encompass efforts to accept the situation, for instance, via cognitive restructuring strategies (e.g., positive reframing, acceptance). Finally, disengagement coping strategies seek to withdraw oneself from the source of stress and the resulting negative emotions either cognitively (e.g., denial or self-blame) or behaviorally (e.g., substance use or resignation).

Accumulating evidence shows that youth with anxious and depressive symptoms rely on disengagement coping to a greater extent than their peers, whereas adolescents who use primary or secondary control engagement strategies more often report adaptive levels of psychological functioning. More specifically, in terms of primary control engagement strategies, adolescents with high depressive symptoms are less prone to seeking social support compared to their well-adjusted peers (Chan, 2012). Conversely, those with high anxiety are more likely to seek this type of support (Thorne et al., 2013). The role of problem-solving strategies is still not clear as some find it to be associated with lower depression levels (Cong et al., 2019), whereas others with higher depression levels (Vannucci et al., 2018). Youth who rely on cognitive restructuring (i.e., secondary control engagement) tend to report lower anxiety and depression levels (Ng et al., 2012). Finally, youth displaying anxiety (Xiong et al., 2019) or depression (Rodriguez-Naranjo & Cano, 2016) often favor disengagement strategies such as cognitive and behavioral avoidance.

Particularly relevant to the study of internalizing profiles, a few existing studies suggest that youth characterized by anxious or depressive symptoms might not function as homogeneously as previously thought in terms of coping strategies. For instance, when assessed separately, adolescents' anxious and depressive symptoms are both associated

with the same coping strategies (Garnefski & Kraaij, 2018). However, when controlling for the cooccurrence of internalizing symptoms, only depressive symptoms remain associated with more problematic and fewer adaptive coping strategies (Garnefski & Kraaij, 2018). Similarly, whereas adolescents with high levels of anhedonia use little social support and problem-solving while frequently relying on behavioral and cognitive avoidance strategies, those with physiological symptoms of anxiety do not use these disengagement strategies as often (Gaylord-Harden et al., 2011). Even more compelling are results showing that adolescents with high anxiety levels are more likely to seek social support and rely on problem-solving than their well-adjusted peers (Herres, 2015). Together, these findings suggest that assessing subgroups of youth characterized by heterogeneous levels of internalizing, anxious, and depressive symptoms might reveal distinct patterns in their use of coping strategies.

Boys and girls also differ in their choice of coping strategies. Potentially because they experience more stressful life events during adolescence (Oldehinkel & Bouma, 2011), girls rely on coping strategies more often than boys (Zimmer-Gembeck & Skinner, 2015). This is especially true for strategies involving social relationships and emotional regulation, such as seeking social support (Malooly et al., 2017; Seiffge-Krenke, 2011). Yet, boys are potentially more prone to rely on disengagement strategies involving avoidance (Thorne et al., 2013). Findings are inconsistent regarding boys' and girls' differential use of problem-solving strategies, some showing that girls use them more often (Eschenbeck et al., 2007), others finding that boys might prefer them (Horwitz et al., 2011). Besides, the benefits or risks associated with these strategies in relation to boys' and girls' internalizing symptoms remain an open question.

In sum, boys and girls with specifically high levels of depressive symptoms might rely on poorer coping strategies than well-adjusted youth, whereas those with specifically high levels of anxious symptoms may tend to adopt primary control engagement strategies. Unfortunately, slight variations in adolescents' coping strategies are currently not captured in studies assessing profiles of anxious and depressive symptoms, as they suggest that adolescents systematically display matching levels of both symptoms. Consequently, holistic evaluations of adolescents' adjustment might shed further light on how coping strategies differ as a function of their unique profiles of internalizing, anxiety, and depressive symptoms, thus allowing a step forward in understanding vulnerability.

## Current Study

The current study pursues three objectives. First, it seeks to identify the most commonly occurring profiles of internalizing symptoms among a sample of adolescents while properly disaggregating youth's global levels of internalizing symptoms from their specific levels of anxious and depressive symptoms. Based on statistical research evidence on the global/specific disaggregation approach (Morin et al., 2016), a first hypothesis expects that profiles characterized by qualitatively distinct configuration (e.g., high anxious) will be identified. Second, this study seeks to assess whether similar profiles will be identified among boys and girls, and whether the relative prevalence of these profiles will remain unchanged across sexes. Boys and girls are expected to present similar manifestations (i.e., shape of profiles; Young et al., 2021), but profiles characterized by high internalizing, anxious, or depressive symptoms are anticipated to be more prevalent among girls (Wang et al., 2018). Third, this study seeks to investigate associations between membership into the various profiles and adolescents' adoption of coping strategies, and whether these associations vary between boys and girls. Youth corresponding to profiles characterized by higher levels of internalizing, anxious, or depressive symptoms are expected to report relying on primary and secondary engagement strategies less frequently, and on disengagement coping strategies more frequently than those corresponding to profiles characterized by lower levels of symptoms. Yet, youth corresponding to profiles characterized by especially high levels of anxiety will potentially report a more adaptive use of coping strategies compared to those with especially high depressive symptoms (e.g., Garnefski & Kraaij, 2018). Whether the associations between profile membership and coping strategies will differ between boys and girls is left as an open question.

## Methods

### Sample and Procedure

The study relies on a sample of 976 adolescents (56.0% girls; aged 12–15, $M = 12.92$, $SD = 0.75$) recruited in four schools from multiethnic low-SES Montreal areas (Quebec, Canada), who participated in this study in October-November 2018. This sample includes 60.0% of youth from immigrant backgrounds (26.2% born abroad, i.e., first-generation; 33.8% born in Canada with at least one parent born abroad, i.e., second-generation), and 69.9% of youth living with both parents. The most frequent countries of origin were Algeria (5.8%), Morocco (4.2%), Haiti (4.0%), India (3.2%), Syria (2.5%), and the Philippines (2.2%). Other countries of origin each represented less than 2% of the sample. The University's research ethics committee and the participating school boards approved this project. Active written parental consent was obtained for all students, in

addition to students' active consent to participate. Students were met at their school by trained research assistants. Research assistants supervised data collection in each classroom. Students answered a 45 min computerized questionnaire on their well-being and school experience.

## Measures

### Sex

Participants self-reported their sex (0 = male; 1 = female).

### Anxious symptoms

Participants self-reported symptoms of anxiety using three subscales from the Screen for Child Anxiety Related Emotional Disorders (Birmaher et al., 1999; French version by Martin & Gosselin, 2012): (a) physiological symptoms (7 items; $\alpha = 0.777$; e.g., "When I am scared, I have trouble breathing."); (b) general anxiety symptoms (6 items; $\alpha = 0.798$; e.g., "I am generally worried."); (c) posttraumatic stress symptoms (4 items; $\alpha = 0.804$; e.g., "I try not to think about an unpleasant event that has happened to me."). Items were rated on a 1 (*almost never*) to 3 (*often*) response scale.

### Depressive symptoms

Participants self-reported symptoms of depression using three subscales from the Center for Epidemiologic Studies Depression scale (Radloff, 1977; French version by Morin et al., 2011): (a) somatic symptoms (7 items; $\alpha = 0.831$; "I have difficulty keeping my attention focused on what I am doing."); (b) negative emotions (7 items; $\alpha = 0.933$; e.g., "I feel sad."); (c) anhedonia, or lack of positive emotions (4 items; $\alpha = 0.821$; "I enjoy life—*reversed coded*"). Items were rated on a 1 (*never*) to 6 (*most of the time*) response scale. Assessed together to obtain a single internalizing symptom score, the 35 anxiety and depressive symptoms items have a good reliability scale ($\alpha = 0.934$).

### Coping strategies

Participants indicated how often they used coping strategies using 22 items from the situational version of the Brief COPE inventory (Carver, 1997; French version by Doron et al., 2014). These items are organized into five subscales (Cramer et al., 2020). Two subscales assessed primary control engagement strategies. The Problem-Solving subscale ($\alpha = 0.808$) included two items measuring active coping (e.g., "I've been taking actions to try to make the situation better.") and two items measuring planning (e.g., "I've been thinking hard about what steps to take."). The Social Support subscale ($\alpha = 0.848$) included two items

measuring instrumental support (e.g., "I've been getting help and advice from other people."), two items measuring emotional support (e.g., "I've been getting comfort and understanding from someone."), and two items measuring venting (e.g., "I've been expressing my negative feelings."). Secondary control engagement strategies were measured with the Cognitive Restructuring ($\alpha = 0.812$) subscale, which included two items measuring positive reframing (e.g., "I've been looking for something good in what is happening.") and two items measuring acceptance (e.g., "I've been learning to live with it."). Finally, two subscales assessed disengagement strategies. The Cognitive Avoidance subscale ($\alpha = 0.749$) included two items measuring denial (e.g., "I've been refusing to believe that it has happened.") and two items measuring self-blame (e.g., "I've been blaming myself for things that happened."). The Behavioral Avoidance subscale ($\alpha = 0.623$) included two items measuring substance use (e.g., "I've been using alcohol or other drugs to make myself feel better.") and two items measuring behavioral disengagement (e.g., "I've been giving up trying to deal with it."). Items were rated on a 1 (*not at all*) to 4 (*always*) response scale.

## Analyses

### Preliminary analyses

A set of preliminary analyses was conducted to test the factor structure and measurement invariance (configural invariance of the model, weak invariance of the factor loadings, strong invariance of the response thresholds, strict invariance of the uniquenesses, latent variance-covariance invariance, and latent mean invariance) across boys and girls samples of scores obtained on all measures (Millsap, 2011). These analyses were performed using Mplus 8.4's robust weight least square (WLSMV) estimator, which outperforms Maximum Likelihood (ML) and Maximum Likelihood robust (MLR) estimation when using ordinal rating scales with five or fewer response categories or asymmetric response thresholds (Finney & DiStefano, 2013) such as the measures used in this study. The limited number of missing responses at the item level (0 to 2.15%) were handled with algorithms implemented in Mplus for WLSMV estimation, which allowed estimating all models while retaining all participants (Asparouhov & Muthén, 2010). In these preliminary analyses, internalizing symptoms measures were represented using a bifactor Confirmatory Factor Analytic (bifactor-CFA) model (Morin et al., 2020). This approach disaggregates participants' global levels of internalizing symptoms (global factor, or G-factor) from non-redundant (i.e., orthogonal) estimates of their specific levels of anxious (physiological symptoms, general anxiety symptoms, posttraumatic stress symptoms)

and depressive (somatic symptoms, negative emotions, anhedonia) symptoms (specific factors, or S-factors) beyond this global level of internalizing symptoms. The five coping strategies subscales (problem-solving, social support, cognitive restructuring, cognitive avoidance, and behavioral avoidance) were represented using a correlated factors CFA model. Standardized factor scores ($M = 0$; $SD = 1$) were saved from the most invariant of these measurement models to ensure comparability of the measurement errors and factor structure between boys and girls (Morin et al., 2016).

### Latent profile analyses (LPA)

**Estimation of internalizing symptoms profiles** LPA models including one to eight profiles were estimated for the seven indicators (i.e., the invariant factor scores from the preliminary analyses) reflecting participants' levels of internalizing symptoms (the global internalizing factor and the six specific anxious and depressive symptoms factors). These models were estimated using Mplus 8.4' robust maximum likelihood estimator (MLR) separately for boys and girls. To avoid converging on a suboptimal solution, models were estimated using 3000 random sets of start values, 500 iterations, and 50 final stage optimizations (Hipp & Bauer, 2006). These models were estimated while allowing for the indicators' means, but not their variances, to be freely estimated across profiles. Although there are advantages to the estimation of LPA models defined while also allowing for the variance of the indicators to vary across profiles (Peugh & Fan, 2013), these more complex models resulted in severe convergence difficulties and improper parameter estimates, which suggests over-parameterization (Chen et al., 2001) and the superiority of our simpler models (Morin & Litalien, 2019).

**Profile similarity across sexes** Based on the optimal LPA solutions identified for boys and girls, tests of profile similarity allowed assessing the extent to which this final solution could be replicated between sexes. These tests were performed in the following sequences (Morin et al., 2016): (a) same number of profiles (configural similarity); (b) same within profile means (structural similarity); (c) same within-person variances (dispersion similarity); (d) same proportion of adolescents in each profile (distributional similarity).

**Differences in coping strategies between profiles and across sexes** The coping indicators were directly incorporated to the most similar LPA solution (Morin & Litalien, 2019) as outcomes to assess their association with profile membership. In a first model, coping strategies mean levels were freely estimated across profiles and sexes. In a second model (i.e., explanatory similarity), coping strategies means were constrained to equality across sexes within each profile. Tests of statistical significance for the mean comparisons were performed using Mplus' MODEL CONSTRAINT function, which relies on the multivariate delta method (Raykov & Marcoulides, 2004).

### Model selection

The selection of the most adequate solution relied on an examination of the statistical adequacy, the meaningfulness, and the theoretical adequacy of each alternative solution (Morin & Litalien, 2019). Statistical indicators guided this selection: the Akaïke Information Criterion (AIC), the Constant AIC (CAIC), the Bayesian Information Criterion (BIC), the Sample-Size-Adjusted BIC (ABIC), the adjusted Lo-Mendell-Rubin (aLMR) likelihood ratio test, and the bootstrap likelihood ratio test (BLRT) (e.g., Diallo et al., 2016; Peugh & Fan, 2013). Lower values on AIC, CAIC, BIC, and ABIC suggest a better fitting solution. Due to their sample-size dependency, these indicators often keep improving with the addition of profiles (Marsh et al., 2009). As such, a graphical examination of "elbow plots", representing the evolution of these information criteria as a function of the number of profiles, is recommended to facilitate decision-making (e.g., Morin et al., 2011). In these plots, the inflection point in the curve suggests that the optimal number of profiles might have been reached. The aLMR and BLRT compare the estimated model to the model with one less profile. A nonsignificant aLMR or BLRT ($p > 0.05$) indicates that the previous model, with one less profile, should be retained. Finally, in tests of profile similarity (including tests of predictive and explanatory similarity), similarity is considered supported when two indicators out of the CAIC, BIC, and ABIC decrease relative to the previous step (Morin et al., 2016). Failure to uphold similarity at any stage was followed by tests of partial similarity (Morin et al., 2016). For all models, the entropy is also reported as a measure of classification accuracy (ranging from 0 to 1). The entropy is reported for descriptive purposes and should not be used to guide model selection.

## Results

### Preliminary Analyses

Preliminary analyses were conducted to assess whether anxious and depressive symptoms were well represented by a bifactor configuration, including one global internalizing factor along with three specific anxious factors (i.e., physiological, general, and posttraumatic stress) and three specific depressive factors (i.e., somatic, negative affect, and anhedonia). Results from the measurement invariance

analyses conducted on our measures of internalizing symptoms and coping strategies are respectively reported in Tables S2, S3 of the online supplements. These results indicated that all models achieved a satisfactory level of model fit across boys and girls. The parameter estimates from the most invariant measurement models, used to generate the factor scores for our main analyses, are reported in Tables S4, S5 of the online supplements. The results from these analyses supported the invariance of boys' and girls' responses to our measures of internalizing symptoms up to the equivalence of the latent variance-covariance. The latent mean of the Internalizing G-factor varied between sexes, as girls reported mean levels 0.519 S. D. higher than boys. The means of all S-factors were invariant between sexes. Responses to the Brief COPE inventory were completely invariant (up to the latent means of the factors) between boys and girls. Correlations between the factor scores extracted in standardized units ($M = 0$; $SD = 1$) from these analyses (partial latent mean invariance for internalizing symptoms and latent mean invariance for coping) are reported in Table 1.

## Profiles of Internalizing Symptoms Among Boys and Girls

First, LPA aimed to identify the various profiles of global internalizing, specific anxious, and specific depressive symptoms among boys and girls. The results from the alternative LPA solutions estimated separately among boys and girls are reported in Table S6 of the online supplements, and corresponding elbow plots are reported in Fig. S1 of the online supplements. In both samples, the AIC and ABIC kept decreasing without reaching a minimum, and the BLRT failed to support any specific solution. In contrast, the BIC and CAIC reached their lowest point at three profiles for boys and girls, whereas aLMR supported the 2-profile solution in both samples. Showing a general alignment with these conclusions, the elbow plots suggested that the value of the various information criteria stopped decreasing roughly after two or three profiles. Given these results, the meaningfulness and added value of the solutions including 2, 3, and 4 profiles in both samples were considered. The 2-profile solution revealed a Global Internalizing and Specific Depressive symptoms (ID) profile and a Global Internalizing and Specific Anxious symptoms (IA) profile. To these two profiles, the 3-profile solution added a theoretically meaningful Low Internalizing symptoms (LI) profile. The 4-profile solution resulted in the arbitrary subdivision of the ID profile into two similar profiles. For these reasons, the 3-profile solution was retained for boys and girls for tests of profile similarity.

Tests of profile similarity were then performed to assess hypotheses pertaining to sex differences between profiles

**Table 1** Correlations

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Sex (1 = female) | | | | | | | | | | | | | | |
| 2. Age | −0.127** | | | | | | | | | | | | | |
| 3. Immig. (1 = immig.) | −0.013 | 0.112** | | | | | | | | | | | | |
| 4. Intern.(G) | 0.233** | 0.053 | −0.010 | | | | | | | | | | | |
| 5. Dep. Som.(S) | −0.071* | 0.068* | −0.050 | 0.212** | | | | | | | | | | |
| 6. Dep. Neg.(S) | 0.119** | 0.011 | 0.000 | 0.153** | −0.197** | | | | | | | | | |
| 7. Dep. Ane.(S) | −0.046 | 0.055 | 0.017 | 0.086** | −0.150** | −0.014 | | | | | | | | |
| 8. Anx. Phy.(S) | 0.155** | −0.043 | −0.074* | 0.034 | −0.096** | −0.185** | −0.178** | | | | | | | |
| 9. Anx. Gen.(S) | 0.188** | −0.057 | −0.036 | 0.063* | −0.178** | −0.133** | −0.122** | 0.227** | | | | | | |
| 10. Anx. PTS(S) | 0.017 | −0.015 | 0.016 | 0.013 | −0.201** | −0.195** | −0.097** | 0.251** | 0.209** | | | | | |
| 11. Problem Solving | −0.038 | −0.024 | −0.008 | −0.273** | −0.082* | 0.026 | −0.281** | 0.069* | 0.102** | 0.097** | | | | |
| 12. Social Support | 0.078* | −0.025 | −0.046 | −0.095** | −0.018 | 0.073* | −0.265** | 0.082* | 0.120** | 0.103** | 0.738** | | | |
| 13. Cog. Restructuring | −0.027 | −0.028 | 0.018 | −0.330** | −0.091** | 0.048 | −0.321** | 0.078* | 0.075* | 0.093** | 0.849** | 0.672** | | |
| 14. Cog. Avoidance | 0.116** | 0.065* | 0.034 | 0.437** | 0.118** | 0.168** | −0.069* | 0.039 | 0.101** | 0.051 | 0.169** | 0.433** | 0.119** | |
| 15. Behav. Avoidance | 0.106** | 0.085** | 0.053 | 0.574** | 0.142** | 0.152** | 0.100** | −0.011 | 0.037 | −0.012 | −0.303** | −0.063 | −0.361** | 0.848** |

The correlations and means are not exactly the same as those from the measurement models. Slight variations in results are due to saving factor scores

*Immig.* immigration status, *(G)* global factor, *Intern.* internalizing symptoms, *Dep.* depressive symptoms, *Anx.* anxious symptoms, *Som.* somatic, *Neg.* negative emotions, *Ane.* anhedonia, *Phy.* physiological, *Gen.* general, *PTS* posttraumatic stress, *Cog.* cognitive, *Behav.* behavioral

*$p < 0.05$; **$p < 0.01$

**Table 2** Results from the tests of profile similarity between the boys and girls samples

| Model | LL | #fp | SCF | AIC | BIC | ABIC | CAIC | Entropy |
|---|---|---|---|---|---|---|---|---|
| *Profile Similarity* | | | | | | | | |
| Configural | −8350.245 | 61 | 1.284 | 16822.489 | 17120.380 | 16926.644 | 17181.380 | 0.738 |
| Structural | −8401.284 | 40 | 1.187 | 16882.568 | 17077.907 | 16950.867 | 17117.907 | 0.736 |
| Dispersion | −8412.529 | 33 | 1.257 | 16891.058 | 17052.212 | 16947.404 | 17085.212 | 0.755 |
| Distributional | −8445.061 | 31 | 1.673 | 16952.121 | 17103.509 | 17005.053 | 17134.509 | 0.774 |
| *Explanatory Similarity* | | | | | | | | |
| Free | −14578.299 | 40 | 1.431 | 29236.598 | 29432.182 | 29305.141 | 29472.182 | 0.866 |
| Explanatory | −14647.462 | 25 | 1.375 | 29344.925 | 29467.164 | 29387.764 | 29492.164 | 0.858 |
| Partial Explanatory Similarity | −14613.391 | 29 | 1.436 | 29284.782 | 29426.580 | 29334.476 | 29455.580 | 0.865 |

*LL* Model LogLikelihood, *#fp* Number of free parameters, *SCF* Scaling correction factor, *AIC* Akaïke Information Criteria, *CAIC* Constant AIC, *BIC* Bayesian Information Criteria, *ABIC* Sample-size adjusted BIC
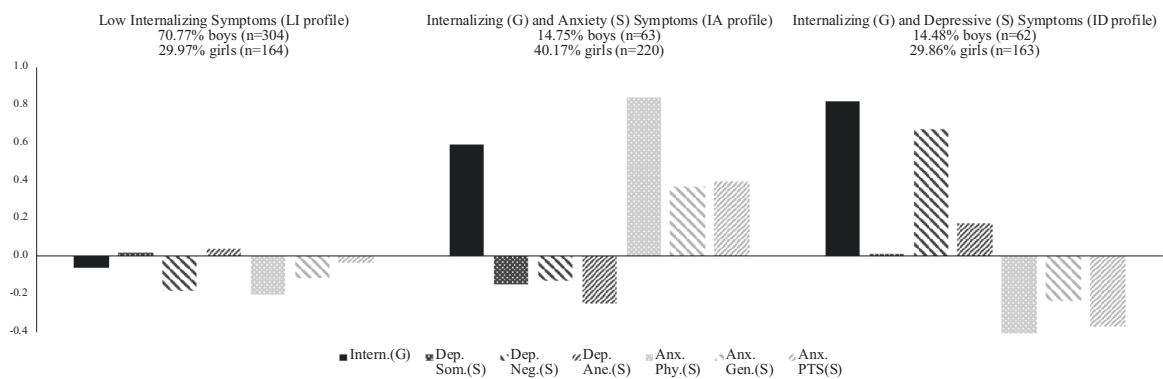


**Fig. 1** Final Three-Profile Solution. *Note.* These profiles are based on factor scores estimated with a mean of 0 and a standard deviation of 1 across samples (the results can thus be interpreted in standardized units). G global internalizing factor, S specific factors, Intern. Internalizing, Dep. Depressive symptom, Som. Somatic, Neg. Negative emotions, Ane. Anhedonia, Phy. Physiological, Gen. General, PTS Posttraumatic stress

(shape and prevalence). Results are reported in Table 2. These results supported the structural (shape) similarity of the profiles across boys and girls, resulting in lower values on the BIC and CAIC relative to the previous model of configural similarity. Starting from this model of structural similarity, the next model of dispersion similarity was also supported by the data (resulting in a lower value on all information criteria relative to the previous model of structural similarity). Finally, starting from this model of dispersion similarity, the last model of distributional similarity failed to be supported by the data (resulting in higher values on the AIC, BIC, and ABIC relative to the previous model of dispersion similarity), indicating that the size (prevalence) of all profiles differed across samples (i.e., partial similarity is not possible for the size of the profiles; Morin et al., 2016).

The final set of profiles (i.e., 3-profile solution with dispersion similarity) is graphically represented in Fig. 1 and detailed parameter estimates are reported in Table S7 of the online supplements. As noted above, three profiles were identified across samples. The first profile was characterized

by a low level of internalizing symptoms (LI) across samples. Boys were more than two times more likely to correspond to this LI profile (70.77%; n = 304) than girls (29.97%; n = 164)[1]. The second profile was characterized by higher-than-average levels of global internalizing symptoms and of specific symptoms of anxiety (physiological symptoms, general anxiety symptoms, and posttraumatic stress symptoms), coupled with lower-than-average levels of specific symptoms of depression (somatic symptoms, negative affect, and anhedonia). Girls were more than twice (40.17%; n = 220) as likely as boys (14.75%; n = 63) to correspond to this Global Internalizing and Specific Anxious symptoms (IA) profile. Finally, the third profile was characterized by higher-than-average levels of global internalizing symptoms and of specific symptoms of depression (negative affect and anhedonia), but average

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[1] The approximate n for each profile is reported as additional information. LPAs result in a probabilistic classification of each participant into the profiles. As such, the profile size represents the proportion of participants most likely corresponding to each profile, rather than a definite classification of participants into each profile.

levels of somatic symptoms, coupled with lower-than-average levels of specific symptoms of anxiety (physiological symptoms, general anxiety symptoms, and posttraumatic stress symptoms). This Global Internalizing and Specific Depressive symptoms (ID) profile was twice more frequent among girls (29.86%; n = 163) than boys (14.48%; n = 62).

## Mean Differences in Coping Strategies Across Profiles and Between Sexes

Finally, the factor scores reflecting coping strategies were incorporated to the final solution of partial dispersion similarity to assess whether and how the coping implications of the profiles differed across boys and girls. As shown in Table 2, tests of explanatory similarity suggest that these solutions might not be entirely identical across samples (the model of explanatory similarity resulted in higher values on all information criteria relative to the model in which these associations were allowed to differ across samples). Examination of these alternative solutions led to a model of partial explanatory similarity in which the means of problem-solving, social support, cognitive restructuring, and cognitive avoidance were allowed to vary in the IA profile between sexes. The data supported this model of partial explanatory similarity (resulting in lower values on the BIC and CAIC relative to the model in which

these associations were allowed to differ across samples). The results from these outcome comparisons are presented in Table 3.

When first considering the coping strategies that were allowed to differ across samples, a noteworthy result is that the means of the problem-solving, social support, cognitive restructuring, and cognitive avoidance strategies were found to be higher in girls corresponding to the IA profile relative to boys corresponding to the same profile. Turning our attention to between-profile comparisons, the results first revealed that boys and girls corresponding to the ID profile were the least likely to rely on *problem-solving* strategies compared to the other profiles. Then, boys corresponding to the LI profile were less likely to rely on these strategies than boys corresponding to the IA profile, who reported the highest levels of problem-solving. In contrast, girls corresponding to the IA and LI profiles reported using problem-solving strategies equally often. Second, boys corresponding to the IA profile were more likely to seek *social support* than those corresponding to the LI and ID profiles, who used this strategy at similar levels. Girls corresponding to the IA profile were also more likely to rely on social support than those corresponding to the ID profile. Girls corresponding to the LI profile were not significantly different from those corresponding to the IA and ID profiles in terms of how often they sought social support. Third, *cognitive restructuring* was used similarly by boys and girls. Youth

**Table 3** Means comparisons between the three profiles in boys and girls samples

| | Low (LI) | Intern.-Anx. (IA) | Intern.-Dep. (ID) | Differences between profiles |
|---|---|---|---|---|
| *Girls Sample* | | | | |
| Problem Solving | 0.004 [−0.109; 0.117] | 1.075 [0.466; 1.684] | −0.342 [−0.489; −0.194] | IA > LI > ID |
| Social Support | −0.199 [−0.309; −0.090] | 1.203 [0.560; 1.847] | −0.107 [−0.255; 0.041] | IA > LI = ID |
| Cognitive Restructuring | 0.040 [−0.071; 0.152] | 1.000 [0.376; 1.625] | −0.371 [−0.516; −0.225] | IA > LI > ID |
| Cognitive Avoidance | −0.643 [−0.736; −0.550] | 1.014 [0.638; 1.390] | 0.614 [0.496; 0.732] | IA > ID > LI |
| Behavioral Avoidance | −0.593 [−0.692; −0.493] | 0.425 [0.251; 0.600] | 0.758 [0.636; 0.880] | ID > IA > LI |
| *Boys Sample* | | | | |
| Problem Solving | 0.004 [−0.109; 0.117] | 0.124 [−0.113; 0.360] | −0.342 [−0.489; −0.194] | IA = LI > ID |
| Social Support | −0.199 [−0.309; −0.090] | 0.321 [0.093; 0.549] | −0.107 [−0.255; 0.041] | IA > ID; LI = IA & ID |
| Cognitive Restructuring | 0.040 [−0.071; 0.152] | 0.111 [−0.130; 0.351] | −0.371 [−0.516; −0.225] | IA > LI > ID |
| Cognitive Avoidance | −0.643 [−0.736; −0.550] | 0.573 [0.040; 0.471] | 0.614 [0.496; 0.732] | ID = IA > LI |
| Behavioral Avoidance | −0.593 [−0.692; −0.493] | 0.425 [0.251; 0.600] | 0.758 [0.636; 0.880] | ID > IA > LI |
| *Profile-Specific Mean Differences by Sample (Boys (B) and Girls (G))* | | | | |
| Problem Solving | B = G | B < G | B = G | |
| Social Support | B = G | B < G | B = G | |
| Cognitive Restructuring | B = G | B < G | B = G | |
| Cognitive Avoidance | B = G | B < G | B = G | |
| Behavioral Avoidance | B = G | B = G | B = G | |

The outcomes are factor scores estimated with a mean of 0 and a standard deviation of 1 across samples (the results can thus be interpreted in standardized units); 95% confidence intervals are reported in brackets

Reported mean differences were significant at $p < 0.05$

corresponding to the IA profile reported the most frequent use of this strategy, followed by those corresponding to the LI profile. Youth corresponding to the ID profile used this strategy the least often. Fourth, boys and girls corresponding to the LI profile were the least likely to rely on *cognitive avoidance*. Then, boys corresponding to the IA profile were more likely to use this strategy than those corresponding to the ID profile, whereas girls corresponding to the IA and ID profiles reported a similar frequency of cognitive avoidance. Fifth, *behavioral avoidance* was also used similarly by boys and girls. Among both sexes, youth corresponding to the ID profile were the most likely to use this strategy, followed by those corresponding to the IA profile, and then by those corresponding to the LI profile.

Additional tests assessing the associations between age and immigration status and the various profiles were performed (see page S9 of the online supplements). Results (Table S8 of the online supplements) indicated that age and immigration status were not significantly associated with membership in any of the three profiles.

## Discussion

Existing studies identifying subgroups of adolescents based on their anxious and depressive symptoms rarely consider that these symptoms are also grouped under the umbrella of internalizing problems, which prevents from targeting potential differences in these youth's use of various coping strategies. This study sought to increase our understanding of the profiles of internalizing symptoms found among boys and girls while relying on a proper disaggregation of their global levels of internalizing symptoms from their specific levels of anxious and depressive symptoms. Results supported the value of combining this disaggregation with a holistic person-centered perspective (i.e., focused on the identification of profiles). Indeed, our results revealed three qualitatively distinct profiles (i.e., low symptoms, internalizing and anxious symptoms, and internalizing and depressive symptoms). As expected, girls were at higher risk of corresponding to profiles characterized by high levels of internalizing symptoms relative to boys. Our results also shed light on how boys and girls from these different profiles relied on coping strategies (i.e., problem-solving, social support, cognitive restructuring, cognitive avoidance, and behavioral avoidance), potentially questioning the efficacy of these strategies for some of them.

### A Holistic Perspective on Internalizing Symptoms

Previous studies have generally considered anxious and depressive symptoms as relatively independent, and sometimes comorbid, conditions. This approach led to the identification of

profiles characterized by matching levels of anxiety and depressive symptoms (e.g., Lallukka et al., 2019; see Table S1 of the online supplements for a detailed review). In contrast, the study relied on a holistic person-centered approach (Bergman and Magnusson, 1997) in which the dual global/specific nature of internalizing, depressive, and anxious symptoms (e.g., Jovanović et al., 2019) was considered. This approach allowed achieving new insights regarding the diversified nature of the internalizing symptoms profiles most observed among adolescent boys and girls. More precisely, adolescents presenting high global levels of internalizing symptoms were found to display either a profile dominated by specific symptoms of depression (the Internalizing and specific depressive symptoms profile) or by specific symptoms of anxiety (the Internalizing and specific anxious symptoms profile). This observation reinforces the importance of adopting an approach allowing for a proper disaggregation of youth's global levels of internalizing behaviors from their specific levels of anxious and depressive symptoms. In addition, preliminary tests revealed a higher level of global internalizing symptoms among girls relative to boys. Yet, boys and girls displayed the same profiles of internalizing symptoms. Such results are consistent with the idea that both sexes experience these symptoms in a similar manner (e.g., Young et al., 2021). However, only 30% of girls corresponded to the Low internalizing symptoms profile, relative to 70% of boys. In contrast, respectively 40 and 30% of girls corresponded to the Internalizing and specific anxious or to the Internalizing and specific depressive profiles, compared to 15% of the boys for each of those profiles. These results corroborate those from previous studies in which adolescent girls were found to be three to four times more likely to report internalizing symptoms than boys (Ferdinand et al., 2005; Wadsworth et al., 2001). In addition to being exposed to more interpersonal stressors when entering adolescence (Zimmer-Gembeck & Skinner, 2015), girls tend to be more attuned to, and willing to disclose, their emotions than boys (Chaplin & Aldao, 2013). Girls' earlier emotional maturation (Chaplin & Aldao, 2013) or the progressive development of the abilities of both sexes to cope with life stressors as they enter adulthood (Vannucci et al., 2018) might help explain these prevalence discrepancies specific to adolescence.

### Internalizing Profiles and Coping Strategies

Youth corresponding to the Low internalizing symptoms profile displayed a more strategic use of all coping strategies (i.e., more primary and secondary control engagement, and less disengagement) than members of the Internalizing and specific depressive profile. Internalizing and specific anxious youth also reported relying quite often on several coping strategies, echoing previous findings (e.g., Garnefski & Kraaij, 2018). First, boys and girls did not globally differ

in their use of coping strategies, a finding which contrasted with those from previous studies (Malooly et al., 2017; Zimmer-Gembeck & Skinner, 2015). Indeed, in our sample, sex differences were limited to the Internalizing and specific anxious profile. Apart from behavioral avoidance, girls corresponding to this profile reported using more coping strategies (problem-solving, social support, cognitive restructuring, and cognitive avoidance) than boys. As this profile corresponded to 40% of the girls, this result suggests that sex differences found in other studies might be restricted to girls with internalizing symptoms dominated by specifically high levels of anxiety. It also questions the efficacy of these strategies for girls. Girls' preference for strategies involving social relationships and emotional regulation (Seiffge-Krenke, 2011) might hide a tendency to vent, self-blame, and ruminate. Such strategies are especially damaging for girls but not for boys, as they contribute to maintaining internalizing symptoms in girls (Rose et al., 2017). Still, others' results suggest that boys and girls benefit from the same strategies (Vannucci et al., 2018), that either only boys or girls benefit more from cognitive restructuring and problem-solving strategies (Kelly et al., 2008; Rodriguez-Naranjo & Cano, 2016), or that boys benefit more from cognitive and behavioral avoidance strategies (Seiffge-Krenke, 2011). These questions merit further investigation as no consensus currently exists regarding the differential efficacy of coping strategies between sexes. Our results demonstrated that coping strategies should be assessed while also considering different profiles of internalizing symptoms.

Second, beyond these sex differences, and apart from behavioral avoidance which was used more often by Internalizing and specific depressive boys and girls, Internalizing and specific anxious youth seemed to rely more often on all other coping strategies relative to youth displaying low levels of internalizing symptoms. Again, this raises questions about the efficacy of these coping strategies to manage internalizing symptoms marked by high levels of anxiety. On the one hand, up to a certain level, anxiety might be less damaging for adolescents than depressive symptoms (Garnefski & Kraaij, 2018). Internalizing and specific anxious adolescents generally adopted more primary (i.e., problem-solving and seeking social support) and secondary (i.e., cognitive restructuring) control engagement strategies than Internalizing and specific depressive or Low internalizing symptoms adolescents. As such, youth with internalizing symptoms dominated by anxiety seemed better able to mobilize their internal and external resources than those whose symptoms are dominated by depression. On the other hand, primary and secondary control engagement strategies, especially social support, could have a double-edged sword effect on adjustment. For some, such as Low internalizing symptoms youth, these strategies might help

maintain adequate mental health. However, for youth with a high tendency for anxiety, like those corresponding to the Internalizing and specific anxious profile, these strategies might also be used less efficiently. For instance, Internalizing and specific anxious youth, especially girls, showed a greater tendency for cognitive avoidance and might come to increasingly rely on social support, in combination with cognitive restructuring and problem-solving, to avoid facing stressors on their own. As avoidance is a process through which anxiety is maintained over time (Borkovev et al., 2004), this form of coping might nurture and maintain anxiety. Further supporting that youth with an Internalizing and specific depressive and Internalizing and specific anxious profiles might not use coping strategies in the same way, it seems that adopting avoidant strategies increases the risk of displaying anxious symptoms one year later (Richardson et al., 2021). However, avoidant strategies do not seem to predispose to depressive symptoms in youth, but rather that their depressive symptoms lead them to rely on avoidant strategies one year later (Richardson et al., 2021). Youth with depressive symptoms might come to increasingly rely on these strategies to try and manage their symptoms. Overall, these results suggest considering the direction of associations between coping strategies and internalizing symptoms over time.

## Limitations

The study's results should be interpreted in light of some limitations. First, the cross-sectional nature of this study prevented from considering developmental trends in boys and girls. Longitudinal studies would make it possible to achieve a fine-grained representation of the directionality of the associations between trajectories of internalizing symptoms and coping strategies. Second, the study relied on a convenience sample, indicating that results should be carefully contrasted with those of other studies using samples of participants from different cultural backgrounds, countries, and age groups recruited via different procedures to document their generalizability. Finally, the study is limited by the sole reliance on self-report measures, which are known to be impacted by various biases (e.g., social desirability, etc.). It would be interesting for future studies to assess whether the current results would generalize using informant reports (i.e., structured clinical interviews) of internalizing symptoms, physiological measures of stress, and a wider range of correlates (predictors and outcomes) of the internalizing symptoms profiles identified in the present study. Moreover, the measures included focused on general aspects of anxiety and depression. A few specific manifestations of these internalizing problems might be relevant to understanding youth development. For instance, assessing social anxiety, especially in adolescence, could further the

understanding of how youth cope with the social stressors specific to their journey in secondary school.

## Conclusion

Adolescents' anxious and depressive symptoms are intimately intertwined, and results of this study reinforce the importance of studying them as such. Failing to consider that anxiety and depression are grouped under the umbrella of internalizing symptoms, but that they still bear a part of specificity, might not adequately reflect the complexity of their nature. Among those displaying internalizing symptoms, some appeared prone to feeling depressed, whereas others seemed predisposed to anxiety. Such finding was equally true for boys and girls. Yet, girls were between two and three times more likely to report internalizing symptoms accompanied by either specific depressive or specific anxious symptoms. The various profiles and sex differences uncovered in this study have important implications for the coping strategies used by youth. Compared to boys, Internalizing and specific anxious girls were more likely to rely on almost all coping strategies. As these sex differences did not appear in the other two profiles, it suggests that the general tendency for girls to use more coping strategies found in other studies (Zimmer-Gembeck & Skinner, 2015) might actually be restricted to those feeling particularly anxious. Besides, relative to Internalizing and specific depressive adolescents, Internalizing and specific anxious boys and girls seemed to rely more on primary and secondary control engagement coping strategies, but also on cognitive avoidance strategies. These results certainly advocate for a transdiagnostic approach of treatment (Garnefski & Kraaij, 2018) to develop a holistic treatment plan recognizing all aspects of adolescent boys' and girls' functioning. This study suggests that identifying and treating adolescents with internalizing symptoms would benefit from a fine-grained representation of their specific symptomatology, which might help therapists consider the likely coping implications of each of these unique profiles.

**Authors' contributions** E.O. conceived the study, analysed and interpreted the data, and wrote the original and revised manuscript; A.J.S. M. conceived the study, analysed and interpreted the data, and wrote the original and revised manuscript; K.T.G. provided the data and participated to writing the original and revised manuscript; I.A. participated to writing the original and revised manuscript; V.D. participated to writingthe original and revised manuscript; C.H. participated to the literature review and to writing the originaland revised manuscript. All authors read and approved the final manuscript.

**Data sharing and declaration** The datasets analyzed during the current study are not publicly available but are available from the corresponding author on reasonable request and with permission of K.T.G.

## Compliance with Ethical Standards

**Conflict of Interest** The authors declare no competing interests.

**Ethical Approval** This research complies with APA's ethical standards in the treatment of human samples and with the highest ethical standards. All procedures performed in this study were approved by the ethics committee of the Université du Québec en Outaouais.

**Informed Consent** Parents gave their active consent for their child to participate. Active informed consent was also obtained from all individual youth included in the study.

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**Elizabeth Olivier** Is an assistant professor at Université de Montréal. Her research focuses on the impact of teaching practices and student mental health on school motivation, engagement, and success.

**Alexandre J.S. Morin** Is a full professor at Concordia University. His major research interests include the application of advanced statistical

methods to the exploration of the social determinants of psychological well-being and psychopathologies.

**Kristel Tardif-Grenier** Is a professor Université du Québec en Outaouais. Her research focuses on interventions fostering the well-being and school engagement of students from immigrant backgrounds.

**Isabelle Archambault** Is a full professor at Université de Montréal where she holds a Canada Research Chair. Her research focuses on the differential effects of school or its practices on the engagement, well-being, and educational success of youth from vulnerable populations.

**Véronique Dupéré** Is a full professor at Université de Montréal where she holds a Canada Research Chair. Her research focuses on the life course trajectories of adolescents and young adults, and the role of social inequalities, and adversity in school-to-work transitions.

**Corinne Hébert** Is a master student at Université de Montréal. Her work focuses on student-teacher relationships among immigrant students.