

RESEARCH ARTICLE

Posttraumatic growth during the COVID-19 lockdown: A large-scale population-based study among Norwegian adolescents

Vidar Sandsaunet Ulset¹ | Tilmann von Soest^{1,2}

¹ PROMENTA Research Centre,
Department of Psychology, University of
Oslo, Oslo, Norway

² Norwegian Social Research (NOVA),
Oslo Metropolitan University, Oslo,
Norway

Correspondence

Vidar Sandsaunet Ulset, PROMENTA
Research Centre, Department of Psy-
chology, University of Oslo, P.O. Box 1094
Blindern, 0317 Oslo, Norway.
Email: vidar.ulset@psykologi.uio.no

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Abstract

The negative consequences of the COVID-19 lockdown during the spring of 2020 have been documented. However, adolescents may also have experienced positive personal and interrelational changes. This was the first study to examine the prevalence of posttraumatic growth (PTG) during the lockdown. We additionally explored how potential risk and protective factors, as well as experiences with the pandemic, were related to PTG and whether these associations were moderated by mental health resources and social support. We used data from a representative survey of 12,686 junior and senior high school students from Oslo, Norway, conducted during the lockdown (37% response rate, 56.4% girls). A short version of the Posttraumatic Growth Inventory was used to assess growth relative to personal strength, relationships with others, and appreciation of life. Several potential predictors in the domains of mental health, social relationships, experiences during the pandemic, and sociodemographic background factors were examined. Results from multiple regression analyses showed that satisfaction with life, parental care, worries about the pandemic, and immigrant status were the most prominent predictors of PTG, β s = .14–.22, $p < .001$. Moderation analyses indicated a complex interplay between predictors of PTG by showing that good mental health was associated with higher degrees of PTG only in groups typically considered to be at higher risk of adverse outcomes. The findings provide information regarding who would profit from additional help to reinterpret the dramatic events during the lockdown to facilitate growth.

Adolescence is a transitional, formative, and malleable developmental period characterized by a strong dependence on external routines and social relationships that help adolescents make sense of the world (Steinberg et al., 2006). As such, the COVID-19 pandemic and resulting lockdowns that were enforced in most countries may have

been a highly stressful psychological event for many adolescents, dramatically changing their everyday lives. In Norway, as in many other countries, strict restrictions were enforced in spring 2020 to limit the pandemic, including school closures, restrictions on recreational activities, and social distancing measures. Research indicates

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that the prevalence of anxiety disorders, depression, and sleep problems have increased during the pandemic, particularly among young people (Huang & Zhao, 2020; Liang et al., 2020). However, although the pandemic has been distressing, some individuals may also experience positive outcomes. Such positive personal and interrelational changes have been observed in other situations when people encounter crises, stressful situations, or traumatic experiences and have been conceptualized under the term *posttraumatic growth*. The present research aimed to examine whether posttraumatic growth could be observed among a large-scale, representative sample of Norwegian adolescents when restrictions due to the COVID-19 pandemic were at their most severe (i.e., April and May 2020). Moreover, we examined a multitude of potential predictors of posttraumatic growth in the domains of mental health, social relationships, experiences during the pandemic, and sociodemographic background factors. This research was the first large-scale study to investigate posttraumatic growth during the COVID-19 pandemic.

Posttraumatic growth during the COVID-19 pandemic

Posttraumatic growth is a positive psychological change that may occur when individuals encounter a traumatic experience, a crisis, or a highly stressful event (Meyerson, Grant, Carter, & Kilmer, 2011). The literature on posttraumatic growth has typically focused on what Tedeschi et al. (1998) termed “seismic psychological events” that challenge individuals’ assumptions about the society in which they live and their schematic structures that guide their sense of purpose, plans about the future, and understanding of the world. Alterations in such schematic beliefs and assumptions about the world are accompanied by high levels of psychological stress. Tedeschi and Calhoun (2004) proposed that in the aftermath of such events, a cognitive restructuring takes place, producing new cognitive schemas that have improved resistance and fit better with the “new reality.” It is this outcome that individuals experience as growth.

For a significant number of young people, the COVID-19 pandemic may represent such a seismic psychological event. For example, the pandemic may challenge one’s basic beliefs about their physical safety and the safety of others. Empirical findings suggest that adolescents may be worried about infection from the coronavirus among family and friends, both in Norway (Zickfeld et al., 2020) and in other countries (Huang & Zhao, 2020). Moreover, the anticipated economic consequences of COVID-19 may elicit considerable stress among adolescents, such as when parents become unemployed or temporarily laid off and

the disastrous economic impact of COVID-19 on society as a whole. Thus, the COVID-19 pandemic shows many characteristics of a psychological seismic event, which may lead to significant distress but also promote posttraumatic growth. However, to the best of our knowledge, the prevalence of posttraumatic growth during the COVID-19 pandemic has not yet been examined in a published study. We sought to address this research gap by examining posttraumatic growth in a large, population-based, sample of Norwegian adolescents.

Potential factors associated with the posttraumatic growth during the COVID-19 pandemic

A major aim of the present research was to identify factors that predict posttraumatic growth during the COVID-19 pandemic. In the empirical literature on posttraumatic growth, reviews of studies among children and adolescents have identified mental health factors, social relationship factors, and characteristics of the traumatic event as three important groups of predictors (Bernstein & Pfefferbaum, 2018; Meyerson et al., 2011). In addition, several sociodemographic factors are thought to be related to posttraumatic growth (Joseph & Linley, 2006). Therefore, these four groups of predictors may be of importance for understanding posttraumatic growth during the COVID-19 pandemic.

First, some have focused on the associations between mental health variables and posttraumatic growth in adolescents. Most of these studies have investigated the link between posttraumatic stress symptoms and posttraumatic growth and found positive correlations (Meyerson et al., 2011). In contrast, psychopathology has often been found to be inversely associated with posttraumatic growth (Meyerson et al., 2011). This inverse association may be explained by the fact that people who report good mental health engage in coping strategies, such as positive appraisal, to deal with distress (Compas et al., 2001). Thus, posttraumatic growth may be an expression of a positive outlook on a difficult situation. Moreover, mental health problems, such as depression, consist of negative emotional, cognitive, and behavioral patterns of perceived hopelessness about the future, withdrawal from social relationships, negative interpretation of events, lack of self-confidence, and rumination over past events (Thapar et al., 2012). Some studies have reported positive associations between posttraumatic growth and positive mental health factors, such as satisfaction with life (Cann et al., 2010; Teodorescu et al., 2012); however, the findings are mixed (Gotay et al., 2007), and most research in this domain has been limited by relatively small sample sizes, which reduce statistical power

and do not allow for complex multivariate analyses or examinations of moderator effects (Meyerson et al., 2011).

The literature also supports a positive association between posttraumatic growth and intrusive and repetitive thoughts about the stressful event, both in adults (Linley & Joseph, 2004) and children (Bernstein & Pfefferbaum, 2018; Kilmer & Gil-Rivas, 2010). Previous research has mainly focused on rumination (Meyerson et al., 2011), and little attention has been paid to worry, which is another type of persistent and repetitive thinking that may be a more pertinent cognitive process during a pandemic. Whereas rumination is a metacognitive preoccupation with repetitive thinking of past events (e.g., a traumatic event), worry is a type of repetitive thinking about future events or threats (Fresco et al., 2002); for example, adolescents may worry that they or someone close will be infected with the virus. Intrusive and unproductive worry and rumination are both considered key thinking patterns that maintain psychopathology (Segerstrom et al., 2000; Young & Dietrich, 2015). However, positive associations between rumination and posttraumatic growth have been observed when rumination is deliberate and reflective (Stockton, Hunt, & Joseph, 2011). In a similar vein, elements that support constructive worry about the pandemic, such as talking with parents or significant others, may be beneficial and increase posttraumatic growth.

With regard to social relationships, researchers have proposed that empathetic and caring parents may limit the likelihood of posttraumatic growth in children and adolescents because such parents may reduce the stress that youth experience (Kilmer & Gil-Rivas, 2010). On the other hand, parents who are highly involved with their children may help them make sense of their worries and incorporate the stressful event into new and more resilient cognitive schemas about the world (McLean & Mansfield, 2012). Tedeschi and Calhoun (2004) noted that an essential part of productive rumination for children and adolescents includes confiding in adults, thereby also highlighting the potential role of parental care and availability. The findings from a recent review highlighted the scarcity of studies assessing the importance of parent- and family-related variables with regard to posttraumatic growth in children and adolescents (Bernstein & Pfefferbaum, 2018). The two existing studies that focused on family functioning and levels of parental acceptance and warmth did not find links with posttraumatic growth; however, the relatively small samples in both studies may have limited the statistical power to detect such effects (Felix et al., 2015; Hafstad et al., 2010).

Findings concerning the link between social relationships with peers and posttraumatic growth among adolescents have been mixed (Bernstein & Pfefferbaum, 2018;

Meyerson et al., 2011), with some studies, particularly those conducted in the United States and Canada, not showing associations (Yaskowich, 2003) and research from other countries, such as China, demonstrating associations between high-quality peer relationships and posttraumatic growth (Yu et al., 2010). The link between social relationships and posttraumatic growth may depend on differences between cultures, and data from a Scandinavian context will provide new information.

Adolescent experiences during the COVID-19 pandemic represent an important factor in examining posttraumatic growth, as some adolescents may report a higher degree of suffering due to pandemic-related impacts than others. It is probable that such experiences may be of importance, as previous research has demonstrated that the type and intensity of trauma exposure is an important source of variation in posttraumatic growth (Meyerson et al., 2011). One study suggested that natural events may be more strongly associated with growth than events caused by humans (Ickovics et al., 2006). Some studies have found a positive correlation between the severity of a traumatic event and posttraumatic growth; however, the findings have been mixed (Meyerson et al., 2011). The present study aimed, therefore, to examine how experiences associated with the COVID-19 pandemic—such as having been in quarantine and parental unemployment because of the pandemic—are related to posttraumatic growth.

Regarding sociodemographic factors, a meta-analysis of gender differences in adults found that women reported higher levels of posttraumatic growth than men (Vishnevsky et al., 2010). In their reviews of the child and adolescent posttraumatic growth literature, Bernstein and Pfefferbaum (2018) and Meyerson et al. (2011) reported mixed findings on gender differences. Theoretical accounts have also proposed that the ability to experience posttraumatic growth may increase across childhood. However, the empirical literature on age differences is mixed and does not provide sound support for an increased potential for posttraumatic growth with increasing age (Bernstein & Pfefferbaum, 2018; Meyerson et al., 2011).

Socioeconomic status is another possible influence that may be directly related to posttraumatic growth. Adolescents from low-income families are likely to be more impacted by trauma exposure and fulfill more of the theoretical prerequisites for posttraumatic growth (Splevins et al., 2010). For example, during the COVID-19 pandemic, Norwegians with low-income jobs, typically within the travel and service industries, were found to be at higher risk of unemployment than those in higher-paying jobs (Statistics Norway, 2020). In their systematic review, Meyerson and colleagues (2011) found that of the three studies that investigated socioeconomic differences in

posttraumatic growth among adolescents, no significant differences emerged. However, these studies used small, homogenous samples with respect to socioeconomic and ethnic characteristics, with most participants coming from middle-to-high-income families and European American backgrounds. Finally, ethnic minority status may be another important factor. Some research among adults has found that individuals with minority backgrounds are more likely to experience posttraumatic growth than non-minority individuals (Helgeson et al., 2006; Maguen et al., 2006). However, little attention has been paid to potential associations between ethnic minority status and posttraumatic growth in youth.

Moderators of the links of mental health and social support with posttraumatic growth

Theoretical accounts have suggested that mental health and social support are important predictors of posttraumatic growth: Youths with good mental health may engage in positive coping strategies, and support from parents and peers may facilitate a positive reframing of difficult situations (Meyerson et al., 2011). However, the empirical findings are mixed concerning the links between mental health, social support, and posttraumatic growth in adolescents (Meyerson et al., 2011). In a recent review, Bernstein and Pfefferbaum (2018) suggested that mental health and social support may be associated with posttraumatic growth under some circumstances but not others, possibly explaining the mixed findings in the literature. For example, high levels of social support and good mental health may be particularly important among youth from disadvantaged backgrounds because such resources may be particularly salient when few other resources are available during stressful and potentially traumatic situations. Social support and good mental health may, therefore, be a stronger predictor of posttraumatic growth in disadvantaged groups. As such, it is important to consider a complex interplay between mental health, social support, sociodemographic factors, and posttraumatic growth by identifying factors that may moderate the associations among mental health, social support, and posttraumatic growth. To date, few studies have had a sufficient sample size to examine such complex associations, and researchers have been recommended to examine moderator effects (Bernstein & Pfefferbaum, 2018). We utilized a large sample to address this issue by investigating potential moderators in the associations among mental health, social support, and posttraumatic stress.

The present study

In sum, previous research on posttraumatic growth has been limited by largely focusing on adult populations, with a limited number of studies conducted among youth, particularly adolescents. Moreover, studies have typically used relatively small samples and have not examined the complex associations between posttraumatic growth and various factors, including potential moderators. Research on posttraumatic growth during the COVID-19 pandemic is particularly lacking. By using a large-scale, representative sample of Norwegian adolescents, the present study was the first to examine the prevalence of posttraumatic growth during the strict lockdowns and social restrictions associated with the COVID-19 pandemic. We expected that a substantial proportion of adolescents would report experiences of personal and interrelational growth. Moreover, we aimed to examine a multitude of factors in the domains of mental health, social relationships, experiences during the COVID-19 lockdown, and sociodemographic characteristics as potential predictors of posttraumatic growth. We expected that mental health problems would be negatively related to posttraumatic growth, whereas good relationships with parents and friends would be positively related. We anticipated that adolescents who reported they and their families were highly impacted by the COVID-19 lockdown would report more posttraumatic growth than other adolescents. Moreover, we expected female gender, ethnic minority status, and older age to be related to higher degrees of posttraumatic growth; we did not make specific predictions regarding socioeconomic status. Finally, we assessed whether any factors moderated the associations between posttraumatic growth and mental health and social support, as a recent review identified the need for research on such complex associations (Bernstein & Pfefferbaum, 2018), and the present sample was large enough to provide ample statistical power for such moderation analyses.

METHOD

Participants and procedure

The present study used data from a large-scale representative survey that was conducted between April 23 and May 8, 2020, in Oslo, Norway. At the time, students were attending digital classrooms from home, and all Norwegian schools had been closed for the previous 6 weeks. Data were collected in collaboration with the school authorities in Oslo, who asked all public junior and senior high schools in Oslo to participate in the study. Students were invited to complete the online questionnaire, which took

approximately 30 min to complete, during a digital classroom session. Of all eligible students in Oslo, 37% participated ($N = 12,686$), with lower participation rates in senior (27%) compared to junior (46%) high schools. The study was carried out by Norwegian Social Research (NOVA) at Oslo Metropolitan University. Students received written information outlining the study objectives and stating that the study was anonymous, and participation was voluntary. Parents were informed in advance about the study.

Measures

Posttraumatic growth

Participants completed items from a short form of the child version of the widely used Posttraumatic Growth Inventory (PTGI; Kilmer et al., 2009). The original PTGI consists of 21 items and was developed to assess the extent to which survivors of stressful events perceive personal benefit as a result of their attempts to cope with the event, including changes in perceptions of one's self, their relationships with others, and their philosophy of life (Tedeschi & Calhoun, 1996). A child version of the PTGI was developed (Cryder et al., 2006) to include simplified language and a scale with four response options instead of the original six response options. Moreover, based on factor-analytic studies, a 10-item short version of the child version was developed, with favorable psychometric properties (Kilmer et al., 2009). All versions of the scale are designed to measure posttraumatic growth in five domains: relating to others, personal strength, appreciation of life, new possibilities, and spiritual change. In the present study, six of the 10 items from the short-form, child-specific version of the PTGI were used to assess three domains with two items each. The four items comprising the Spiritual Change and New Possibilities subscales were excluded because the Spiritual Change items did not seem to fit a Norwegian setting, and the participants found it hard to respond to items on the New Possibilities subscale, which references a past event, because the COVID-19 pandemic was ongoing. For the remaining subscales (i.e., Relating to Others, Personal Strength, and Appreciation of Life), respondents scored items on a scale ranging from 1 (*completely wrong*) to 4 (*completely correct*). Because confirmatory factor analyses (CFAs) provided support for both an overall factor and a three-factor solution (see Data analysis), we computed composite posttraumatic growth scores across all six items, with good internal consistency, Cronbach's $\alpha = .83$. Moreover, we computed mean scores for each of the three subscales. Internal consistency, as measured using the Spearman–Brown coefficient for two-item scales, was .58, .71, and .63, respectively, for the Relating to Others,

Personal Strength, and Appreciation of Life subscales. For some analyses, the composite score was dichotomized into low (i.e., less than 2.0) and moderate to high (i.e., 2.0 or higher; Wu et al., 2019).

Mental health and pandemic-related concerns

Depressive symptoms

Depressive symptoms were measured by using a six-item version of the Hopkins Symptom Checklist (Derogatis et al., 1974). Participants were asked to rate items on a scale of 1 (*not distressed*) to 4 (*extremely distressed*), and a mean score was computed. In the present sample, Cronbach's alpha was .87.

Life satisfaction

Satisfaction with life was measured using Cantril's Ladder (Cantril, 1965). Adolescents were asked to rate their level of satisfaction with their lives on a scale from 0 (*worst possible life*) to 10 (*best possible life*).

COVID-19- and pandemic-related concerns

To address pandemic- and COVID-19-related concerns, a three-item scale was developed for this study. Items addressed participants' concerns about contracting COVID-19, concerns regarding the virus infecting others, and concerns about family and friends being infected. Respondents rated items on a scale of 1 (*not at all worried*) to 4 (*very worried*), with higher scores reflecting a higher level of worry. In the present sample, Cronbach's alpha was .73.

Social relationships

Parental relationships

Parental care was assessed using items from a validated short-form version of the Parental Bonding Instrument (PBI; Parker et al., 1979; Pedersen, 1994). The original scale comprises 25 items that assess two dimensions: parental care and parental overprotection. In the present study, participants were asked to respond to three items related to parental care, scoring responses on a scale of 1 (*very like*) to 4 (*very unlike*). A composite score was created as the average of the three items. In the present sample, Cronbach's alpha was .68.

Friendship and social support

Friendship was assessed using one item, "Do you have at least one friend who you completely trust and in whom you can confide everything?," with responses given a score of 4 (*yes, certainly*), 3 (*yes, I think*), 2 (*I don't think so*), or 1

(*I don't have anyone I would call a friend, these days*). Participants were also asked, "If you feel down or blue and need someone to talk to, do you have someone you can talk to?" with responses scored as 2 for "yes" and 1 for "no" or "I don't know."

Experiences during the COVID-19 pandemic

Participants answered three questions about the impact of the COVID-19 pandemic on their family life, with the response options ranging from 1 (*no, not at all*) to 5 (*yes, very much*). We assessed whether adolescents or someone they lived with had been in quarantine, if one or both of the parents had lost their job or been temporarily laid off because of the pandemic, and whether one or both of the parents had a home office because of the pandemic.

Sociodemographic background

Participants were asked about their gender and educational attainment (i.e., years of schooling). Immigrant status was defined as having both parents born in a foreign country. Family affluence was assessed using the four-item Family Affluence Scale II (FAS II; Currie et al., 2008). The FAS II includes items related to the number of computers and cars in the family, how many times the family went on vacation in the previous year, and whether the respondents had their own room at home; a mean score was computed. Parental educational attainment was measured by asking participants whether their mother and father, respectively, had received a college degree, with responses scored as 0 for no parents with a college degree, 1 for one parent, and 2 for both parents. A district-level socioeconomic index (Pedersen & Bakken, 2016) was used as a composite indicator of neighborhood social status. For this measure, the following register-based information from the municipality of Oslo in which the participant lived was collected: median income, the proportion of residents receiving pay for work, the proportion of residents who reported primary school as their highest level of educational attainment, the proportion of unemployed residents, proportion of single-parent households, proportion of residents who were immigrants, and death rate. The mean Pearson correlation among the indicators was .48, and Cronbach's alpha was .86. The sociodemographic data for all 15 districts in the Oslo municipality were *z*-standardized, and a composite DLSI score was computed as the average of *z* scores. Information about participants' school grades was collected by asking for grades in Nor-

wegian, English, and mathematics. A composite score was created as the average of the three subjects.

Data analyses

To examine the factor structure of the child version of the PTGI used in this study, CFAs were conducted using the *lavaan* package in R (Version 4.0.3) to analyze the latent structure of the PTGI items. First, a solution with one overall posttraumatic growth factor was modeled, showing a satisfactory fit, $\chi^2(9, N = 10,072) = 412.70, p < .001$, comparative fit index (CFI) = .98, root mean square error of approximation (RMSEA) = .067, standardized root mean squared residual (SRMR) = .025. Second, we tested a three-factor solution with correlated latent factors consisting of Relating to Others, Personal Strength, and Appreciation of Life. This model also demonstrated satisfactory fit, with slightly better fit indices than the one-factor model, $\chi^2(6, N = 10,072) = 216.98, p < .001$, CFI = .99, RMSEA = .059, SRMR = .018. Because CFAs demonstrated support for both an overall factor and a three-factor solution, we computed both composite posttraumatic growth scores across all six items and composite scores for each of the three subscales (see Measures).

Correlation and multiple linear regression analyses were conducted to examine the associations between predictors and composite and subscale posttraumatic growth scores. Moderation analyses were conducted by including interaction terms in addition to main effects in the linear regression analyses. Because of the large sample and relatively large number of moderation analyses, we chose a level of significance of $p < .001$. We used the *interactions* package in R to conduct post hoc probing of the moderator effects. Interactions involving a continuous moderator were plotted with three lines corresponding to 1 standard deviation above the mean, the mean, and 1 standard deviation below the mean. When the moderator was a categorical variable, lines were plotted for each level of the variable. On average, across all variables, 9.7% of the data were missing. Listwise deletion was used to handle cases with missing data. We used SPSS Statistics (Version 27) to conduct post hoc analyses in which missing data were replaced using multiple imputation with five imputations. A comparison of listwise deletion and multiple imputation showed that differences between regression coefficients were .01 or less. Multiple regression analyses were run with and without outliers (i.e., cases with standardized residuals greater than 3), resulting in almost identical estimates and *p* values.

TABLE 1 Descriptive statistics and Pearson's bivariate correlations among study variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Posttraumatic growth																			
1 Posttraumatic growth	–	.85*	.86*	.86*	–.17*	.28*	.21*	.24*	.14*	.18*	.00	.03*	–.16*	.10*	–.05*	.22*	–.14*	–.13*	–.15*
2 Relating to others		–	.61*	.58*	–.12*	.23*	.20*	.27*	.18*	.20*	.01	.02	–.08*	.14*	–.03	.12*	–.06*	–.06*	–.08*
3 Appreciation of life			–	.61*	–.16*	.26*	.19*	.20*	.10*	.14*	–.00	.03*	–.16*	.07*	–.03*	.21*	–.14*	–.13*	–.14*
4 Personal strength				–	–.16*	.24*	.15*	.16*	.08*	.11*	.00	.03*	–.17*	.03*	–.06*	.23*	–.17*	–.14*	–.16*
Mental health																			
5 Depressive symptoms					–	–.53*	.19*	–.34*	–.15*	–.27*	.05*	.06*	.01	.22*	.18*	–.02	–.02	–.04*	–.00
6 Satisfaction with life						–	–.07*	.28*	.16*	.23*	–.01	–.05*	–.01	–.10*	–.11*	.03*	.02	.03*	.01
7 Worry about COVID-19							–	.05*	.02	.01	.01	.08*	–.12*	.23*	.05*	.16*	–.13*	–.14*	–.12*
Social support																			
8 Parental care								–	.21*	.32*	–.03*	–.06*	.09*	.04*	–.03*	–.07*	.12*	.09*	.02
9 Close friendship									–	.40*	–.01	–.023	.05*	.06*	.03*	–.07*	.08*	.06*	.05*
10 Someone to talk to										–	–.01	–.04*	.03*	.03*	.02	–.05*	.06*	.05*	.03*
Experiences during the pandemic																			
11 Quarantine											–	.03*	.04*	.00	.02	–.02	.03*	.02	.03*
12 Unemployment												–	–.13*	.02	.01	.13*	–.18*	–.17*	–.07*
13 Home office													–	–.01	–.02	–.52*	.52*	.48*	.36*
Sociodemographic background																			
14 Female gender															–	.03*	.02*	.02	–.02*
15 Years of schooling																–	–.01	–.00	–.07*
16 Immigrant status																	–	–.50*	–.43*
17 Family affluence																		–	.81*
18 Parental education																			–
19 DLSI																			–
<i>M</i>		2.16	2.28	2.10	2.10	2.17	6.08	2.38	1.76	1.51	1.18	1.26	1.23	2.08	1.57	3.01	0.31	1.77	2.17
<i>SD</i>		0.68	0.79	0.78	0.82	0.74	2.00	0.72	0.65	0.78	0.39	0.44	0.49	0.81	0.50	1.61	0.46	0.48	1.13

Note: DLSI = District-level socioeconomic status.

* $p < .001$.

RESULTS

Table 1 shows descriptive statistics and correlations for all study variables. The results showed that 9.6% of respondents experienced moderate-to-high levels of posttraumatic growth due to the COVID-19 lockdown (e.g., scores of 2 or higher). Composite posttraumatic growth scores were strongly and positively correlated with all three PTGI subscales (i.e., r values of approximately .85), whereas the subscales were moderately correlated with each other (i.e., r values of approximately .60). Overall, girls scored higher on the composite measure of posttraumatic growth and on all three subscales. Adolescents

with lower levels of family affluence, immigrant status, and those living in low socioeconomic areas also reported higher levels of posttraumatic growth with respect to both the composite score and subscale scores. Depressive symptoms were negatively related to posttraumatic growth, whereas satisfaction with life was positively correlated. Moreover, worry about the COVID-19 pandemic, parental care, close friendships, and someone to talk to were related to higher posttraumatic growth. Finally, having a parent who was working out of a home office was associated with less posttraumatic growth, whereas no associations were observed between posttraumatic growth and having experienced quarantine or parental unemployment.

Table 2 presents the findings from multiple regression analyses. The results revealed that immigrant status, $\beta = .14$, $p < .001$; satisfaction with life, $\beta = 0.22$, $p < .001$; parental care, $\beta = 0.15$, $p < .001$; and COVID-19-related worry, $\beta = 0.16$, $p < .001$, were the most prominent predictors of the composite posttraumatic growth score. Gender, district-level socioeconomic status, depressive symptoms, having a close friendship, having someone to talk to, and parental home office were no longer significantly associated with posttraumatic growth in the adjusted models. The pattern was similar for subscale outcomes.

Table 3 provides the results from the moderation analyses. Sociodemographic background variables, pandemic-related concern, and pandemic experiences were assessed as potential moderators of the associations between posttraumatic growth and mental health (i.e., depressive symptoms and satisfaction with life) and social support (i.e., parental care and friendships). A pattern emerged in which gender, immigrant status, pandemic-related concerns, and parental care moderated the associations between posttraumatic growth and both depressive symptoms and satisfaction with life. In particular, low levels of depressive symptoms and high degrees of satisfaction with life were more strongly related to posttraumatic growth among girls than boys. Moreover, the associations were stronger for immigrant children than ethnic Norwegian children as well as among adolescents who worried more about the COVID-19 pandemic and those who reported a high degree of parental care (see Table 3).

Concerning social support, in addition to interaction effects with mental health variables, immigrant status interacted with parental care, and gender interacted with social support (Table 3). More specifically, parental care was more strongly related to posttraumatic growth for immigrant children than for children of Norwegian ethnicity. Moreover, having someone to talk to was more strongly associated with posttraumatic growth for girls than boys. Supplementary Figure 1 provides a graphical illustration of the interaction effects for satisfaction with life (i.e., interaction effects for depressive symptoms showed similar patterns).

DISCUSSION

This study represents the research on posttraumatic growth during the COVID-19 pandemic. The goals of our study were to (a) examine the prevalence of posttraumatic growth among adolescents during the COVID-19 pandemic, (b) assess a multitude of possible psychosocial and situational predictors of posttraumatic growth, and (c) investigate the possible complex interplay among these factors. The results indicate that approximately one

in 10 adolescents in the sample reported experiencing moderate-to-high levels of posttraumatic growth during the pandemic. Multivariate regression analyses revealed that satisfaction with life, parental care, immigrant status, and adolescents' worries about consequences of the pandemic were associated with higher levels of posttraumatic growth after adjusting for a host of possible sociodemographic and psychosocial confounds. Moderator analyses revealed a pattern in which the associations between satisfaction with life and depression and posttraumatic growth were consistently dependent on factors such as worrying about the pandemic, parental care, gender, and immigrant status.

The finding that approximately one in 10 adolescents in the sample experienced moderate-to-high levels of posttraumatic growth during the lockdown suggests that pandemic-related lockdowns are a type of event that can lead to positive psychological changes, similar to other types of stressful or traumatic events. However, the prevalence of posttraumatic growth in the present sample was low compared to findings from studies of child and adolescent populations in which 30%–70% of adolescents reported moderate-to-high levels of posttraumatic growth after experiencing a traumatic or life-changing event (Laufer & Solomon, 2006; Milam et al., 2004). Similarly, the prevalence was low compared to findings from studies in adult populations, which have reported prevalence rates of approximately 50% after experiencing a serious disease or accident or being employed in a profession that carries a high risk of trauma exposure (Wu et al., 2019). The relatively low prevalence of posttraumatic growth may be attributable to the notion that the COVID-19 pandemic may have been perceived as less intrusive or significant than other stressful and traumatic experiences typically examined in posttraumatic growth research. Another possible explanation may be related to the timing of the study, which was conducted in the middle of the first lockdown. Studies of posttraumatic growth are typically conducted several months or even years following a stressful event (Meyerson et al., 2011). Posttraumatic growth is a process that may take some time to develop, and adolescents may also be less likely to remember the negative impact of events as time has passed, particularly when such events lasted for a long time (Tadić et al., 2014). As such, an assessment of posttraumatic growth later in the pandemic may have resulted in a higher prevalence rate.

We found that those adolescents who reported higher satisfaction with life were more likely to experience posttraumatic growth. This finding is consistent with previous research findings that posttraumatic growth is associated with a range of positive mental health outcomes and resources (Meyerson et al., 2011). The results also showed that low depressive symptom loads were correlated with

TABLE 2 Multivariate regression analysis

	Posttraumatic growth ^a			Relating to others			Appreciation of life			Personal strength		
	B	β	95% CI	p	B	β	95% CI	p	B	β	95% CI	p
Mental health												
Depressive symptoms	−0.02	−.02	[−.04, .00]	.106	0.02	.02	[.00, .05]	.094	−0.04	−.04	[−.07, −.01]	.003
Satisfaction with life	0.08	.22	[.07, .08]	< .001	0.07	.18	[.07, .08]	< .001	0.08	.18	[.07, .09]	< .001
Worry about COVID-19	0.15	.16	[.13, .17]	< .001	0.16	.15	[.14, .18]	< .001	0.16	.15	[.14, .18]	< .001
Social support												
Parental care	0.16	.15	[.14, .18]	< .001	.22	.18	.20, .25	< .001	0.14	.12	[.11, .16]	< .001
Close friendship	0.05	.06	[.04, .07]	< .001	.09	.08	.06, .11	< .001	0.04	.04	[.02, .06]	< .001
Someone to talk to	0.11	.06	[.07, .14]	< .001	.16	.08	.11, .20	< .001	0.08	.04	[.04, .13]	< .001
Experiences during the pandemic												
Quarantine	0.03	.02	[.00, .06]	.037	0.03	.02	[.00, .06]	.061	0.02	.01	[−.02, .05]	.295
Unemployment	0.00	.00	[−.02, .03]	.762	0.02	.01	[−.01, .05]	.167	0.00	.00	[−.03, .03]	.935
Home office	−0.04	−.05	[−.06, −.02]	< .001	−0.02	−.02	[−.04, .00]	.080	−0.05	−.05	[−.07, −.02]	< .001
Sociodemographic background												
Girl	0.10	.07	[.08, .13]	< .001	0.17	.11	[.14, .20]	< .001	0.10	.06	[.07, .13]	< .001
Years of schooling	−0.01	−.02	[−.02, .00]	.053	−0.01	−.01	[−.02, .00]	.138	0.00	.00	[−.01, .01]	.744
Immigrant status	0.21	.14	[.17, .24]	< .001	0.13	.07	[.09, .17]	< .001	0.23	.13	[.19, .27]	< .001
Family affluence	−0.02	−.05	[−.04, −.01]	.003	−0.01	−.01	[−.02, .01]	.591	−0.02	−.04	[−.04, .01]	.010
Parental education	0.00	.00	[−.02, .02]	.829	−0.01	−.01	[−.03, .02]	.602	0.00	.00	[−.02, .02]	.904
DLSI	−0.04	−.05	[−.06, −.02]	< .001	−0.04	−.03	[−.06, −.01]	.001	−0.04	−.04	[−.06, −.02]	< .001

Note: N = 1696 = District-level socioeconomic status.

^aComposite score of Posttraumatic Growth Inventory Relating to Others, Appreciation of Life, and Personal Strength subscales.

TABLE 3 Moderators of the associations of mental health and social support to posttraumatic growth^a

Moderators	Predictors							
	Mental health				Social support			
	Depressive symptoms		Satisfaction with life		Parental care		Someone to talk to	
	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>
Depressive symptoms			-.01	.183	-.05	< .001	-.03	.125
Satisfaction with life	-.01	.183			.02	< .001	.00	.994
Worry about COVID-19	-.05	< .001	.02	< .001	.03	.030	.05	.024
Parental care	-.05	< .001	.02	< .001			.07	.007
Close friendship	.01	.549	.00	.737	.01	.328	.03	.136
Someone to talk to	-.03	.125	.00	.994	.07	.007		
Quarantine	.03	.096	.01	.100	.00	.829	-.01	.869
Unemployment	.00	.794	.01	.080	.00	.975	-.01	.736
Home office	.03	.011	-.01	.016	-.01	.422	-.03	.190
Gender	-.10	< .001	.03	< .001	.04	.039	.13	< .001
Years of schooling	.01	.015	.00	.636	-.02	.006	.00	.806
Immigrant status	-.07	< .001	.03	< .001	.08	< .001	.04	.237
Family affluence	.01	.032	.00	.308	-.01	.304	-.02	.172
Parental education	.01	.066	.00	.919	-.01	.139	-.03	.046
DLSI	.05	< .001	-.01	.007	-.02	.160	-.01	.522

Note: Results are from separate multiple regression analyses with each model containing interaction terms between predictor and moderator, as well as main effects. Beta estimates and *p* values are presented for the interaction terms. DLSI = District-level socioeconomic status.

^aComposite score of Posttraumatic Growth Inventory Relating to Others, Appreciation of Life, and Personal Strength subscales.

higher degrees of posttraumatic growth; however, this association was reduced into insignificance in multivariate analyses. Milam et al. (2005) reported a similar finding such that an observed association between depression and posttraumatic growth was no longer statistically significant after adjusting for other psychosocial risk and resilience factors. Thus, it may be that the posttraumatic growth process depends on other types of psychological resilience factors or that there are mutually dependent associations between growth and resilience (Bernstein & Pfefferbaum, 2018). Such bidirectional relations could be examined in longitudinal studies, taking mental health resources into account when investigating the associations between distress and growth over multiple assessment points. Taken together, our findings are in line with those from previous studies (Meyerson et al., 2011) and add to the literature by replicating these findings in the context of a pandemic and using a large sample that allowed us to adjust for a host of possible confounding factors.

The finding that adolescents who worried more about the pandemic were more likely to experience posttraumatic growth is, however, an exception to this pattern. This is an interesting finding because theoretical accounts and empirical findings suggest strong links between posttraumatic growth and rumination, a type of repetitive thinking similar to worry. In theory, posttraumatic growth involves

the restructuring of cognitive schemas caused by a cognitive preoccupation with a traumatic event but occurs only when the thinking is deliberate and reflective (Stockton et al., 2011). Worrying about the pandemic may constitute such as process because it is a type of repetitive cognitive preoccupation with future threats that can either be deliberate or intrusive (Fresco et al., 2002). However, depressive symptoms are characterized by an involuntary, repetitive, and dysfunctional thinking process with a strong bias toward negative interpretations of events (Thapar et al., 2012). Thus, it may be that depressive symptoms interfere with or even block the deliberate and reflective type of worry that is potentially necessary for posttraumatic growth to occur, whereas worry supported the development of new cognitive schemas as participants adapted to possible pandemic-related threats. In turn, these adaptations could lead to a sense of growth. Adolescents who worried more about the consequences of the pandemic may also have experienced the lockdown as more dramatic and suffered increased distress, which is another theoretical prerequisite for posttraumatic growth.

With respect to social support factors, our finding that parental care was consistently associated with posttraumatic growth is in contrast to the few studies on parental-child relationships, which found no such associations (Felix et al., 2015; Hafstad et al., 2010). However, these

studies had small sample sizes ($N = 50$ and $N = 105$, respectively) and may not have had sufficient statistical power to identify such associations. We suggest that caring parents who are willing to discuss the pandemic with their adolescent children may help their offspring to engage in more deliberate and constructive thinking about the pandemic, which, in turn, may foster posttraumatic growth. Friendship with peers may have similar functions; however, the association with such forms for social support was smaller in size than parental care.

In multivariate analyses, experiences during the pandemic, such as quarantine, parental unemployment, and a parental home office, were not significantly related to posttraumatic growth. It is possible that the pandemic-related experiences assessed in our study may not necessarily indicate higher stress levels for adolescents and may, therefore, be of lesser importance than concerns related to the pandemic. Among sociodemographic variables, immigrant status, in particular, was consistently associated with higher posttraumatic growth in multiple analyses. This finding contributes to the scarce literature about the role of ethnicity in adolescents and extends similar findings from adult populations (Maugen et al., 2006). Minority youth may be particularly prone to experience posttraumatic growth because they are more likely to come from families that have been exposed to stress and adversity earlier in life and may have developed strategies to cope and find new opportunities in difficult situations.

Even though gender was linked with posttraumatic growth such that there was a stronger correlation for girls than boys, we encountered few or small associations between gender and dimensions of posttraumatic growth in multivariate analyses. This finding is consistent with Meyerson's (2011) review, which reported mixed findings regarding gender effects in adolescents. It is possible that girls may be more likely than boys to experience growth in the domain of relating to others, whereas gender differences in the other dimensions of posttraumatic growth appear to be small after controlling for relevant confounders. Our finding that the gender difference was specific to the domain of relating to others may point to a potential mechanism in which girls benefit more than boys from social support via their relationships with others during times of stress. This notion is consistent with a previous study finding that boys experienced less family support than girls in the context of traumatic experiences (Kimhi et al., 2009).

We examined moderators of the associations between mental health and social support and posttraumatic growth as a way to address mixed findings in the previous literature (Bernstein & Pfefferbaum, 2018; Meyerson et al., 2011). The results showed a considerable number of moderation effects of mental health (i.e., depressive symp-

toms and high satisfaction with life) such that worrying about the COVID-19 pandemic, a high degree of parental care, female gender, immigrant status, low neighborhood socioeconomic status, and immigrant status strengthened the association between good mental health and posttraumatic growth. Taken together, these findings offer an explanation of the mixed findings in the previous literature regarding the associations between mental health and social support and posttraumatic growth. It appears that good mental health is associated with more posttraumatic growth only in groups that are usually considered less privileged and have a higher risk of adverse outcomes, such as girls, individuals from a minority background, and those with low socioeconomic status (Black & Stone, 2005). It may be that girls, individuals with immigrant backgrounds, and those from neighborhoods characterized by low socioeconomic status have more experience with adversity, and positive reframing of the situation is a more readily available coping mechanism for these adolescents. Moreover, the moderator effect of parental care provides indications for the important role of parents in the interpretation of stressful life events: Supportive parents may be of particular help in perceiving positive aspects of stressful life events for adolescents who report good mental health, whereas adolescents with mental health problems may not have the emotional resources to see positive aspects of stressful life events, such as the COVID-19 pandemic, when interacting with supportive parents.

The COVID-19 pandemic and the subsequent lockdown was a potentially traumatic event that affected entire communities. Because of the wide impact of the pandemic, we were able to study posttraumatic growth in a large, population-based sample of 12,686 adolescent participants, allowing us to test multivariate models and moderator effects, thereby addressing the mixed findings reported in the previous literature. However, some limitations should be noted. First, the present work used cross-sectional data, which did not enable us to provide information about the direction of causation between variables. As such, although it is likely that mental health and social support influence an adolescent's susceptibility to posttraumatic growth, it is also possible that posttraumatic growth improves mental health and social relationships. Also for other predictors, reciprocal relationships with posttraumatic growth are possible. We also cannot rule out unmeasured confounders, such as variations in personality or genetic factors that cause systematic susceptibility to both posttraumatic growth and other psychosocial factors. Longitudinal studies can address these issues and strengthen causal inference. Second, with the exception of the district-level socioeconomic status variable, the study relied solely on self-report data. It is conceivable that individuals with high levels of depressive symptoms were less

likely to report positive experiences, such as improvements in relationships, increased appreciation of life, or improved personal strength, as previous research has shown that depressive symptoms may cause a strong bias for the negative interpretation of events (Gotlib, 1983). Third, the 37% of eligible adolescents who participated in the study may have been different from those who did not. In particular, posttraumatic growth estimates may have been influenced by this potential bias. Third, even though the factor structure and internal consistency of the composite posttraumatic growth score were satisfactory, some of the posttraumatic growth subscales and the short version of the PBI measure had somewhat low reliability, thus possibly resulting in Type II error or deflated estimates. Finally, the present study was conducted in the context of a Nordic welfare state with relatively generous social welfare policies that may have reduced the economic and emotional stress and strain during the COVID-19 lockdown to a larger degree than in other countries with less generous social welfare arrangements. It remains to be seen whether the present findings can be generalized to other countries.

This was the first study to provide information about posttraumatic growth during the pandemic and is one of the largest ever conducted in the area of posttraumatic growth among adolescents. We found that 9.6 % of adolescents in the sample experienced moderate-to-high levels of posttraumatic growth 6 weeks into the first lockdown. Moreover, moderator analyses revealed new information about the complex interplay between social support, mental health factors, and other predictors of posttraumatic growth, thereby emphasizing the importance of parental support and mental health resources in the development of posttraumatic growth. Parents may facilitate positive growth by spending time with, caring for, and talking to their adolescents about the pandemic. Moreover, encouraging peers to support one another may facilitate growth during the pandemic. The present results also have implications for practitioners and teachers, who can design interventions or talk to adolescents in a way that provides support. In particular, girls, adolescents with immigrant backgrounds, and those who worry about the pandemic are more likely to benefit from such support. However, it appears that good mental health resources are necessary for posttraumatic growth to occur. Particular attention may be directed to adolescents with preexisting mental health problems, as they may need additional help to reinterpret stressful pandemic-related events in a way that enables personal growth and improved interpersonal relationships.

OPEN PRACTICES STATEMENT

The study reported in this article was not formally preregistered. Neither the data nor the materials have been made available on a permanent third-party archive; requests for the data or materials can be sent via email to the lead author at vidar.ulset@psykologi.uio.no.

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