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Socioeconomic hardship, uncertainty about the future, and adolescent mental wellbeing over a year during the COVID-19 pandemic

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Abstract

Socioeconomic vulnerabilities put adolescents at risk for mental wellbeing issues, also in times of a pandemic. In the present longitudinal online survey study, we explored changes in mental wellbeing (i.e., mood and life satisfaction) during the COVID-19 pandemic. Second, we examined how socioeconomic hardship in online home schooling predicted adolescents' mental wellbeing 1 year later. Third, we tested whether this relation was mediated by feelings of uncertainty about the future. Fourth, we tested whether this relation was moderated (in terms of a protective factor) by self-efficacy. In total, 177 Dutch-speaking adolescents aged 10–18 years ($M_{age} = 15.64$, $SD_{age} = 1.72$, 79% females) participated in all three 6-month separated waves (T1 = May 2020, T2 = November 2020, and T3 = May 2021). Mood results demonstrated that feelings of vigor decreased between T1 and T2, and feelings of tension and depression increased between T1, T2, and T3. Socioeconomic hardship in online home schooling in the early phase of the pandemic was negatively associated with both baseline mental wellbeing and 1 year later. Socioeconomic hardship at T1 predicted higher feelings of future uncertainty at T2, and higher levels of future uncertainty were associated with lower feelings of

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vigor, and higher feelings of tension and depression at T3. However, we found no evidence for mediation or moderation effects. In conclusion, the present findings illustrate the complexity of disentangling the adverse effects of socioeconomic hardship on adolescent mental wellbeing.

KEYWORDS

adolescence, COVID-19, mental wellbeing, socioeconomic hardship, uncertainty

1 | INTRODUCTION

Adolescence is a formative period for the development of emotional and cognitive abilities (Blakemore & Mills, 2014; Crone & Dahl, 2012). The COVID-19 pandemic has threatened this development as it has limited the social experiences of youth due to social distancing, schools closing, opening, and re-closing again, and lockdowns (Liang et al., 2020; Orben et al., 2020; Panda et al., 2020). Prior studies have demonstrated that the mental wellbeing of adolescents and young adults is negatively affected by the pandemic (O'Connor et al., 2021), including an increase in internalizing symptoms, such as feelings of anxiety and depression (Hawes et al., 2021; Magson et al., 2020). These experiences may have long-term effects on mental wellbeing, a multidimensional construct often operationalized as comprising an affective component, positive and negative mood, and a cognitive component, referred to as life satisfaction (Diener et al., 1985; Gamble & Gärling, 2012).

Although the pandemic is likely to have a general negative impact on the mental wellbeing in at least a proportion of youth (Barendse et al., 2022; O'Connor et al., 2021; Power et al., 2020), certain adolescents are more vulnerable due to socioeconomic disparities (Fegert et al., 2020; Holmes et al., 2020; Nicola et al., 2020; Singh et al., 2020). The existing literature on adolescence covers a broad range of pre-pandemic studies showing the negative impact of socioeconomic hardship on internalizing symptoms and other mental health outcomes (Evans & Kim, 2013; Quon & McGrath, 2014; Reiss, 2013a). Indeed, COVID-19 studies have demonstrated that economic factors, such as economic disruption and low-income, were strongly associated with emotional distress among adolescents and young adults during the pandemic (Creswell et al., 2021; Shanahan et al., 2020). The disruption of education during the COVID-19 pandemic, where adolescents were forced to attend their classes online from home, has reinforced socioeconomic inequality among youth (Dietrich et al., 2021; Katz et al., 2021). An example is the presence of academic stress among youth as a result of disparities in internet access, and thus disparities in schooling (Mahapatra & Sharma, 2021). A study among high school students in Jordan showed that the experience of challenges and difficulties with online education during the pandemic, predicted symptoms of anxiety and depression (AlAzzam et al., 2021). Children with better home school experiences reported lower emotional and somatic/cognitive problems (Larsen et al., 2021). Even though these studies have contributed to our understanding that socioeconomic disparities and specifically hardship in online education put adolescents at risk for reduced wellbeing during the COVID-19 pandemic (Magson et al., 2020) most studies were limited to examining adolescents' wellbeing cross-sectionally during the very early phases of the pandemic, making it difficult to examine the longitudinal effects and underlying mechanisms (Ellis et al., 2020). The aim of the present study was therefore to examine how socioeconomic hardship in online home schooling at the beginning of the COVID-19 pandemic affected adolescent mental wellbeing during the pandemic using three longitudinal waves of data collection.

The present study follows up on a previous study in which we examined adolescents' mood, specifically feelings of vigor, tension, and depression, during two time points in the pandemic (Green et al., 2021). Vigor reflects feelings

of excitement, alertness, and physical energy; tension reflects feelings of nervousness, worry, and anxiety; and depression comprises feelings as hopelessness and worthlessness (Terry et al., 1999). The present study includes a third time point to continue examination of the pattern demonstrated in the first two time points (Green et al., 2021) and to examine the relation between socioeconomic hardship and adolescent mental wellbeing. The addition of a third time point in the present study also enabled us to investigate two additional longitudinal aims. First, we examine whether future uncertainty is a potential underlying mechanism within the impact of socioeconomic starting position. Second, we examined whether domain-specific self-efficacy at the beginning of the COVID-19 pandemic moderated the relation between socioeconomic starting position and mental wellbeing 1 year later.

One potential mechanism explaining the underlying long-term effects of socioeconomic hardship on mental wellbeing is adolescents' uncertainty about their future. Numerous studies have shown that families dealing with poverty or socioeconomic hardship, are also dealing with cumulative exposure to stress (Evans & Kim, 2013). As the COVID-19 pandemic has become a chain of stressful events, the continuous load of stressors may impact adolescents' mental wellbeing through feelings of uncertainty about the future. Indeed, uncertainty about the COVID-19 pandemic was one of the most frequently reported stressors according to parents (Scrimin et al., 2022). In that same study, the authors found that low-income families were more worried about the uncertainty as compared to high-income families. Previous studies have shown that the experience of a stressful or traumatic event can lead to prolonged internalizing symptoms, due to perseverative cognition, as seen in worrisome thinking (Borkovec et al., 1998; Brosschot et al., 2006). Adolescents who show more worrisome thinking are also more likely to act intolerant to uncertainty (Dugas et al., 2012). Furthermore, worry mediates the associations between subjective stressor load and anxiety and depressive symptoms over time (Anniko et al., 2019), showing the negative long-term effects of worry on mood in vulnerable adolescents. Using longitudinal measures, the present study examined whether future uncertainty mediates the relation between socioeconomic hardship in online home schooling and mental wellbeing, given that the longevity of the COVID-19 pandemic opens doors to new and longer lasting worries, due to its uncertain character.

In addition to getting a better understanding of how socioeconomic hardship affects mental wellbeing in times of crises, there is also a need to unravel protective factors that foster resilience among youth (Masten et al., 1999; Masten & Motti-Stefanidi, 2020). Resilience is a dynamic process, involving multiple systems, including but not limited to the individual (Masten et al., 2021; Zahodne et al., 2015). An example of a potential protective factor on an individual level is self-efficacy. Although many definitions of self-efficacy exist, we define it here as an individual's belief in his or her capacity to execute behaviors necessary to produce specific performance attainments (Bandura, 1978). In a theoretical model proposed by (Lent, 2004) self-efficacy is viewed as a stable and trait-like cognitive contributor of wellbeing. In a recent study on adverse childhood experiences self-efficacy buffered the negative effects of these experiences on mental health during young adulthood (Cohrdes & Mauz, 2020). Self-efficacy beliefs have also been found to promote both affective and cognitive wellbeing among adolescents during the COVID-19 pandemic (Cattellino et al., 2021). Self-efficacy is closely associated with executive functioning, as it has been found that enhancing self-efficacy beliefs leads to better executive function performance especially among individuals with lower education (Zahodne et al., 2015). Studies among adolescents and adults show adverse effects of lower socioeconomic status on the development of executive functions (Sarsour et al., 2011), but at the same time also show that executive functions mitigate the harmful influences of stress exposure on mood and wellbeing (Chahal et al., 2020; Williams et al., 2009). As such, in the present study we specifically focus on self-efficacy in the domain of executive functions and how this may buffer the adverse effects of socioeconomic hardship at the start of the COVID-19 pandemic on long-term mental wellbeing outcomes.

Taken together, the central aim of this preregistered longitudinal study (<https://osf.io/9xds7>) was four-fold: (1) to explore longitudinal changes in adolescents' mental wellbeing (i.e., mood and life satisfaction), experiences of socioeconomic hardship in online home schooling during the pandemic, self-efficacy, and feelings of uncertainty about the future; (2) to examine whether socioeconomic hardship in online home schooling in the early phase of the COVID-19 pandemic predicted mental wellbeing 1 year later; (3) whether the relation between socioeconomic hardship in online home schooling and mental wellbeing was mediated by feelings of future uncertainty; and (4) how individual

differences in domain-specific self-efficacy might influence the relations between socioeconomic hardship, feelings of future uncertainty and mental wellbeing. We conducted an online survey study at three time points during the COVID-19 pandemic: May 2020 (T1), November 2020 (T2), and May 2021 (T3).

We hypothesized that adolescents with socioeconomic hardship in online home schooling at T1 were more likely to experience feelings of tension and depression, to feel less vigorous, and to be less satisfied with their life at T3 (*preregistration H1*; Creswell et al., 2021; Magson et al., 2020). We hypothesized that these associations would be mediated by feelings of uncertainty about the future at T2 (Anniko et al., 2019): adolescents with more exposure to socioeconomic hardship in online home schooling at T1 were expected to show heightened feelings of future uncertainty at T2, which in turn was expected to predict higher levels of tension and depression, lower levels of vigor, and less life satisfaction at T3 (*preregistration H2*). In addition, we hypothesized that those adolescents with better domain-specific self-efficacy at T1 would show weaker mediational effects (Chahal et al., 2020; Masten et al., 2021). Hence, we expected moderated mediation effects (*preregistration H3*). Adolescents who scored higher on self-efficacy were expected to show weaker positive associations between exposure to socioeconomic hardship in online home schooling at T1 and feelings of tension and depression at T3. In addition, it was expected that adolescents with higher self-efficacy beliefs about executive functioning would show weaker negative associations between exposure to socioeconomic hardship in online home schooling at T1 and vigor and life satisfaction at T3. We also hypothesized that the positive association between socioeconomic hardship in online home schooling at T1 and feelings of future uncertainty at T2 is weaker for adolescents with higher self-efficacy beliefs about executive functioning.

2 | METHODS

2.1 | Participants

In May 2020 (T1) 511 Dutch adolescents initially applied for the present study (see Supplements S1a for a flow chart). After application, 26 adolescents decided not to participate, resulting in a sample of 485 participants ($M_{\text{ageT1}} = 15.33$ years, $SD_{T1} = 1.82$, age range 10–22 years, 63% females). Of these 485 participants, 431 had indicated that they wished to be contacted for follow-up research. In total 258 adolescents reapplied and gave consent for the second time point (T2; November 2020), of whom four did not participate, resulting in a final sample of 254 adolescents ($M_{\text{ageT1}} = 15.52$ years, $SD_{T1} = 1.78$, age range_{T1} 10–19 years, 72% females). After T2, 426 of the initial participants had indicated they wanted to be contacted for a third time point. In May 2021 (T3) 232 adolescents gave consent of which 206 participated ($M_{\text{ageT1}} = 15.60$ years, $SD_{T1} = 1.72$, age range_{T1} 10–20 years, 77% females).

In total, there were 177 adolescents ($M_{\text{ageT1}} = 15.64$ years, $SD_{T1} = 1.72$, age range_{T1} 10–18 years, 79% females), who participated in all three waves (i.e., they filled in questionnaires for at least 1 day at each wave), and only these participants were included in the present analyses. For detailed information on differences between the attrition and non-attrition group, please see Supplement S1b. Around 81% of the participants attended secondary education, of which 2% followed a prevocational secondary education program, 26% attended senior general secondary education, and 72% preuniversity education. Regarding the other 19%, 1% attended elementary school, 1% was enrolled in secondary vocational education, 7% in higher professional education, 7% attended a university program, and 3% did not follow any education program at all during T3. Overall, the sample was middle to highly educated. Most of the adolescents (97%) were born in the Netherlands, other birth countries were: China (1%), Hong Kong (1%), and Spain (1%). At least 24% of the participants identified with a bi-cultural or multi-cultural background. Within this sub-sample, 93% identified as Dutch beside their other cultural identities. Other commonly reported backgrounds were Surinamese (7%) and Indonesian (6%), either as single cultural background or as part of a bi- or multi-cultural background. In the present study, we did not exclude participants with a psychiatric or neurological disorder. At T1, T2, and T3, rates of current psychiatric or neurological disorders were, respectively, 12%, 10%, and 19%. Most prevalent disorders were autism, affective disorders (e.g., depression) and attention deficits.

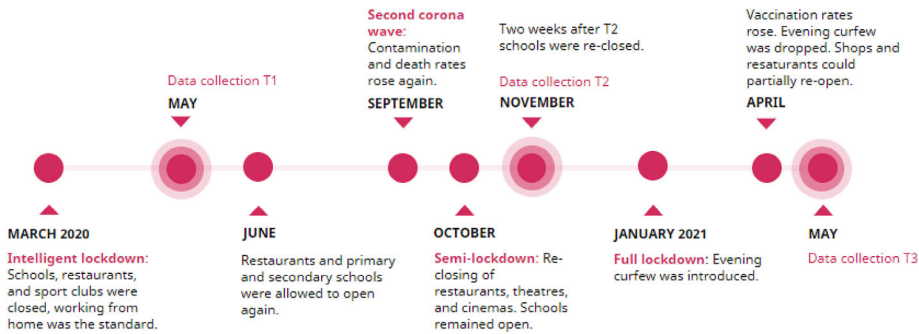


FIGURE 1 A simplified timeline of the COVID-19 situation in the Netherlands from March 2020 until May 2021.

2.2 | Procedure

The present study is part of a larger longitudinal study on wellbeing, self-oriented behavior, and prosocial behavior among young people during the COVID-19 pandemic (<https://osf.io/h5%D7;2a/>). Participants were recruited through secondary and high schools, specifically their online platforms (e.g., e-mail, website, and social media), in Rotterdam in the Netherlands. Participants applied via an online system. Participants received a monetary reward of €15 for T1 and T2, and €10 for T3, regardless of the amount of completed questionnaires. Permission for participation was ensured by means of informed consent for adolescents aged 16 years and older. For participants younger than 16 years, additional parental consent was needed. The present study was approved by the ethics committee of the Erasmus School of Social and Behavioural Sciences, Erasmus University Rotterdam (application 20–036).

In May and November 2020, participants received daily online questionnaires for two consecutive weeks from Mondays to Fridays, resulting in ten questionnaires per wave (for a complete overview of the data preparation steps see Green et al. (2021)). The survey software platform Qualtrics was used to digitally collect the data. At the third time-point we collected data for a single day, resulting in one questionnaire. For all questionnaires, participants received an invitation by email at 12:00 a.m. Text messages were sent between 19:00 and 20:00 p.m. as reminders to participants who had not yet filled in the questionnaire of that day. Figure 1 provides a simplified overview of the COVID-19 situation in the Netherlands during the three waves.

2.3 | Measures

2.3.1 | Mood

Mental wellbeing was operationalized in terms of mood and life satisfaction. The shortened Dutch translation of the Profile of Mood States Scale (POMS) was used to assess daily mood during the COVID-19 pandemic (Wald & Mellenbergh, 1990). In the present study we used three subscales: vigor (five items), tension (six items), and depression (eight items), see Supplements S1c for a complete overview of the items. Participants were instructed to indicate to what extent they felt that the descriptions represented their current mood state. The questionnaire used a five-point Likert scale ranging from 1 (“not at all”) to 5 (“extremely”). Reliability at T1 Day 1 was Cronbach’s $\alpha_{\text{vigor}} = .76$, $\alpha_{\text{tension}} = .84$, $\alpha_{\text{depression}} = .91$. At T2 the reliability for vigor, tension, and depression was, respectively, Cronbach’s $\alpha_{\text{Day1}} = .79$, $= .86$, and $= .91$. At T3 the reliability for vigor, tension, and depression was, respectively, Cronbach’s $\alpha = .87$, $= .89$, and $= .94$ for depression. We computed overall mean scores for each subscale at each time point (see Figure 2 for the assessment design).

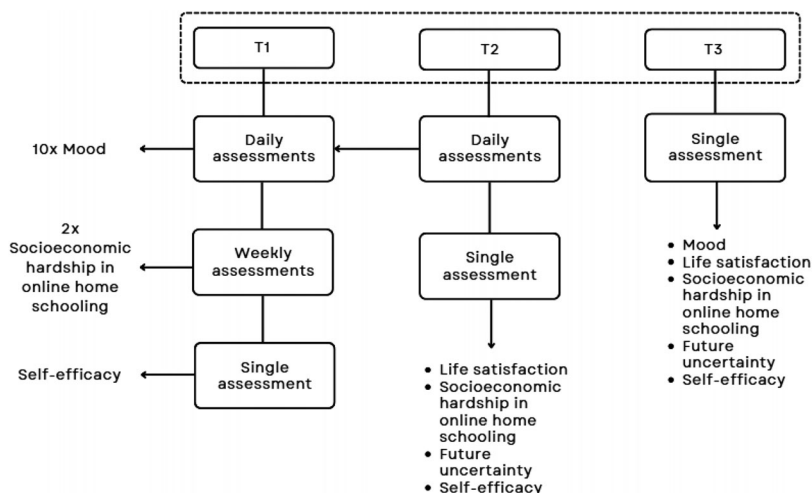


FIGURE 2 Schematic overview to illustrate when each assessment occurred. At T1 and T2 Mood (i.e., vigor, tension, and depression) was assessed ten times per wave, all assessments were used to compute aggregated scores per wave. Similarly, we used the two assessments of socioeconomic hardship in online home schooling at T1 to compute an aggregated score.

2.3.2 | Life satisfaction

We used the Satisfaction With Life Scale (SWLS), a five-item self-report questionnaire to assess life satisfaction (Diener et al., 1985) at T2 and T3. This questionnaire was found to be suitable to assess life satisfaction in both adults and adolescents (Huebner, 2004). Responses were given on a seven-point Likert scale from 1 (“strongly disagree”) to 7 (“strongly agree”). It consisted of five items (see Supplements S1c for a complete overview of the items). Reliability at T2 and T3 was, respectively, Cronbach’s $\alpha = .90$ and $= .86$. At both time points, this questionnaire was administered once. Mean scores were computed per time point.

2.3.3 | Socioeconomic hardship in online home schooling

The recently developed hardship in online home schooling questionnaire was used to assess socioeconomic hardship among adolescents during the pandemic (Green et al., 2021). This questionnaire focused to what extent adolescents were dealing with socio-economic difficulties in online home-schooling during the pandemic. It consisted of five items (e.g., “did you have stable internet connection to take your online classes”), which had to be rated on a five-point Likert scale, ranging from 1 (“not at all”) to 5 (“totally true”), for a complete overview of the items, see Supplements S1c. The questionnaire was administered weekly at T1 and only once at T2 and T3. Reliability was Cronbach’s $\alpha_{\text{Week1}} = .69$, for T1, and $\alpha = .76$, and $\alpha = .70$ for, respectively, T2, and T3. We computed mean scores for each time point.

2.3.4 | Future uncertainty

To assess feelings and thoughts of uncertainty about the future, a newly developed questionnaire was used (<https://osf.io/x37tm>). This questionnaire contained five items, which focused on worries and feelings of uncertainty with regard to educational choices (e.g., “I am afraid that I have to make different choices in the future, because I am now behind in my studies”), job opportunities (e.g., “I think that I will struggle in finding a job), and financial concerns (e.g., “When I am thinking about my future, I worry about money”). There was one item specifically targeted at the COVID-19 pandemic

("I think COVID-19 will have negative consequences for my future"). In total the questionnaire contained six items. Items were rated on a five-point Likert scale ranging from 1 ("does not describe me at all") to 5 ("describes me very well"). This questionnaire was administered once at T2 and once at T3. Correlational analyses revealed a moderate association between the single COVID-19-item and the mean score of all other items in this questionnaire (respectively, $r = .64$ at T2 and $r = .72$ at T3). Hence, we computed mean future uncertainty scores per time point, including both the general items as well as the single COVID-19 specific item. Reliability on the total of six items was good (Cronbach's $\alpha = .82$ and $= .87$ for, respectively, T2 and T3).

2.3.5 | Self-efficacy beliefs about executive functioning

The web-based executive function questionnaire was used to assess individual differences in self-efficacy beliefs within the domain of executive functioning (Buchanan et al., 2010). We used the Webexec self-report measure as an index of executive functioning self-efficacy. Previous studies reported that the Webexec is associated with self-reported psychological symptoms, such as anxiety and depression (Keen et al., 2022), and personality (Buchanan, 2016), rather than performance-based executive function. The questionnaire contains six items (Cronbach's $\alpha_{\text{Week1}} = .83$, $= .82$, and $= .90$ for, respectively, T1, T2, and T3) using a four-point Likert scale ranging from 1 ("not at all") to 4 ("a lot"). The complete items list can be found in the Supplement S1c. Items were recoded to ensure that a higher score on this measure indicated better self-efficacy. The questionnaire was administered once at each time point. We computed mean scores based per time point.

2.4 | Statistical analysis plan

2.4.1 | Power analysis and multiple comparison correction

We used the G*Power 3.1.9.7 software (Kang, 2021) to detect whether the present study was sufficiently powered for the more complex analyses (Aim 3 and 4). The power analyses revealed a sample size of $N = 147$ (with .80 actual power) for the mediation models to detect an effect size of Cohen's $f^2 = .1$, α error probability = .009, number of tested predictors = 2 (i.e., socioeconomic hardship, future uncertainty). Our sample sizes for the mediation analyses varied between $N = 138$ and 143, suggesting close to sufficient power for the mediation models (i.e., Aim 3). However, we were somewhat underpowered for the moderated mediation models (i.e., Aim 4). Power analyses for the moderated mediation models, revealed a required sample size of $N = 190$ (with .80 actual power) to detect a small effect size of Cohen's $f^2 = .1$, α error probability = .009, number of tested predictors = 5 (i.e., socioeconomic hardship, future uncertainty, self-efficacy, socioeconomic hardship*self-efficacy, and future uncertainty*self-efficacy). Our sample sizes for the moderated mediation analyses varied between $N = 135$ and 138.

To correct for the multiple comparisons (number of tests is 15), we calculated the Holm–Bonferroni correlation corrected alpha-value ($p = .009$) via Simple Interactive Statistical Analysis (SISA, n.d.). Given the conservative threshold, for completeness we also report uncorrected results ($p < .05$).

2.4.2 | Missing data

In our preregistration (<https://osf.io/9xds7/>) we argued that in case of data missing completely at random (MCAR), we would impute missing data using Expectation–Maximization (EM) imputation of missing values. We used Little's MCAR test to examine if MCAR holds (Little, 1988). Results showed that the data in the present study were not missing completely at random and hence we did not use imputation, $\chi^2 = 120.17$, $p = .027$, normed chi-squared (χ^2/df) was 1.1. Instead, we used listwise deletion. However, for exploratory purposes, we did repeat the mediation and moderated

mediation analyses (Aim 3 and 4) with EM in SPSS, to impute missing values and to test our aims within a more powered sample. These findings are discussed in Supplement S5.

2.4.3 | Aim 1: Repeated-measures ANOVAs and *t*-tests

To explore general trends across the three time points we performed repeated measures (RM) ANOVAs and *t*-tests. In cases where Mauchly's test indicated that sphericity had been violated in the RM ANOVAs, the Huyn-Feldt or Greenhouse-Geisser corrected tests were reported (Barcikowski et al., 1984). The software SPSS was used for all the data analyses.

2.4.4 | Aim 2: Regression analyses

To examine whether socioeconomic hardship in online home schooling in the early phase of the COVID-19 pandemic predicted mental wellbeing 1 year later, we performed three separate regression analyses for, respectively, negative mood, vigor, and life satisfaction as dependent variables (*preregistration H1*). We controlled for age at T1, gender at T1, educational level at T1, and ethnicity in all models.

2.4.5 | Aim 3: Mediation analyses

To examine whether the adolescents' socioeconomic position in terms of hardship in online home schooling at the beginning of the pandemic, predicted their mental wellbeing (i.e., mood and life satisfaction) later in the pandemic, we conducted mediation models in PROCESS (Hayes, 2012), using *model 4* (i.e., the simple mediation model using x , m , y with m being the mediator), both directly and indirectly via feelings of uncertainty about the future (*preregistration H2*).

We conducted separate mediation models for two indices of mental wellbeing: mood and life satisfaction. Mood has been operationalized using three subscales: feelings of tension, depression, and vigor. For all analyses below, we computed an aggregated score for feelings of tensions and depression, since these two mood states (i.e., negative moods) were highly correlated (see S3) and were found to have similar trajectories over time. Hence, in total we performed three mediation models with negative mood (i.e., feelings of tension and depression), vigor, and life satisfaction as the three dependent variables.

We controlled for age, gender, ethnicity, and educational level in all pathways of the three mediation models. In addition, we controlled for mood at T1 in all pathways in the two mediation models with negative mood and vigor at T3 as dependent variable, and for life satisfaction at T2 in the model with life satisfaction at T3 as dependent variable. We computed 95% confidence intervals (CI). For a complete overview on the bivariate correlations between all the variables, see S3. Mediation models were evaluated according to recommendations by Hayes and Rockwood (2017), meaning that interference about mediation is based on the indirect effect of x on y estimated as ab rather than the individual paths of a and b .

Mediation analyses can still be valuable to test even in the absence of effects of x on y (O'Rourke & Mackinnon, 2018), thus we tested also tested the preregistered mediational hypotheses, in case of null findings.

2.4.6 | Aim 4: Moderated-mediation analyses

To examine whether domain-specific self-efficacy moderates the interplay between socioeconomic hardship in online home schooling, future uncertainty, and mental wellbeing (i.e., mood and life satisfaction), we conducted three separate moderated mediation analyses (*preregistration H3*). These analyses were performed using *model 8* (i.e., moderated

mediation model using x , m , w , y with w being the moderator influencing the relationship between x and y , and the relationship between x and m in the software package PROCESS (Hayes, 2012; Hayes & Rockwood, 2017). We performed moderated mediation analyses per dependent variable (i.e., negative mood at T3, vigor at T3, and life satisfaction at T3). In all three moderated mediation models, the socioeconomic hardship in home schooling at T1 was entered as predictor, feelings of future uncertainty at T2 as mediator, and self-efficacy at T1 as moderator. PROCESS enters all variables simultaneously in the model.

We controlled for age, gender, educational level, and ethnicity in all pathways of the three moderated mediation models. In addition, we controlled for mood at T1 in the two moderated mediation models with either vigor at T3 or negative mood at T3 as dependent variable, and for life satisfaction at T2 for the model with life satisfaction at T3 as dependent variable. We computed 95% CI.

3 | RESULTS

The present longitudinal study had a partial daily diary design, therefore there was some variation in sample sizes between the daily and non-daily measures, due to missing data. Hence, we report the sample size for each analysis. For detailed information on the descriptive statistics of the variables, see Table 1.

3.1 | Aim 1: Longitudinal changes during the pandemic

The first aim of the study was to explore longitudinal patterns of mental wellbeing during the pandemic, with a focus on mood and life satisfaction. We were also interested in the longitudinal changes of the predictors and mediator/moderator factors; therefore, we performed the similar analyses for socioeconomic hardship, future uncertainty, and self-efficacy.

3.1.1 | Mood

To explore trajectories of feelings of vigor, tension, and depression during the COVID-19 pandemic across three time points, we conducted a RM ANOVA ($N = 177$) with Time (T1-T2-T3) and Mood State (vigor-tension-depression) as within-subject factors.

We found main effects of Mood State and Time, respectively, $F(1.12, 196.46) = 183.97, p < .001, \eta^2 = .51$ and $F(1.86, 327.02) = 54.15, p < .001, \eta^2 = .24$, which were qualified by an interaction between Mood State and Time, $F(2.29, 403.62) = 37.59, p < .001, \eta^2 = .18$. Post-hoc analyses revealed that adolescents showed a distinct trajectory for feelings of vigor compared to feelings of tension and depression during the COVID-19 pandemic, see Figure 3. Pairwise comparisons with Bonferroni correction revealed that adolescents showed a decrease in vigor levels between T1 ($M = 3.18, SE = .06$) and T2 ($M = 3.01, SE = .06$), $F(1.90, 333.52) = 8.26, p < .001, \eta^2 = .05$, but no further changes were detected between T2 and T3 ($M = 3.02, SE = .070$). Tension levels increased as a function of time, $F(1.76, 309.67) = 73.83, p < .001, \eta^2 = .30$. Pairwise comparisons with Bonferroni correction showed that adolescents reported an increase in tension levels at each timepoint (T1: $M = 1.56, SE = .05$; T2: $M = 1.86, SE = .06$; T3: $M = 2.24, SE = .08$). Similar findings were found for depression levels, $F(1.83, 322.68) = 40.42, p < .001, \eta^2 = .19$. Pairwise comparisons with Bonferroni correction showed that at each time point there was an increase in depression levels among adolescents (T1: $M = 1.45, SE = .04$; T2: $M = 1.65, SE = .06$; T3: $M = 1.95, SE = .08$).

An additional RM ANOVA with age and the difference scores between T3 and T1 for vigor, tension, and depression as within-subject factors (i.e., T3 mean levels minus T1 mean levels) and gender as between-subject factor revealed no age nor gender differences in the degree or direction in which mood had changed over the year (see Supplement S2).

TABLE 1 Descriptive statistics of mood, life satisfaction, socioeconomic hardship in online home schooling, feelings of future uncertainty, and self-efficacy at each time point they were measured.

	N	Mean score (SD)	95% CI	Minimum	Maximum	Skewness	Kurtosis
Mood							
Vigor _{T1}	176	3.19 (.74)	[3.08, 3.30]	1.01	4.94	-.14	-.35
Tension _{T1}	176	1.58 (.64)	[1.49, 1.68]	1.00	4.72	2.05	5.25
Depression _{T1}	176	1.47 (.62)	[1.38, 1.56]	1.00	4.73	1.95	3.63
Vigor _{T2}	177	3.01 (.77)	[2.89, 3.12]	1.24	4.78	-.21	-.71
Tension _{T2}	177	1.89 (.83)	[1.76, 2.01]	1.00	4.83	1.30	1.38
Depression _{T2}	177	1.67 (.79)	[1.55, 1.78]	1.00	4.61	1.62	2.77
Vigor _{T3}	176	3.02 (.90)	[2.89, 3.16]	1.00	5.00	-.28	-.68
Tension _{T3}	176	2.23 (.100)	[2.08, 2.38]	1.00	5.00	.72	-.46
Depression _{T3}	176	1.94 (.99)	[1.80, 2.09]	1.00	4.88	1.28	.86
Life satisfaction _{T2}	158	4.43 (1.49)	[4.20, 4.66]	1.00	7.00	-.39	-.69
Life satisfaction _{T3}	175	4.52 (1.40)	[4.31, 4.73]	1.00	7.00	-.53	-.64
Svsocioeconomic hardship in online homeschooling _{T1}	170	1.82 (.93)	[1.71, 1.93]	1.00	4.20	1.21	1.35
Socioeconomic hardship in online homeschooling _{T2}	157	1.85 (.80)	[1.73, 1.98]	1.00	5.00	1.38	2.00
Socioeconomic hardship in online homeschooling _{T3}	175	1.80 (.75)	[1.69, 1.92]	1.00	4.20	.93	.12
Future uncertainty _{T2}	155	2.10 (.85)	[1.97, 2.24]	1.00	4.33	.67	-.60
Future uncertainty _{T3}	175	2.36 (1.06)	[2.20, 2.52]	1.00	5.00	.52	-.82
Self-efficacy _{T1}	165	3.03 (.59)	[2.94, 3.12]	1.33	4.00	-.95	.38
Self-efficacy _{T2}	157	2.96 (.65)	[2.85, 3.06]	1.00	4.00	-.94	.67
Self-efficacy _{T3}	174	2.77 (.82)	[2.65, 2.90]	1.00	4.00	-.62	-.63

Note: The minimum and maximum score represent the actual range of the responses and not the possible scores. We only included those who participated in all three waves.

Abbreviation: CI, Confidence Interval for mean score.

3.1.2 | Life satisfaction

To explore whether adolescents changed in how satisfied they are about their life, we performed a paired sample *t*-test ($N = 158$) based on T2 and T3. We found no significant change between T2 ($M = 4.46$, $SD = 1.48$) and T3 ($M = 4.49$, $SD = 1.43$) for life satisfaction ($t = -.57$, $p = .572$).

3.1.3 | Socioeconomic hardship in online home schooling

To explore changes in socioeconomic hardship in online home schooling during the COVID-19 pandemic, we performed a RM ANOVA with three time points ($N = 153$). We found no significant changes in socioeconomic hardship in online home schooling throughout the COVID-19 pandemic, $F(1.99, 302.47) = .42$, $p = .654$ (respectively, T1, T2, and T3: $M = 1.79$, $SD = .69$; $M = 1.84$, $SD = .80$; and $M = 1.80$, $SD = .74$).

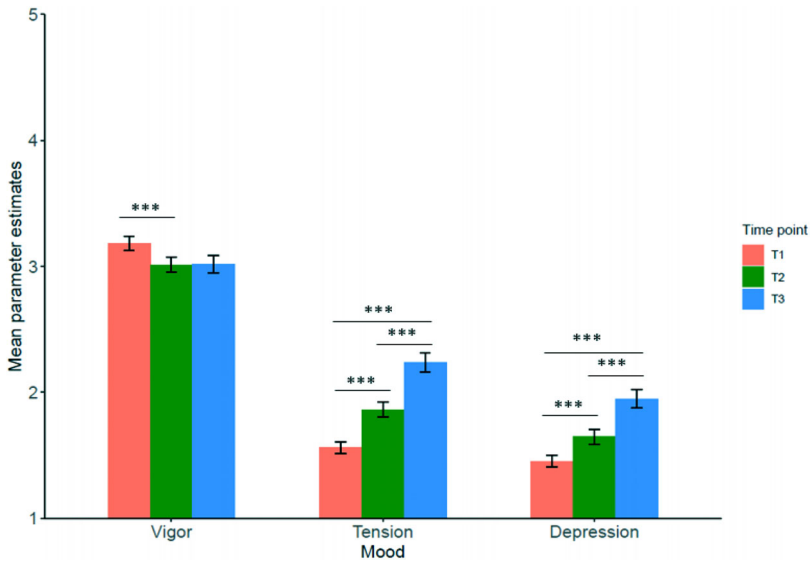


FIGURE 3 Adolescents ($N = 177$) initially showed a decrease in vigor levels between T1 (May 2020) and T2 (November 2020) ($p < .001$), after which vigor levels stabilized at T3 (May 2021). An opposite pattern was found for tension and depression levels, as these feelings increased among adolescents after each time point ($ps < .001$). Error bars represent the standard error of the mean. * $p < .05$, ** $p < .01$, *** $p < .001$.

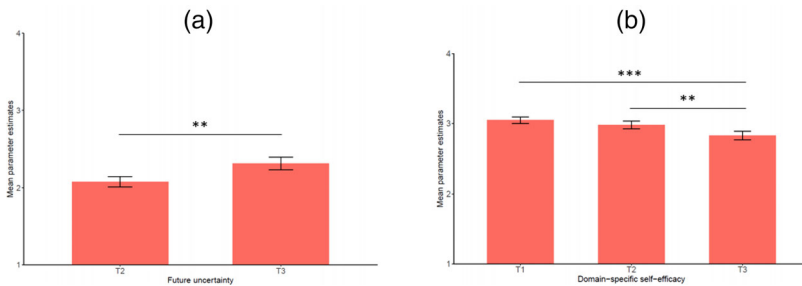


FIGURE 4 Panel a illustrates that adolescents ($N = 155$) showed an increase in future uncertainty levels between T2 (November 2020) and T3 (May 2021), $p = .003$. Error bars represent the standard error of the mean. Panel b shows that between T1 (May 2020) and T3 (May 2021), and T2 (November 2020) and T3 (May 2021) there was a decrease in self-efficacy beliefs in executive functioning among adolescents, respectively, $p < .001$ and $p = .008$. * $p < .05$, ** $p < .01$, *** $p < .001$.

3.1.4 | Future uncertainty

We performed a paired sample t -test to explore whether feelings of uncertainty about the future changes between T2 and T3 ($N = 155$). We found an increase between T2 ($M = 2.08$, $SD = .83$) and T3 ($M = 2.31$, $SD = 1.02$) in uncertainty about the future, $t = -3.01$, $p = .003$ (see Figure 4a).

3.1.5 | Self-efficacy beliefs about executive functioning

Finally, we conducted a RM ANOVA to explore longitudinal changes in domain-specific self-efficacy ($N = 150$). We found a significant change, $F(1.83, 272.97) = 10.55$, $p < .001$, $\eta^2 = .07$. As can be seen in Figure 4(b), pairwise

comparisons with Bonferroni correction revealed a decrease in self-efficacy between T1 ($M = 3.05, SE = .05$) and T3 ($M = 2.83, SE = .06$), and between T2 ($M = 2.98, SE = .05$) and T3 ($M = 2.83, SE = .06$).

An additional one-way ANOVA with the difference score between T3 and T1 for self-efficacy as dependent variable (i.e., T3 mean levels minus T1 mean levels) and gender as between-subject factor, and age as covariate revealed no age or gender effect in the degree or direction in which self-efficacy had changed over the year.

3.2 | Aim 2: The associations between socioeconomic hardship in online home schooling and adolescent mental wellbeing

The second aim of the study was to examine effects of socioeconomic hardship on longitudinal patterns of adolescent mental wellbeing. For this purpose, we performed regression analyses to examine the main effects of socioeconomic hardship in online home schooling on adolescent mental wellbeing 1 year later. Multicollinearity was not violated (VIF ranged from 1.000 to 1.229).

In the first regression analysis, socioeconomic hardship in online home schooling at T1 was entered as predictor and negative mood at T3 as dependent variable. We controlled for age at T1, gender at T1, educational level at T1, and ethnicity. Socioeconomic hardship in online home schooling at T1 accounts for 13% of the variance in negative mood at T3 ($R^2 = .13, F(5, 179) = 5.37, b = .35, SE B = .10, \beta = .26, p < .001$). However, this effect did not survive Holm-Bonferroni correction, after controlling for negative mood at T1 in the second step of the model ($b = .17, SE B = .09, \beta = .12, p = .050$).

The second regression analysis contained socioeconomic hardship in online home schooling at T1 as predictor and vigor at T3 as dependent variable. We controlled for age at T1, gender at T1, educational level at T1, and ethnicity. We found that socioeconomic hardship in online home schooling at T1 accounts for 14% of the variance in vigor at T3 ($R^2 = .14, F(5, 179) = 5.96, b = -.33, SE B = .09, \beta = -.27, p < .001$). However, this effect was no longer significant after controlling for vigor at T1 in step 2 of the model ($b = -.11, SE B = .08, \beta = -.09, p = .146$).

In the third regression analyses, we entered socioeconomic hardship in online home schooling at T1 as predictor and life satisfaction at T3 as dependent variable. We controlled for age at T1, gender at T1, educational level at T1, and ethnicity. Socioeconomic hardship in online home schooling at T1 accounts for 12% of the variance in life satisfaction at T3 ($R^2 = .12, F(5, 139) = 3.74, b = -.69, SE B = .18, \beta = -.32, p < .001$). This effect was no longer significant after controlling for life satisfaction at T2 in step 2 ($b = -.25, SE B = .14, \beta = -.12, p = .068$).

Together, the results show that socioeconomic hardship at T1 is associated with mental wellbeing at T3, but not with a change in wellbeing between T1 and T3.

3.3 | Aim 3: Mediating role of future uncertainty on the association between socioeconomic hardship in online home schooling and adolescent mental wellbeing

The third aim of the study was to examine mediation effects of future uncertainty at T2 on the relationship between socioeconomic hardship in online home schooling at T1 and longitudinal patterns of adolescent mental wellbeing using mediation analyses, separately for negative mood (tension and depression), vigor, and life satisfaction.

3.3.1 | Negative mood

First, we examined the links between socioeconomic hardship in online home schooling at T1 (x), feelings of future uncertainty at T2 (m), and negative mood at T3 (y), $N = 143$. There was no direct effect of socioeconomic hardship in

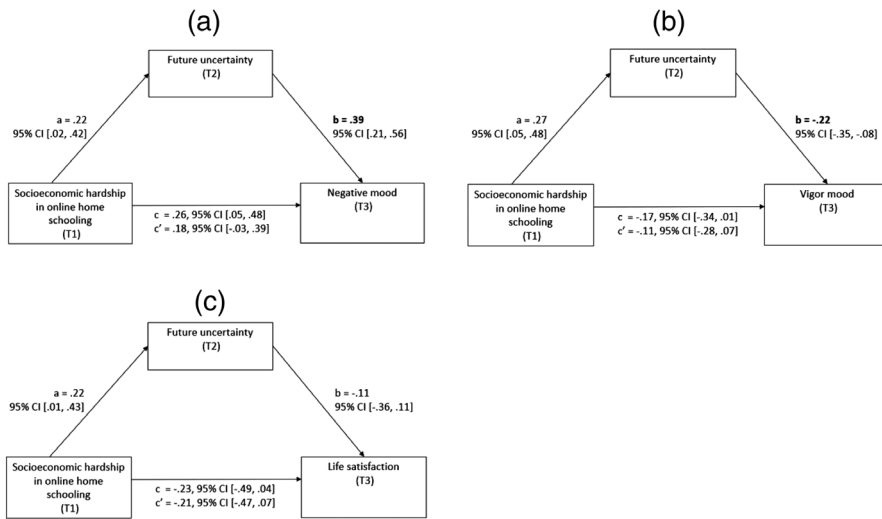


FIGURE 5 The mediation models on the associations between socioeconomic hardship in online home schooling at T1 (x) and negative mood (i.e., feelings of tension and depression) at T3 (panel a), vigor at T3 (panel b), and life satisfaction at T3 (panel c) (y), with feelings of future uncertainty as mediator (m). Bold numbers represent significant associations (Bonferroni corrected) $p < .0033$. We controlled for age, gender, ethnicity, and education level in each model for each pathway. We also controlled for negative mood at T1, vigor at T1, and life satisfaction at T2 in, respectively, panel a, b, and c.

online home schooling at T1 on negative mood at T3 ($p = .092$), see path c' in Figure 5(a). At the uncorrected threshold, we did find a total effect (i.e., path c in Figure 5a) of socioeconomic hardship in online home schooling at T1 on negative mood at T3 ($p = .018$, 95% CI [.05, .48]). There was an effect of socioeconomic hardship in online home schooling at T1 on future uncertainty at T2 (path a in Figure 5a; $p = .030$, 95% CI [.02, .42]); this effect did not survive the Holm–Bonferroni correction but was significant at a corrected threshold after imputation (see Supplement 5.1.1). Adolescents with more feelings of uncertainty about the future at T2 were more likely to report negative mood at T3, $b = .39$, $p < .001$, 95% CI [.21, .56] (see Figure 5a, path b). Finally, we found no indirect effect of socioeconomic hardship in online home schooling at T1 on negative mood at T3 through future uncertainty at T2, $b = .08$, 95% CI [-.003, .21]. Thus, there was no support for a mediation effect.

3.3.2 | Vigor

Next, we examined the links between socioeconomic hardship in online home schooling at T1 (x), feelings of future uncertainty at T2 (m), and vigor at T3 (y), $N = 143$. The results indicated no total effect or direct effect of socioeconomic hardship in online home schooling on adolescents' vigor (respectively, $p = .065$ and $.222$; Figure 5b path c and c'). The effect socioeconomic hardship in online home schooling at T1 on future uncertainty at T2 was significant at an uncorrected threshold ($p = .014$, 95% CI [.05, .48]), but did not survive the Holm–Bonferroni correction, see Figure 5(b) path a, but was significant at a corrected threshold after imputation (see Supplement 5.1.2). The analysis further showed that adolescents with higher feelings of uncertainty about the future at T2 were less vigorous at T3, $B = -.22$, $p = .002$, 95% CI [-.35, -.08], see Figure 5(b) (path b). There was no support for a significant mediation effect, as we found no indirect effect of socioeconomic hardship in online home schooling at T1 on positive mood at T3 through future uncertainty at T2 ($b = -.06$, 95% CI [-.14, -.01]).

3.3.3 | Life satisfaction

Lastly, we examined the links between socioeconomic hardship in online home schooling at T1 (x), feelings of future uncertainty at T2 (m), and life satisfaction at T3 (y), $N = 138$. We found no total effect of socioeconomic hardship in online home schooling at T1 on life satisfaction at T3 ($p = .092$), nor a direct effect ($p = .140$), see Figure 5(c) path c and c', respectively. The effect of socioeconomic hardship in online home schooling at T1 on feelings of future uncertainty at T2 was significant at an uncorrected threshold ($p = .037$, 95% CI [.01, .43]) but did not survive Holm-Bonferroni correction (see Figure 5c path a). Adolescents with greater feelings of future uncertainty at T2 were not found to be less satisfied with their life at T3 ($p = .312$), see Figure 5c path b. There was no indirect effect of socioeconomic hardship in online home schooling at T1 on life satisfaction at T3 via future uncertainty at T2 ($b = -.03$, 95% CI [-.10, .02]). Hence, we found no support for a mediation effect.

3.4 | Aim 4: A moderated mediation perspective of the effects of domain-specific self-efficacy on adolescents' mental wellbeing

The fourth aim of the study was to examine moderation effects of self-efficacy beliefs about executive functions at T1 (w) on two pathways (x on m ; x on y) from the previous mediation models with socioeconomic hardship in online home schooling at T1 (x), future uncertainty at T2 (m), and mental wellbeing at T3 (y). We performed three separate moderated mediation models for the following outcomes measures: negative mood (tension and depression), vigor, and life satisfaction.

3.4.1 | Negative mood

First, we examined whether adolescents' self-efficacy at T1 (w) moderates the association between socioeconomic hardship in online home schooling at T1 (x) and future uncertainty at T2 (m), and the association between socioeconomic hardship in online home schooling at T1 (x) and negative mood at T3 (y), $N = 138$. Self-efficacy at T1 did not moderate the associations between socioeconomic hardship in online home schooling at T1 and feelings of future uncertainty at T2 (path a_3 , $p > .05$; see Figure S4.1), nor between socioeconomic hardship in online home schooling at T1 and negative mood at T3 (see Figure S4.1, path c_3 , $p > .05$).

3.4.2 | Vigor

The moderating effect of self-efficacy at T1 on the association between socioeconomic hardship in online home schooling at T1 and feelings of future uncertainty at T2 was examined first. We found no interaction (path a_3' , $p > .05$). Second, we examined whether adolescents' self-efficacy at T1 (w) moderates the association between socioeconomic hardship in online home schooling at T1 (x) and vigor at T3 (y), $N = 138$. There was no interaction effect between self-efficacy at T1 and socioeconomic hardship in online home schooling at T1 on adolescent's feelings of future of vigor (path c_3' , $p > .05$), see Figure S4.2

3.4.3 | Life satisfaction

Here we assessed the role of adolescents' self-efficacy as moderator (w) and future uncertainty (m) as mediator on the link between socioeconomic hardship in online home schooling (x) and life satisfaction (y) during the COVID-19 pandemic ($N = 135$). We found no interaction effect between self-efficacy at T1 and socioeconomic hardship in online

home schooling at T1 on adolescent's feelings of future uncertainty (path a_3' , $p > .05$) nor on their life satisfaction (path c_3' , $p > .05$), see Figure S4.3

4 | DISCUSSION

In the present longitudinal study, we explored behavioral changes over time and investigated whether socioeconomic hardship in online home schooling at the early phase of the COVID-19 pandemic contributed to mental wellbeing outcomes (i.e., mood and life satisfaction) 1 year later. Second, we tested how feelings of uncertainty about the future and self-efficacy beliefs about executive functioning contributed to these associations.

Our main results were: (1) that over an 1-year course of the pandemic, negative feelings of tension and depression increased; (2) socioeconomic hardship at T1 was related to adolescent mental wellbeing at T3, but this effect was mainly driven by baseline levels of mental wellbeing at T1; (3) at uncorrected threshold there was support that among adolescents socioeconomic hardship contributes to greater feelings of future uncertainty; (4) feelings of future uncertainty predicted adolescent mood 6 months later, but not life satisfaction; and (5) we found no evidence that self-efficacy buffers the associations between socioeconomic hardship in online home schooling and mental wellbeing. All findings are discussed in more detail below.

4.1 | Distinct trajectories for mood and life satisfaction throughout the pandemic

Consistent with prior studies, feelings of tension and depression continued to increase over the course of the pandemic in adolescents across three time points, while feelings of vigor decreased and then stabilized (Cost et al., 2022; Hawes et al., 2021; Luijten et al., 2021; Pascoe et al., 2020). This study builds on findings from the first 6 months of the pandemic and reinforces our previous interpretation that the increases in negative mood between May and November 2020 were most likely not due to other factors such as seasonal effects (Green et al., 2021). Given the pronounced developmental changes in mood and mental health across adolescence, we explored whether the COVID-19 pandemic affects older adolescents more than younger adolescents (Bailen et al., 2019; Green et al., 2021). The present study showed that across different ages, adolescents were similarly affected. We found no age effects on the extent to which mood had changed over time. The present study illustrates that mood issues may outlast the COVID-19 pandemic (Cost et al., 2022). This persistence of internalizing symptoms could possibly reflect the consequences of dealing with cumulative uncertainty for a prolonged period of time (Rettie & Daniels, 2021; Scrimin et al., 2022). Future studies could examine whether feelings of tension and depression would decrease as soon as the uncertain character of the pandemic and its future consequences also start to decline.

Another important finding was that life satisfaction did not change across two time points (November 2020 and May 2021). Prior theoretical models suggested that mental wellbeing is a multifaceted construct with both affective and cognitive components (Diener, 1984; Diener et al., 2018; Huebner, 2004). It is known that mood (i.e., affective component) is more state-dependent and less stable over time compared to life satisfaction (Pavot & Diener, 2008). Additionally, adolescence is often characterized by enhanced mood variability, but not necessary variability in life satisfaction (Antaramian & Huebner, 2009; Bailen et al., 2019; Maciejewski et al., 2015). However, these previous findings may not fully explain why, unlike mood, life satisfaction did not change during the pandemic. Like vigor, it could be that life satisfaction was more susceptible to change in the beginning of the pandemic as compared to later stages (Stevens et al., 2022). Unfortunately, in the present study life satisfaction was not assessed at the first time point. Hence, there is no possibility to test whether life satisfaction shows a similar trajectory as vigor. Still, the present findings illustrate the importance of disentangling the various components of wellbeing, as the COVID-19 pandemic has a differential influence on them. As global societal challenges (e.g., climate crisis, geopolitical tensions, social inequality, etc.) continue to interfere with our daily lives, it is valuable to understand how worries related to future

uncertainty differentially contribute to various mental wellbeing outcomes on the long-term, especially in at-risk adolescents.

4.2 | Proximal determinants of adolescent mental wellbeing

The present study provided evidence that adolescents with more experiences of socioeconomic hardship in online home schooling at the beginning of the pandemic were disproportionately negatively impacted (Fegert et al., 2020; Holmes et al., 2020; Nicola et al., 2020; Singh et al., 2020). Findings from the present study confirmed that socioeconomic hardship in online home schooling at T1 was associated with mental wellbeing (mood and life satisfaction) at T3, although this effect was mainly driven by baseline mental wellbeing at T1. Many prior studies showed that adolescents with low family income or low socioeconomic status were disproportionately hit by the pandemic (Creswell et al., 2021; Li et al., 2021; O'Connor et al., 2021; Shanahan et al., 2020), but there are also a few studies with mixed results. For example, Stevens and colleagues (2022) showed that during the pandemic (between 2019 and fall 2020) adolescent life satisfaction decreased linearly, but these patterns (i.e., slopes) did not differ between the low or high socioeconomic groups. Another study reported that greater pandemic related economic concerns were associated with declines in anxiety and depression levels over time among some children and adolescents (Cost et al., 2022). A potential explanation for these mixed findings could be how socioeconomic hardship is defined and assessed. For example, poverty and socioeconomic adversity are known to have both direct and indirect effects of mental health (McBride Murry et al., 2011; Morales et al., 2021; Reiss, 2013b; Santiago et al., 2011).

Next, we found that at an uncorrected threshold, socioeconomic hardship in online home schooling at T1 predicted higher feelings of uncertainty about the future at T2. This finding that socioeconomic hardship negatively impacts how adolescents view and feel about their future, is in line with our hypotheses and existing literature (Evans & Kim, 2013; Scrimin et al., 2022). Dietrich et al. (2021) investigated policymakers' decision to close schools and adapt to online home schooling and how this causes or reinforces socioeconomic inequality among youth. Among other factors, differences in social support and learning equipment at home were found to influence home schooling efforts. In another study inequality in reading behavior increased extensively during the COVID-19 pandemic (Reimer et al., 2021). Changes like these can contribute to feelings of stress, worry, and uncertainty. As the present finding did not survive multiple comparison corrections it should be interpreted with caution. More research is needed to verify the current findings in a more powered sample.

As hypothesized, the results showed that adolescents with worries and uncertainty about educational and career perspectives, financial resources, and the future in general are at risk for mood issues (i.e., lower vigor levels and higher tension and depression levels) as compared to their peers. In the present study, we found that the subjective feeling of uncertainty about the future is a stronger predictor of adolescent mood, but not life satisfaction, than the experience of socioeconomic hardship in online home schooling. Indeed, there is some evidence that distal measures of socioeconomic hardship, like family income or socioeconomic status, may have smaller effects on wellbeing (Bergman & Scott, 2001), whereas more proximal measures like concerns, worries, or stress related to socioeconomic adversity may have more profound effects (Santiago et al., 2011). We did not find evidence that future uncertainty mediates the association between socioeconomic hardship in online home schooling and adolescent mental wellbeing, therefore possible these are separable influences.

Overall, there is accumulating evidence from prior studies showing the adverse effects of (chronic) socioeconomic hardship on adolescent mental wellbeing (Lee et al., 2013; McBride Murry et al., 2011; Reiss, 2013b). The present study contributes to this literature by showing that socioeconomic adversity may not impact all aspects of wellbeing equally but could possibly have distinct effects on mood as compared to life satisfaction. Taken together, future research should focus on capturing the distinct components of wellbeing, as well as the interplay between distal and proximal measures of socioeconomic hardship, when studying their effects.

4.3 | The relation between domain-specific self-efficacy and mental wellbeing during the pandemic

Contrary to our expectations, self-efficacy beliefs about executive functions at the beginning of the pandemic did not buffer the adverse effects of socioeconomic hardship in online home schooling on long-term mental wellbeing. In previous studies self-efficacy was shown to have positive effects on mental wellbeing (Caprara et al., 2006; Cattelino et al., 2021). For example, in a study by Vecchio et al. (2007) social and academic self-efficacy beliefs among adolescents were found to predict life satisfaction over a 5-year period. Here, we tested whether the beneficial effects interacted with environmental factors, such as socioeconomic hardship, but we did not observe evidence for this buffering effect.

One explanation for the absence of this effect could be related to the way we assessed self-efficacy, namely, limited to the domain of executive functions. Prior research reported that executive functions can mitigate harmful effects from the social environment on mental wellbeing (Sarsour et al., 2011; Williams et al., 2009). The present online survey design prohibited us to assess executive functioning in actual behavior as it was limited to self-report (Nyongesa et al., 2019). Thus, we focused on self-efficacy beliefs instead. Also, there is some overlap between our self-efficacy beliefs about executive functions measure and frequently used measures of mood which include items on attention and concentration problems. Future research should, therefore, examine protective factors using more extensive measures of executive functions and other aspects of resilience that go beyond the individual (Masten & Motti-Stefanidi, 2020). Second, we found that adolescents scored lower on self-efficacy between May 2020 and May 2021, therefore the experiences of lockdowns may have had a negative impact on adolescents' beliefs about their general performances and their abilities. Self-efficacy in the domain of executive functions could therefore possibly be partly an outcome measure instead of a protective factor (Lent, 2004). It should be noted that the general development of self-efficacy is not yet well understood. Prior studies reported both declines and increases in self-efficacy during adolescence, possibly due to the many different domains in which individuals can experience self-efficacy (Schunk & Meece, 2006). Therefore, it is difficult to state whether the changes in self-efficacy found in the present study are due to normative development or whether they are related to the COVID-19 pandemic. Future studies should also examine to what extent socioeconomic hardship in online home schooling may have impacted self-efficacy development in times of a pandemic in targeted experiments.

4.4 | Strengths and limitations

The present study provides a novel contribution to the increasing body of literature on the impact of the pandemic on adolescent mental wellbeing. The additional third wave in the present study enabled us to examine effects over a 1-year period. Subsequently, we were able to investigate an underlying mechanism (i.e., feelings of future uncertainty) along with a protective factor (i.e., self-efficacy). By doing so we gained more knowledge on *how* some adolescents are disproportionately hit by the pandemic.

Nevertheless, the present study also has several limitations which deserve attention. First, most adolescents in the present study were enrolled in higher education. Additionally, females were overrepresented (there were more females than males in the initial sample), which limits the generalizability of the current findings to the broader population of adolescents. Prior studies have demonstrated gender differences in mental wellbeing issues, with females being more prone to anxiety and depression related symptoms (Landstedt et al., 2009; Van Droogenbroeck et al., 2018). Yet, attrition rates were higher among males than females (see Supplement S1b). Other studies during the pandemic have also been hampered by low participation and high attrition rates of males (Kwong et al., 2021; van de Groep et al., 2020).

Second, and relatedly, the current sample may be limited in variability in the degree to which adolescents experienced socioeconomic hardship. A more heterogenous sample is required to get a better understanding of the impact of socioeconomic disparities on adolescents' long-term mental wellbeing.

The third limitation is that the present study was underpowered in the moderated mediation models due to attrition rates. Power analyses showed that a sample of 190 adolescents was needed to identify small effects, whereas our samples ranged from 135 to 138 in the moderated mediation models. Exploratory analyses with imputed data, as discussed in Supplement S5, showed that a more powered sample would have positively contributed to results remaining significant after Holm–Bonferroni correction. Hence, the null findings with respect to self-efficacy about executive functioning need to be interpreted with caution.

Fourth, although we found no differences in socioeconomic hardship in online home schooling between the attrition group compared to the non-attrition group, there could have been a selection bias in the initial phase of this longitudinal project, influencing the present sample composition. Adolescents with no access to internet, with potential language difficulties or insufficient comprehension of the Dutch language, with limited free time, or from schools which did not respond or disagreed to participate, were unintentionally left out of the present study. The fifth and final limitation is that we have no information on our sample's mental wellbeing prior to the COVID-19 pandemic. Therefore, we were unable to compare the current mood trajectories to those preceding the pandemic.

5 | CONCLUSION

The present study's novelty is embedded in its longitudinal design to cover a broader period of the COVID 19 pandemic in a sample of Dutch adolescents. This approach, combined with preregistered tests that were corrected for multiple comparisons, enabled us to examine how individual differences in starting position of the COVID-19 pandemic on both an individual level (i.e., self-efficacy) and within the environment (i.e., socioeconomic hardship in online home schooling) predicted mental wellbeing 1 year later in a group of middle-highly educated adolescents. Socioeconomic hardship was associated with less mental wellbeing among adolescents 1 year later, although this effect was mainly driven by baseline mental wellbeing. The results also show that subjective feelings of an uncertain future contribute to adolescent mood in terms of being less vigorous and more tensed and depressed. Moreover, at uncorrected threshold, we found evidence showing that higher levels of socioeconomic hardship were associated with higher levels of future uncertainty. Nevertheless, we found no evidence that future uncertainty mediates the association between socioeconomic hardship in online home schooling and adolescent mental wellbeing 1 year later. Self-efficacy beliefs in the domain of executive functioning decreased over time, but self-efficacy did not buffer the associations. Longitudinal studies with more powered and representative samples are needed to confirm the present findings. Still, the current study illustrates that health care and policy makers should not only focus on promoting resilience within the individual but should also include the social environment and surrounding systems. Taken together, the present results demonstrate the need for an active focus on young people's mental wellbeing, to both prevent and treat negative long-term consequences, and to make sure that future generations can thrive and tackle the challenges of their time.

OPEN SCIENCE STATEMENT

Part of the data from the first and second time point have already been published (Green et al., 2021). The materials, the pseudonymized data, which was analyzed during the present study, along with the computer code are available upon reasonable request from the authors, in the EUR Data Repository (<https://datarepository.eur.nl>).

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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SUPPORTING INFORMATION

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