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Changes over time in mental health symptoms among adolescents in Tampere, Finland

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Abstract

Background: Mental health problems are common in adolescence and seeking help for them is becoming more common. Referrals to adolescent mental healthcare have recently increased in Finland.
Objective: To examine time trends in internalizing and externalizing mental health symptoms among Finnish adolescents.
Method: A time-trend school survey was conducted among 9th graders (15-year-olds) in Tampere, Finland, in three time periods: 2002–03, 2012–13 and 2018–19 (N = 4,162).
Results: Compared to the period 2002–03, prevalence of externalizing symptoms decreased in the period 2012–13 and further in 2018–19. The prevalence of internalizing symptoms did not change significantly between 2002–03 and 2012–13; however, in 2018–19, depression, social anxiety, general anxiety, poor subjective health, stress symptoms among boys, and poor self-esteem increased compared to earlier time periods. The increases were more marked among girls. However, suicidal ideation did not increase in 2018–19 compared to earlier time periods.
Conclusion: Whereas the prevalence of externalizing symptoms decreased among Finnish adolescents between 2002–03 and 2018–19, the prevalence of internalizing symptoms increased between 2012–13 and 2018–19. To help to understand the causes of these increases and to prevent internalizing problems, further research on the underlying causes is needed.

Keywords: adolescent; adolescent psychiatry; public health; epidemiologic studies

Introduction

Adolescence is a time of marked growth and change (1). These changes enable young people to become adults but also put them at risk for developmental problems (1). Mental health disorders are the most common illness group in adolescence (2). Mental health disorders can be divided into internalizing and externalizing disorders (3). In internalizing disorders, the symptoms are directed at oneself, i.e. the problem is internalized (3). Examples of internalizing disorders/symptoms include depression and anxiety (3). In externalizing disorders, the symptoms are directed towards the outside world, manifesting through unwanted behavior, such as conduct problems or delinquency (3). In scientific literature, eating disorders have either been classified under internalizing disorders or considered to form their own category outside the dichotomy (4). Similarly,

substance abuse can be considered to constitute a category of its own or be classified under externalizing symptoms (5).

The prevalence of mental health disorders increases as children enter early adolescence (6). As adolescents mature, externalizing symptoms become less common (7). However, a minority of adolescents exhibit a pattern of externalizing symptoms that persists into adulthood; this persistent life-course subtype of externalizing behaviors, such as delinquency, often already begins in childhood (7). Similarly, the prevalences of internalizing disorders decrease as adolescents move into adulthood although they remain high among adults as well (8). In addition, a considerable proportion of adolescents suffering from internalizing symptoms continue to suffer from these symptoms as adults (8).

Being common in adolescence, mental health problems have a huge impact on adolescents' lives, impairing wellbeing, academic performance, and social relationships. In addition, if not addressed early enough, adolescent mental health problems may have far-reaching consequences in later life (9–11). In a US study (12), three quarters of mental health disorders in adulthood started before the age of 25. Therefore, when it comes to mental health disorders in adolescence, both prevention as well as early diagnosis and treatment are essential to prevent the harm caused by these disorders to individuals' lives and also the effects on public health.

The world has seen drastic changes since the beginning of the 21st century, including technological advances, the rise of social media, and an overall acceleration of the pace of life. These societal changes have raised concerns about their effects on mental health (13, 14). Concerning children and also adolescents, the accelerated pace of life and social media use may have led to increased stress and psychological suffering (13, 14).

To keep track of mental health in the population and to monitor the effectiveness of interventions on mental health disorders, data on the time trends of these disorders are needed. According to time trend studies in the 2000s and 2010s, mental health problems among Finnish adolescents have not increased (15–19). Instead, the demand for mental health services, especially for the treatment of depression and anxiety disorders, has recently increased among adolescents. The number of adolescents in psychiatric treatment has increased tremendously, likewise contacts by adolescents to primary care services due to mental health complaints (20). The rising trend in the utilization of mental health services can be seen throughout Western countries (21–23). Overall, there seems to be a huge mismatch between the stable or even decreasing trend in the prevalence of mental health problems and the increased demand for mental health services.

In Tampere University Hospital, referrals to adolescent psychiatric specialist level services increased markedly from 2015 to 2017. This prompted us to replicate an adolescent mental health survey already conducted twice, namely the Adolescent Mental Health Cohort study and its 10-year replication (24, 25). Our research questions were:
1. Has the prevalence of mental health problems changed among Finnish adolescents 2018–2019 compared to 2002–2003 and 2008–2009?
2. Are there differences in the trends between externalizing and internalizing symptoms?

Methods
The data for this study was obtained from the Adolescent Mental Health Cohort study (AMHC). The AMHC is an anonymously completed school survey by the Tampere city administration and the Tampere University, providing time-trend data on adolescent mental health. It has been conducted among 9th graders in Tampere, Finland, in the academic years 2002–03, 2012–13, and 2018–19. In 2002–03 the study was conducted using paper and pencil, in 2012–13 partly using paper and pencil and partly online, and in 2018–19 completely online. The number of participants was 1,483 in 2002–03, 1,293 in 2012–13, and 1,386 in 2018–19 (N = 4,162 in the whole sample). Participation in the survey was voluntary and adolescents and their guardians were informed about the voluntary nature of the study both orally and in writing. To evaluate whether increased help-seeking was due to increased concerns about common mental health symptoms, the measures of this study comprised both common mental health symptoms (drunkenness, bullying, subjective health) and more severe symptoms suggestive of mental health disorders (depression, social anxiety, eating disorders, etc.). The study was approved by Pirkanmaa Ethics Committee and the City of Tampere.

Measures
As the purpose of this study was to assess changes in self-reported mental health symptoms over time instead of the actual prevalences at a certain point in time, the cutoff points of all measures were held constant across the study waves. Therefore, the cutoff points used in the analyses between the two earlier waves were preserved in these analyses.

Depression
Raitasalo's modification of the short form of the Beck Depression Inventory (R-BDI, 26) was used to measure depression. R-BDI is a Finnish modification of the 13-item Beck Depression Inventory (27), in which options indicating positive mood have been added to each item. The questionnaire has been shown to possess good reliability in adolescent populations (28). The cutoff was set between moderate and severe depressiveness (a score of 8 or more on the R-BDI).

Suicidal ideation
Suicidal ideation was elicited as follows: "Do you have thoughts of self-harm?" The response options were "I have never had suicidal thoughts/I don't think of or want to hurt myself/I feel it would be better if I were dead/I have detailed plans for suicide/I would commit suicide if I had a chance". The last two options refer to self-reported thoughts

of engaging in suicide-related behavior, which is considered suicidal ideation according to the definition in the scientific literature (29).

Social anxiety

Social anxiety was elicited by the Mini-SPIN. The Mini-SPIN is a three-item short version of the Social Phobia Inventory (SPIN), a well validated measure of social anxiety (30). The Mini-SPIN questionnaire has been shown to be a valid measure of screening social phobia in adolescent population (31). The Mini-SPIN consists of three SPIN items: (1) "Fear of embarrassment causes me to avoid doing things or speaking to people," (2) "I avoid activities in which I am the center of attention," and (3) "Being embarrassed or looking stupid are among my worst fears." The items are rated using a 5-point scale: 0 = not at all, 1 = a little bit, 2 = somewhat, 3 = very much, 4 = extremely. The Mini-SPIN has been used with various cutoff points (31). A sum score of 9 or more was set as a cutoff point in previous waves and was therefore preserved in this study to retain comparability between the waves.

General anxiety

General anxiety was elicited with a question used in previous large community samples of adolescents (32, 33): "Are you anxious/nervous?" The response options were: "I consider myself self-possessed and do not get anxious very easily/I don't feel anxious/nervous/I get anxious/nervous rather easily/I get distressed, anxious or nervous very easily/I feel constant anxiety and distress as if my nerves were worn out". The last two options were considered general anxiety, as in previous studies using the same measure (32,33).

Eating disorders

Asking directly about eating disorders has been shown to be a valid screening method for eating disorders at population level (34). Eating disorders were elicited as follows: "Have you had or been suspected of having an eating disorder?" The response options were "no/yes, anorexia/yes, bulimia/yes, both". Treatment for eating disorders was elicited as follows: "Have you ever been treated for an eating disorder?" The response alternatives were "no/yes". The third question eliciting untreated eating disorders was formulated as follows: "Have you suffered from an eating disorder without seeking help?" The response options were "no/yes, from macilency/yes, from bingeing/I do not know". These variables were combined to form two variables, the first one on having had/having been suspected of having/having been treated for anorexia; the other one on having had/having been suspected of having/having been treated for bulimia.

Stress symptoms

The questionnaire on psychosomatic symptoms covered a spectrum of symptoms frequently used in different symptom checklists. The questionnaire has been widely used in nationwide Finnish studies of adolescent health (34). The respondents answered the question "How often have you had the following symptoms in the past half year?" Below followed a list of symptoms: "Neck pain, lower back pain, stomach pain, anxiety or nervousness, irritability or bursts of anger, difficulty falling asleep or waking up at night, headache, tiredness or debility". The response alternatives were "seldom or never/about once a month/about once a week/almost every day". Anxiety or nervousness, irritability or bursts of anger, and difficulty falling asleep or waking up at night were combined to form the stress symptoms variable. Experiencing any of these symptoms at least once a week was considered experiencing stress symptoms.

Poor subjective health

The participants were asked to assess their health on a four-step scale used in previous studies on adolescent subjective health (35). The question was formulated as follows: "What do you think of your health?" The response options were: "It is very good/quite good/mediocre/quite or very bad". For the analyses, the measure was dichotomized so that "mediocre" and "quite or very bad" were classified as poor subjective health.

Poor self-esteem

Self-esteem was measured with the Rosenberg Self-Esteem Scale (RSES; 36). The RSES is the most widely used measure of self-esteem globally (37). The statements to which a response was requested were: "I think I am at least as valuable a human being as other people; I think I have several good qualities; I tend to consider myself a failure; I can do things as well as most other people; I think I do not have much to be proud of; I think of myself positively; I am reasonably happy with myself; I wish I had more self-respect; I feel very useless at times; Sometimes I think I am not good for anything". The response options were: "1 = completely disagree, 2= disagree, 3 = agree, 4 = completely agree". As no widely-used cutoff points on poor self-esteem exist, a sum score of less than 25 was considered poor self-esteem as done in a previous study using the same instrument (38).

Drinking and substance use

Lintonen & Rimpelä (39) have shown that when adolescents are asked about their drinking, their perceptions correlate well with their blood alcohol concentrations. In this study, lifetime drunkenness

was elicited with the following question: "Have you ever drunk so much alcohol that you have been REALLY DRUNK?" The response options were: "never/yes, once/yes, 2–3 times/yes, 4–10 times/yes, more than 10 times". The response option "more than 10 times" was considered several episodes of drunkenness in one's lifetime. Frequent drunkenness was elicited as follows: "How often have you drunk until you were REALLY DRUNK?" The response options were "never/less often than monthly/1–2 times a month/once a week". The latter two options were considered to indicate frequent drunkenness. Lifetime cannabis use was elicited as follows: "Have you ever tried or used hashish or other cannabis products?" The response options were "never/once/2–4 times/5 times or more". All other options apart from "never" were considered as having tried cannabis in one's lifetime.

Delinquency
Delinquency was measured by the aggression and delinquency scales of the Youth Self Report (YSR; 40). The YSR is a widely used youth self-report measure for the assessment of emotional and behavioral problems. In a given population, scoring to the 90th percentile is considered to indicate clinically significant symptoms on each scale (40). Therefore, respondents were defined as having self-reported delinquency by scores equal to or higher than the 90th percentile.

Bullying perpetration and truancy
Bullying others was elicited as follows: "How often during THIS SEMESTER have you participated in bullying other pupils?" The response options were "not once/once or twice/2–3 times a month/around once a week/several times a week". Bullying several times a week was considered frequent bullying perpetration. Truancy was elicited the following way: "How many whole school days have you skipped during the past 30 days: Playing truant?" The response options were "not once/one day/2–3 days/more than 3 days". The last option was considered playing truant.

Statistical analyses
Statistical analyses were conducted using SPSS software. The prevalences of internalizing and externalizing symptoms among both sexes in different time periods were calculated using crosstabs with the Chi-square test. In order to avoid bias related to multiple testing, we set the limit for statistical significance at $p < 0.001$. The associations between internalizing and externalizing problems and time were calculated separately for both sexes using binomial logistic regression. Results are shown as odds ratios (OR) and 95% confidence intervals (CI). Age, parental education, parental employment status, and family structure were controlled for in the analyses. The distributions of these sociodemographic variables are presented in Table 1.

TABLE 1. Distributions of socioeconomic characteristics in the study population (%)

	Girls				Boys			
	2002–2003	2012–2013	2018–2019	*p**	2002–2003	2012–2013	2018–2019	*p**
N	700	657	676		783	636	710	
Family structure								
mother and father	68.7	77.8	78.0	0.003	69.7	77.8	83.1	<0.001
other family structure	25.7	20.7	19.5		22.9	19.5	14.5	
missing	5.6	1.5	2.5		7.4	2.7	2.4	
Both parents only basic education								
no	69.4	79.3	85.2	<0.001	68.7	87.4	84.6	<0.001
yes	20.0	9.3	5.6		18.3	7.7	4.4	
missing	10.6	11.4	9.2		13.0	12.6	11.0	
Parental unemployment past year								
no	68.7	75.8	71.2	0.02	73.1	72.3	75.5	0.4
one parent	27.1	19.8	24.4		21.7	21.7	18.7	
both parents	2.9	2.3	1.9		3.1	2.8	2.1	
missing	1.3	2.1	2.5		2.2	3.1	3.7	

Note. *P-values were calculated by Chi-square test

TABLE 2. Distributions of internalizing problems over time (% (n/N))

	Girls				Boys			
	2002–2003	2012–2013	2018–2019	p*	2002–2003	2012–2013	2018–2019	p*
Depression	11.4 (80/700)	12.6 (83/657)	23.9 (161/673)	<0.001	5.0 (39/783)	3.3 (21/632)	8.0 (57/709)	0.001
Suicidal ideation	0.9 (6/685)	0.3 (2/650)	0.6 (4/647)	0.4	1.2 (9/778)	0.2 (1/627)	1.0 (7/700)	0.09
Social anxiety	9.4 (66/699)	11.6 (76/656)	28.3 (185/653)	<0.001	8.2 (64/782)	6.0 (38/632)	12.8 (87/679)	<0.001
General anxiety	27.0 (186/690)	32.9 (214/650)	38.4 (249/648)	<0.001	19.0 (144/757)	15.2 (92/605)	34.0 (233/685)	<0.001
Anorexia	14.3 (99/693)	18.6 (121/650)	18.6 (121/650)	0.05	3.0 (23/770)	1.3 (8/618)	3.6 (24/676)	0.03
Bulimia	4.8 (33/693)	5.3 (34/647)	0.5 (3/648)	<0.001	0.5 (4/768)	0.3 (2/613)	0.3 (2/689)	0.7
Poor subjective health	18.4 (128/697)	14.9 (96/643)	27.8 (185/665)	<0.001	14.5 (113/778)	9.6 (57/595)	17.0 (116/683)	0.001
Poor self-esteem	19.6 (136/694)	20.8 (134/645)	30.6 (199/650)	<0.001	8.9 (68/761)	6.1 (38/619)	9.6 (63/658)	<0.001
Stress symptoms	56.1 (393/685)	55.3 (363/639)	51.2 (346/642)	0.4	39.0 (305/753)	33.6 (214/597)	50.1 (356/678)	<0.001

Note. *P-values were calculated by Chi-square test

TABLE 3. Distributions of externalizing problems over time (% (n/N))

	Girls				Boys			
	2002–2003	2012–2013	2018–2019	p*	2002–2003	2012–2013	2018–2019	p*
Lifetime drunkenness	41.6 (290/697)	21.9 (143/653)	9.7 (63/649)	<0.001	38.9 (304/781)	17.6 (110/624)	11.1 (77/691)	<0.001
Frequent drunkenness	16.8 (117/695)	27.0 (176/651)	4.4 (29/662)	<0.001	20.4 (159/781)	16.5 (104/629)	4.8 (34/702)	<0.001
Cannabis use	11.1 (78/700)	5.3 (35/656)	5.2 (34/653)	<0.001	12.1 (95/782)	9.6 (60/628)	6.2 (43/695)	<0.001
Delinquency	18.2 (127/699)	9.0 (59/656)	7.2 (48/667)	<0.001	16.1 (126/781)	6.5 (41/633)	5.7 (40/702)	<0.001
Bullying others	1.9 (13/697)	0.3 (2/650)	0.4 (3/669)	0.003	5.6 (44/781)	2.1 (13/628)	1.1 (8/702)	<0.001
Playing truant	4.0 (24/600)	3.9 (22/557)	2.8 (17/605)	0.5	3.6 (25/690)	3.1 (17/547)	1.6 (10/625)	0.07

Note. *P-values were calculated by Chi-square test

TABLE 4. The odds ratios and 95% confidence intervals for internalizing problems for both sexes over time. Age, parental education level, family structure and parental unemployment were controlled for

	Girls			Boys		
	2002–2003	2012–2013	2018–2019	2002–2003	2012–2013	2018–2019
Depression	ref*	1.2 (0.9–1.8)	2.9 (2.0–4.0)	ref	0.6 (0.3–1.1)	1.6 (1.0–2.7)
Suicidal ideation	ref	0.4 (0.1–1.9)	0.6 (0.1–2.4)	ref		0.8 (0.2–3.2)
Social anxiety	ref	1.3 (0.9–2.0)	4.1 (3.0–5.8)	ref	0.7 (0.5–1.2)	1.6 (1.1–2.3)
General anxiety	ref	1.4 (1.1–1.8)	3.3 (2.6–4.2)	ref	0.8 (0.6–1.1)	1.2 (0.8–2.8)
Anorexia	ref	1.5 (1.1–2.1)	1.5 (1.1–2.0)	ref	0.6 (0.2–1.3)	1.5 (0.7–2.8)
Bulimia	ref	1.2 (0.7–2.0)	1.4 (0.9–2.4)	ref	1.0 (0.2–5.7)	1.3 (0.3–5.7)
Poor subjective health	ref	0.9 (0.7–1.3)	1.9 (1.4–2.5)	ref	0.6 (0.4–0.9)	1.3 (0-9–1.8)
Poor self-esteem	ref	1.4 (1.0–1.8)	2.1 (1.6–2.8)	ref	0.6 (0.4–1.0)	1.1 (0.8–1.7)
Stress symptoms	ref	1.0 (0.8–1.2)	1.0 (0.7–1.2)	ref	0.8 (0.6–1.0)	1.7 (1.3–2.0)

Note. *Years 2002–2003 used as a reference group

TABLE 5. The odds ratios and 95% confidence intervals for externalizing problems for both sexes over time. Age, parental education level, family structure and parental unemployment were controlled for

	Girls			Boys		
	2002–2003	2012–2013	2018–2019	2002–2003	2012–2013	2018–2019
Lifetime drunkenness	ref*	0.4 (0.3–0.5)	0.2 (0.1–0.2)	ref	0.4 (0.3–0.5)	0.2 (0.2–0.3)
Frequent drunkenness	ref	2.1 (1.5–2.8)	0.3 (0.3–0.5)	ref	0.9 (0.7–1.1)	0.2 (0.2–0.4)
Cannabis use	ref	0.5 (0.3–0.9)	0.5 (0.3–0.8)	ref	0.8 (0.5–1.1)	0.6 (0.4–0.8)
Delinquency	ref	0.5 (0.3–0.7)	0.4 (0.3–0.6)	ref	0.4 (0.2–0.6)	0.3 (0.2–0.5)
Bullying others	ref	0.1 (0.01–0.8)	0.2 (0.03–0.8)	ref	0.3 (0.1–0.6)	0.2 (0.07–0.4)
Playing truant	ref	1.1 (0.6–2.2)	0.7 (0.4–1.5)	ref	0.9 (0.4–1.8)	0.7 (0.3–1.7)

Note. *Years 2002–2003 used as a reference group

Results

Compared to the period 2002–03, the prevalences of internalizing problems did not change markedly in the period 2012–13. Instead, in the period 2018–19, the prevalences of depression, social anxiety, general anxiety, poor subjective health, and poor self-esteem increased in both sexes compared to the period 2012–13. In addition, the prevalence of stress symptoms increased among boys between the period 2012–13 and 2018–19. No change or a slight decrease in prevalence was observed in bulimia, anorexia, and stress symptoms among girls (Table 2).

The prevalence of externalizing problem behaviors decreased throughout the study period. Compared to the period 2002–03, all externalizing problem behaviors showed either a decrease or no marked change in the period 2012–13, apart from frequent drunkenness among girls, which increased compared to baseline. The prevalence of lifetime drunkenness, frequent drunkenness, delinquency, and playing truant decreased from the period 2012–13 to 2018–19 (Table 3).

The regression analyses controlling for sociodemographic confounding confirmed that among girls, depression, social anxiety, poor subjective health, and poor self-esteem increased from 2002–03 to 2018–19. General anxiety already increased statistically significantly from 2002–03 to 2012–13, and further to 2018-19, and self-reported anorexia increased between the years 2002–03 and 2012–13 among girls and between 2012–13 and 2018–19 among boys. Statistically significant increases were seen between 2012–13 and 2018–19 in social anxiety, depression, and stress symptoms among boys. (Table 4.)

Regarding externalizing symptoms among girls, statistically significant decreases were seen between the period 2002–03 and 2012–13 in lifetime drunkenness, cannabis use, delinquency, and bullying others. All externalizing symptoms decreased among girls in the period 2018–19 apart from cannabis use, which remained the same. Among boys, statistically significant decreases were found in all externalizing symptoms throughout the study period. (Table 5.)

Discussion

In this study, we observed that the prevalences of externalizing symptoms decreased and those of internalizing symptoms increased among Finnish adolescents between the period 2012–13 and 2018–19. Compared to the period 2002–03, the prevalences of externalizing symptoms decreased in the years 2012–13 and further in 2018–19. The prevalences of internalizing symptoms did not change significantly in 2012–13 compared to baseline. In 2018–19, depression, social anxiety, general anxiety, poor subjective health, stress symptoms among boys, and low self-esteem increased 1.5–2-fold compared to baseline. However, severe suicidal ideation did not increase over the study period.

Today's Western society is decidedly characterized by an acceleration in almost every area of life (14). Intensification is a fairly new term in psychology developed and used to describe the acceleration of technology, social changes, and the pace of life in modern society (14). This acceleration can also be seen in the school world (41). The modern school system is driven by an efficiency-oriented philosophy, thereby putting a lot of pressure on adolescents who are still in search of their identities (41). Leaving little room for searching and experimenting, the school world may in part contribute to the increased burnout and mental health symptoms seen among adolescents (41).

The Finnish education system has gained international renown for its equality and academic excellence (42). Being free of charge through all levels from preschool to university, it offers children and adolescents equal opportunities for education regardless of their parents' financial status. In addition, Finnish students have performed exceptionally well in the international tests measuring academic achievement, including the PISA tests (42). However, recent studies have observed regional differences between Finnish schools in academic achievement. School inequality is already apparent in secondary schools, especially in bigger cities, where schools located closer to the city center tend to be ranked higher in comparisons than suburban schools (43). Also, budget cuts to education, leading to bigger classes and integrating students with special education needs into mainstream classrooms, may have increased the struggles of adolescents at school (44).

Since the beginning of the 21st century, social media has become a highly pervasive element in adolescent everyday life. In social media, people tend to post selectively only positive pictures and stories about their lives – often enhanced with editing filters – which gives viewers a skewed picture of reality (45). Comparing one's life to the unrealistic images in social media can easily lead to feelings of relative deprivation (44). Substantial consumption of social media apps, including Instagram and Facebook, has indeed been linked to increased likelihood of suffering from internalizing symptoms, especially depression and anxiety (45, 46). On the other hand, social media may also have had a positive impact on adolescent mental health. Thanks to those with influence in social media, awareness of different mental health issues has increased significantly in recent decades (47). Influential social media participants who are role models for many young

people open up about their own mental health struggles and share information on psychiatric disorders with their followers, aiming at reducing the stigma surrounding mental illness. Adolescents may therefore be better informed about mental health problems, recognize these symptoms more easily in themselves, and be encouraged to open up about their problems more than earlier.

Finally, the decline in externalizing problems that emerged prior to the recent rise in internalizing problems warrants attention. The maturity gap theory of adolescent delinquency posits that adolescents experience a discrepancy between their biological maturation, resulting in their desiring autonomy and independence, and their social maturation, i.e. the degree of autonomy allowed to them, that lags behind their biological maturation in contemporary Western societies (48, 49). Being accorded a status of restricted autonomy, adolescents start to engage in delinquent acts in an attempt to bridge the gap between their self-perceived maturity and the way society perceives them, adolescents have been shown to engage in less delinquency or desist from it when they assume adult roles and start to perceive themselves as adults. It may be that the intensifying pace of life and intensifying demands in the school world may be opportunities for unrestricted social interaction, and the opportunity to experiment with roles in social media offers contemporary adolescents a perception of themselves as responsible actors facing adult challenges, and this decreases their desire to engage in externalizing behaviors. On the other hand, the same demands may risk overwhelming the adolescents' capacities and expose them to internalizing symptoms (48, 49).

Limitations
The results of this study should be viewed with certain limitations in mind. First, the sample of this study consists of 9th graders in one city, and therefore the results may not be generalizable to the whole of Finland. Second, as with all surveys relying on self-report data, this study is subject to bias. Most notably recall bias has to be taken into account in self-report questionnaires. Another source of error is mischievous responding: some adolescents may find it funny to exaggerate their symptoms in questionnaires. However, there is no reason to assume that such responding had increased over the years and therefore explains the increased trend in internalizing symptoms observed in this study.

Despite the limitations, this study has several strengths. It was based on a large, population-based sample that included nearly all 9th graders in the city of Tampere. The same survey was conducted at three time points, which enabled us to study time trends in

mental health symptoms. The measures of mental health symptoms were held constant across questionnaires, thereby ensuring the comparability of the results between periods.

Clinical significance
Internalizing symptoms have increased among adolescents in the city of Tampere since the beginning of the 21st century. At the same time, the prevalence of externalizing symptoms has decreased. Societal changes, including the accelerated the pace of life, competition in the school world, and social media may have contributed to the increase in internalizing symptoms among adolescents. To help to understand the causes of the increase and to prevent internalizing problems, further research on the underlying causes of the increased prevalence of internalizing symptoms is needed.

Conflicts of interest
All authors declare no conflicts of interest.

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