Investigating how students' learning environment, social and physical well-being influence their resilience and feelings of depression and loneliness during the COVID-19 pandemic in the Netherlands

Kiltz, Lisa; Fokkens-Bruinsma, M.; Jansen, E. P.W.A.

Published in:
Higher Education Research and Development

DOI:
10.1080/07294360.2023.2209509

Publication date:
2023

Routledge
Taylor & Francis Group

Higher Education Research & Development

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/cher20

Investigating how students' learning environment, social and physical well-being influence their resilience and feelings of depression and loneliness during the COVID-19 pandemic in the Netherlands

Lisa Kiltz, M. Fokkens-Bruinsma & E.P.W.A. Jansen

To cite this article: Lisa Kiltz, M. Fokkens-Bruinsma & E.P.W.A. Jansen (2023) Investigating how students' learning environment, social and physical well-being influence their resilience and feelings of depression and loneliness during the COVID-19 pandemic in the Netherlands, Higher Education Research & Development, 42:8, 1970-1985, DOI: 10.1080/07294360.2023.2209509

To link to this article: https://doi.org/10.1080/07294360.2023.2209509

HIGHER EDUCATION RESEARCH & DEVELOPMENT
2023, VOL. 42, NO. 8, 1970–1985
https://doi.org/10.1080/07294360.2023.2209509

Investigating how students' learning environment, social and physical well-being influence their resilience and feelings of depression and loneliness during the COVID-19 pandemic in the Netherlands

Lisa Kiltz, M. Fokkens-Bruinsma and E.P.W.A. Jansen

Department Teacher Education, University of Groningen, Groningen, The Netherlands

ABSTRACT

In response to COVID-19 pandemic-related social restrictions, university students have reported being more depressed, lonelier, and less resilient, potentially affected by changes within the academic system. The present study investigates how students' social and physical well-being affect their psychological well-being and additionally explores the role of the learning environment. To this end, we analyzed secondary data collected during the first wave of the COVID-19 pandemic with multiple regression and explorative analysis. Results indicate that social resources – in particular, the quality rather than the quantity – positively influenced students' psychological well-being. Engaging in physical exercise appeared beneficial, whereas consuming drugs remained a contradictory predictor. Emergency remote teaching appeared a main factor that predicted students' well-being. This powerful effect masked the positive influence the teachers could have had. Given the profound changes in the academic system due to persistent social distancing requirements, these insights could provide valuable input when designing a healthy post-pandemic learning environment.

ARTICLE HISTORY
Received 4 March 2022
Accepted 26 March 2023

KEYWORDS
Student well-being; resilience; COVID-19 learning environment; depression; loneliness

Introduction

In response to the COVID-19 pandemic, the Dutch government imposed various restrictive measures (RIVM, n.d.), which have resulted in adverse mental health consequences. These measures included social distancing and closing universities, leading to emergency remote teaching (ERT). Such changes in the learning environment (LE) may have resulted in lower social and physical well-being among students. However, understanding the impact such changes may have had on student well-being may help us shape the so-called post-pandemic LE. Moreover, from a theoretical understanding within well-being research, social and

CONTACT Lisa Kiltz l.kiltz@rug.nl Department Teacher Education, University of Groningen, Kruisstraat 2/1, Groningen 9712TS, The Netherlands https://www.linkedin.com/in/lisa-kiltz-846170194/ @KiltzLisa
Supplemental data for this article can be accessed online at https://doi.org/10.1080/07294360.2023.2209509.

physical well-being impact psychological well-being. Therefore, we analyzed secondary data on students' social, physical, and psychological well-being and perceptions of their LE during the first wave of the COVID-19 pandemic (Van de Velde et al., 2021).

Students' psychological well-being

Students typically report lower psychological well-being worldwide, compared to the rest of the population (e.g., Bore et al., 2016; Stallman, 2010). Unsurprisingly, research has shown that students are especially vulnerable concerning their pandemic-related well-being (e.g., González-Sanguino et al., 2020). Faced with closures of educational institutes, economic insecurities, and social distancing, this population has been particularly affected. Specifically for depression and loneliness, younger individuals and students in particular reported adverse mental health responses to the COVID-19 crisis (Lim et al., 2020; Mamun et al., 2021; Palgi et al., 2020; Shah et al., 2020).

Students' resilience is a crucial theoretical construct studied in positive well-being research. This concept refers to the potential to activate resources and regain a prior psychological state after an adverse event (Masten, 2001). Thus far, students' resilience has been associated with promoting well-being and preventing negative emotions (e.g., Bore et al., 2016). Especially in times of crisis, resilience has the potential to help overcome adverse psychological effects (Chen & Bonanno, 2020; Shigeto et al., 2021). Bonanno (2020) ascribes to resilience the potential to keep stress at a minimum and thereby counteract depressive symptoms. Resilience also relates to lower stress during the COVID-19 pandemic (Pollak et al., 2020). At the same time, non-resilient people perceived the pandemic as more uncontrollable (Shigeto et al., 2021). These findings emphasize the need to focus on resilience as a resource to overcome the adverse psychological impacts that inevitably accompany a global crisis.

Students' social and physical well-being

To identify protective and risk factors of students' psychological well-being during a pandemic, we elaborate on their social and physical well-being. First, social well-being refers to a person's social connectedness and interpersonal relations. With restrictive measures of social distancing, the public's social lives have been interrupted. This interruption led family and friends to separate, limiting opportunities for social interaction and support (Holmes et al., 2020; Taylor, 2019). Accordingly, people living alone suffered more from depression and loneliness (Lim et al., 2020). Being in a relationship offers another protective factor against depressive symptoms during the pandemic (Shah et al., 2020). Yet generally, social distancing measures have substantially diminished the sense of connectedness and created lower social and psychological well-being (Firkey et al., 2021; Ford, 2021). In fact, a US study investigating student well-being shortly before and after the pandemic hit found social well-being to have substantially decreased (Hagemeier & Dowling-McClay, 2020). Noting consistent evidence that social resources are connected to resilience (Bonanno, 2020; Chen & Bonanno, 2020), investigating social well-being seems particularly relevant.

Second, physical well-being influenced mental health during the pandemic. Physical health concerns relate to experiences of loneliness (Lim et al., 2020). Moreover, the

physical symptoms of COVID-19 and the likelihood of risking a severe infection correlate positively with depressive symptoms (González-Sanguino et al., 2020; Wang et al., 2020). People recovering from prior infections appear to be at risk, too (Holmes et al., 2020). In contrast, physical activity has a significant effect on staying healthy during a pandemic (Chen et al., 2020). People feel depressed when they do not exercise sufficiently (Shah et al., 2020), and smoking and alcohol consumption are potential risk factors associated with increased depression (Mamun et al., 2021) – though counterexamples exist as well (Firkey et al., 2021). In this context, younger people such as students are at higher risk of high alcohol use (Ahmed et al., 2020). Therefore, both COVID-19- and lifestyle-related physical aspects might influence students' psychological well-being.

The learning environment

In line with a systemic perspective, we assume that students' academic surroundings affect their well-being. From this perspective, social constructivism (Gergen, 1985) suggests that students and faculty together create academia through their interactions, such that we cannot view individuals as independent from the environment or others within their system. Rather, they are holistically influenced. Therefore, student well-being does not solely concern the individual; instead, we must consider the system in which the individual exists (von Schlippe & Schweitzer, 2015).

Prior research illustrates the role of the LE, in which both structural and interpersonal factors can promote student well-being (Niemiec & Ryan, 2009). Baik et al. (2019) identified several factors within the LE that increase students' well-being, encompassing both social factors (e.g., student support) and academic factors (e.g., course design), along with the academic culture and communication patterns. Regarding interpersonal factors, the emphasis lies on teacher–student relationships that foster student well-being (Baik et al., 2019; Niemiec & Ryan, 2009; Trolian et al., 2020).

Considering the impact of pandemic-related restrictions on the LE, the academic system we have known has changed, profoundly and perhaps even permanently (e.g., Yang, 2020). Students perceive this sudden change within their LE as negative (Besser et al., 2020). For instance, relying on offline teaching results in a lack of personal development (Eley & Stallman, 2014). Furthermore, social relationships have suffered due to ERT, resulting in compromised social belonging (e.g., Besser et al., 2020). These factors may have affected some groups more than others. Especially first-year students display a higher risk of depressive symptoms, because they have not yet built up a social network (Farrer et al., 2016). Being cut off from family and friends, international students may also experience heightened psychological distress. With ERT, this effect may have been amplified. Therefore, investigating the interpersonal and structural characteristics of the LE constitutes a promising research avenue to understand how to promote student well-being both during and beyond the COVID-19 pandemic.

The study's aims

Within this study, we investigate aspects of students' psychological well-being in relation to their social well-being, physical well-being, and LE. Building on previous findings and the theoretical assumptions elaborated above, we postulate hypotheses pertaining to how

students' social (H1) and physical (H2) well-being relate to depressive symptoms, loneliness, and resilience as their psychological well-being.[1] Additionally, we were interested in group differences regarding social (H1.a–H1.c) and physical well-being (H2.a). Furthermore, we explore how changes within the LE might be associated with students' psychological well-being.

H1. Indicators of social well-being (i.e., students' social resources, engagement in social activities, and sharing concerns with others) relate to psychological well-being, so that heightened social well-being result in a decrease of depressive symptoms and loneliness and an increase of resilience.

(a) Domestic students demonstrate fewer depressive symptoms and less loneliness, but higher resilience than international students.

(b) Students in non–long-distance (NLD) relationships demonstrate fewer depressive symptoms and less loneliness, but higher resilience than single students or students in long-distance (LD) relationships.

(c) First-year students demonstrate more depressive symptoms and loneliness, and lower resilience than higher-year students.

H2. Indicators of physical well-being (i.e., drug consumption and physical activity) relate to psychological well-being. Whereas drug consumption results in an increase of depressive symptoms and loneliness and a decrease of resilience, physical activity results in the contrary.

(a) Students with a physical predisposition to COVID-19, an actual infection, or symptoms display more frequent depressive symptoms and more loneliness, but lower resilience compared with students without.

Materials and methods

This study is part of the COVID-19 International Student Well-Being Study executed by the University of Antwerp (C19 ISWS; Van de Velde et al., 2021). Within this international survey, we focus on data of a Dutch university. Although these data already had been gathered, we pre-registered the study at the Open Science Framework prior to the analysis.[2]

Participants

The sample consisted of a convenience sample, including students above 17 years of age and enrolled at the university in question ($n = 3{,}698$). For this study's purpose, we excluded the following: respondents who were not Bachelor's or Master's students, older than 30 years, and who had completed less than 50% of the questionnaire. This process led to a final sample size of $n = 3{,}007$ with a mean age of 22 years ($SD = 2.50$), ranging from 17 to 30 years (for additional information, see Table 1 and Table S1 in the supplementary material[3]).

Measures

Within the existing data set, we identified items that related to either social or physical well-being. Finally, we found three indicators for social well-being and five for physical

Table 1. Socio-demographics and further study- and COVID-19-related information of the sample.

		N	Percentage
Gender	Female	2,090	69.5
	Male	885	29.4
	Other	32	1.1
International	Dutch citizen	2,011	66.9
	International	996	33.1
Relationship status	Single	1,597	53.1
	In an LD relationship	151	5.0
	In an NLD relationship	1,102	36.6
First-year student	Yes	655	21.8
	No	2,352	78.2
Underlying conditions	Yes	349	11.8
	No	2,619	88.2
COVID-19 symptoms during the past month	Yes	1,303	46.6
	No	1,493	53.4
Prior COVID-19 infection	Yes	327	10.9
	No	2,679	89.1

Note. We define an LD relationship herein as one in which the respondent had not seen their partner for a month or more. This distinction was done retrospectively based on participants' responses to how long they have not seen their partner.

well-being (for a detailed illustration of these indicators, see Table S2 in the supplementary material). The first social well-being indicator pertains to students' contact with others and consists of two items to measure social resources referring to their contact with friends and family, both currently and compared with before the pandemic as stated retrospectively by the students. We combined these two items to a mean value. The second one focuses on students' engagement in social activities, combining six activities as items to form a single index ranging from 0 to 6. Lastly, a dichotomous item assessed whether participants have shared their concerns with others. The first physical well-being indicator indicates students' current drug consumption, and the second any consumption increase or decrease compared with pre-COVID-19 pandemic, retrospectively stated. Both consist of three items, referring to tobacco, alcohol, and marijuana consumption, all of which are legal in the Netherlands. Regarding the increase-indicator, we created an index comparing the participants' responses regarding their current consumption with their consumption prior to COVID-19. The third and fourth indicators consist of two items each, asking students to describe their exercise habits, currently and compared with pre-pandemic, again in retrospective. Finally, we calculate an index ranging from 0 to 3, based on three items measuring whether or not participants engaged in various physical activities.

We included three measures of students' psychological well-being. First, students' depressive symptoms were measured using the Center for Epidemiological Studies depression scale (CES-D 8; based on Radloff, 1977). Second, their loneliness was assessed using two items from the Roberts UCLA-8 Loneliness Scale (Roberts et al., 1993). Both scales feature 4-point Likert scales, ranging from 'none to almost none of the time' to 'all or almost all of the time'. Third, with the Brief Resilience Scale (Smith et al., 2008), we included a positive perspective on students' psychological well-being. The participants rated their resilience on a 5-point Likert scale ranging from 'strongly disagree' to 'strongly agree'.

Finally, a 12-item scale indicates students' perception of their LE. The initial eight items derived from the Inholland Student Enquete 2020. We created three subscales

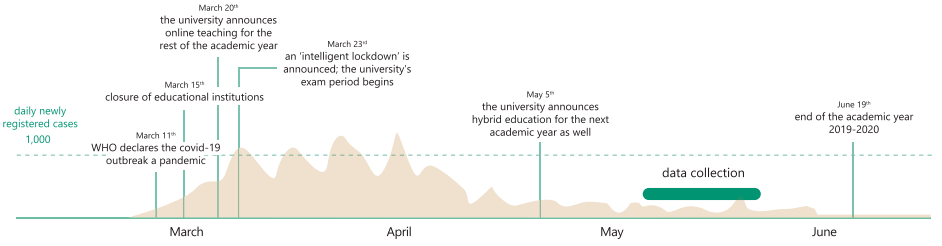

Figure 1. The timeline of the study, including the period of data collection and the relevant events surrounding the pandemic. Note. All societal events and pandemic developments pertain to the Netherlands, and all university events pertain to the university in question. Sources: containmentnu.nl, coronavirus.nl, nos.nl, rijksoverheid.nl, rivm.nl, who.int.

from them, comprising how ERT supported students' learning process, how engaged students were, and how committed the students perceived their teachers to be. The final four items focus on the students' social and academic integration (for internal reliabilities of the scales, see Table S3 in the supplementary material).

Data collection

The data collection took place for two weeks in May 2020, shortly after the first wave of the COVID-19 pandemic in the Netherlands (see Figure 1). Prior to data collection, the ethics committees at the University of Antwerp and the Ghent University approved the procedure. Participants had to consent to the study before proceeding with the questionnaire. The questionnaire was set up with Qualtrics software and distributed amongst students via email.

Analysis

Initially, we checked for potential outliers ($z \pm 2$) or zero variations and excluded these cases. For H1 and H2, we calculated a joint multiple regression with the social and physical well-being indicators as predictors to examining the predictive power of each potential indicator. To investigate the group differences, we ran between-subjects factorial multivariate analyses of variance (MANOVAs). Noting the exploratory nature regarding the further examination of the LE, we first examined how the LE scales correlated with the psychological well-being outcomes. Subsequently, we executed a multiple regression analysis to identify aspects within the LE that protected students' well-being.

Results

Social and physical well-being as predictors

We ran multiple regressions for each of the three psychological well-being measures, using social and physical well-being indicators as predictors (see Table 2). Table 3 illustrates the corresponding means and standard deviations. The analyses demonstrated relatively small adjusted R^2, meaning that the indicators accounted for less than 10% of the variation within the model.

Table 2. Summary of the multiple regressions with depression, loneliness, and resilience as the outcome variable, respectively, and social as well as physical well-being indicators as predictors.

	Depression			Loneliness			Resilience		
	B	SE B	β	B	SE B	β	B	SE B	β
Social resources	−.01	.02	−.01	−.11	.03	−.07**	.023	.02	.02
Social activities	−.01	.01	−.01	.09	.01	.01	.03	.01	.06**
Sharing concerns	−.32	.03	−.17**	−.60	.05	−.21**	.25	.05	.10**
Drug consumption	.04	.01	.06**	.05	.02	.05*	.07	.02	.07**
Increase drug consumption	.01	.02	.01	−.11	.03	−.07**	−.11	.03	−.08**
Exercise habits	−.07	.01	−.15**	.04	.02	.05	.09	.02	.14**
Increase exercise habits	−.02	.01	−.05*	−.06	.02	−.08**	−.04	.01	−.07**
Physical activities	−.01	.01	−.01	−.02	.02	−.02	−.01	.02	−.01
Adjusted R^2	.08			.06			.04		
F	31.5			23.1			13.6		

Note. *$p < .05$, **$p < .01$; B = unstandardized coefficient beta; $SE\ B$ = standard error of B; β = standardized coefficients beta.

Table 3. Means (M) and standard deviation (SD) of university students' psychological, social, and physical well-being.

	M	SD	Scale
Psychological well-being			
Depression	2.3	0.5	1 ('none or almost none of the time') – 4 ('all or almost all of the time')
Loneliness	2.4	0.9	1 ('none or almost none of the time') – 4 ('all or almost all of the time')
Resilience	3.0	0.7	1 ('strongly disagree') – 5 ('strongly agree')
Social well-being			
Social resources	1.9	0.6	1 (less) – 3 (more)
Social activities	3.2	1.5	0–6 (see in-text description)
Sharing concerns	1.9	0.3	1 (yes); 2 (no)
Physical well-being			
Drug consumption	1.5	0.8	1 ('(almost) never') – 5 ('(almost) daily')
Increase in drug consumption	−0.2	0.5	Index: Current consumption – consumption prior to COVID-19
Exercising habits	3.1	1.1	1 ('(almost) never') – 5 ('(almost) daily')
Increase in exercising habits	−0.6	1.3	Index: Current habits – habits prior to COVID-19
Physical activities	0.9	0.9	0–3 (see in-text description)

For depression, four indicators proved significant: sharing concerns, drug consumption, current exercise habits, and increases thereof. The more students shared their concerns with close others, and the more they exercised and intensified these exercise habits, the less prone they were to depressive symptoms. At the same time, students who consumed drugs more frequently experienced more depressive symptoms.

Five factors significantly predicted loneliness. As with depressive symptoms, whenever students shared their concerns and increased their exercise habits, but also when they intensified their social resources, they felt less lonely. Likewise, students reported feeling less lonely when they consumed drugs more frequently than before the pandemic. However, students' current drug consumption constituted a positive predictor: The more frequently they smoked or drank at the time of measurement, the lonelier they felt.

Nearly all factors significantly predicted students' resilience. First, students who shared their concerns and participated in social activities were more resilient. Furthermore, the more students exercised or consumed drugs, the more resilient they were. In contrast, both an increase in exercise habits and drug consumption compared with pre-COVID-19 related to lower resilience.

Group differences

We analyzed potential group differences in social well-being with a factorial MANOVA including nationality (H1.a), relationship status (H1.b), and first-year status (H1.b) as fixed factors and the psychological well-being measures as dependent variables. The multivariate tests indicated significant differences for students' nationality and relationship status (nationality: $F(3, 2506)$, $p < .001$; Wilks' $\Lambda = .99$; relationship: $F(6, 5012)$, $p < .001$; Wilks' $\Lambda = .98$). First-year students did not differ significantly from their more experienced fellow students ($F(3, 2506)$, $p = .67$; Wilks' $\Lambda = 1.00$).

The tests of between-subjects effects for nationality revealed significantly different levels of depressive symptoms and loneliness (depression: $F(1) = 4.28$, $p = .04$; loneliness: $F(1) = 4.84$, $p = .03$; see Table S4 in the supplementary material). Namely, international students reported feeling more depressed yet less lonely compared with Dutch students (Figure 2(a)). Furthermore, students' depressive symptoms and loneliness differed according to their relationship status (depression: $F(2) = 5.58$, $p = .004$; loneliness: $F(2) = 27.92$, $p < .001$). As post-hoc analyses demonstrated, singles and students in a LD relationship reported being significantly more depressed and lonely than students in NLD relationships (singles vs. NLD relationship, depression: $.09 \pm .02$, $p < .001$; loneliness: $.29 \pm .03$, $p < .001$; LD vs. NLD relationship, depression: $.16 \pm .05$, $p = .006$; loneliness: $.32 \pm .08$, $p < .001$). Students in LD relationships and singles did not differ significantly from each other neither regarding depression ($.07 \pm .05$, $p = .35$) nor loneliness ($.03 \pm .08$, $p = .95$; see Table S5 in the supplementary material for further information). Looking at Figure 2(a), students in a NLD relationship reported fewer depressive symptoms and lower loneliness compared to singles and students in LD relationships. In conclusion, the results indicate NLD relationships to be favorable for counteracting depression and loneliness. For resilience, however, we found no significant difference ($F(2) = 2.41$, $p = .09$).

In another factorial MANOVA, with physical well-being group differences as factor variables (H2.a), experiencing COVID-19 symptoms during the past month constituted the only significant factor ($F(3, 2423)$, $p = .02$; Wilks' $\Lambda = 1.00$). Experiencing COVID-19 symptoms significantly influenced students' depressive symptoms ($F(1) = 8.34$, $p = .003$). Figure 2(b) indicates that students without COVID-19 symptoms felt fewer depressive symptoms than other students. The remaining two independent variables did not account for any significant effects (underlying medical conditions: $F(3, 2423)$, $p = .37$; Wilks' $\Lambda = 1.00$; COVID-19 infection: $F(3, 2423)$, $p = .23$; Wilk's $\Lambda = 1.00$; see Table S6 in the supplementary material).

The learning environments' influence

To explore the LE's role in students' psychological well-being, we first calculated correlations. As illustrated in Table 4, ERT relates positively to students' psychological well-being. The same accounted for the teachers' role and students' academic integration, although less strongly. These factors related negatively to depression and loneliness but positively to resilience. Moreover, the more students engaged in their studies, the less likely they were to display depressive symptoms. Finally, social integration correlated positively with students' resilience.

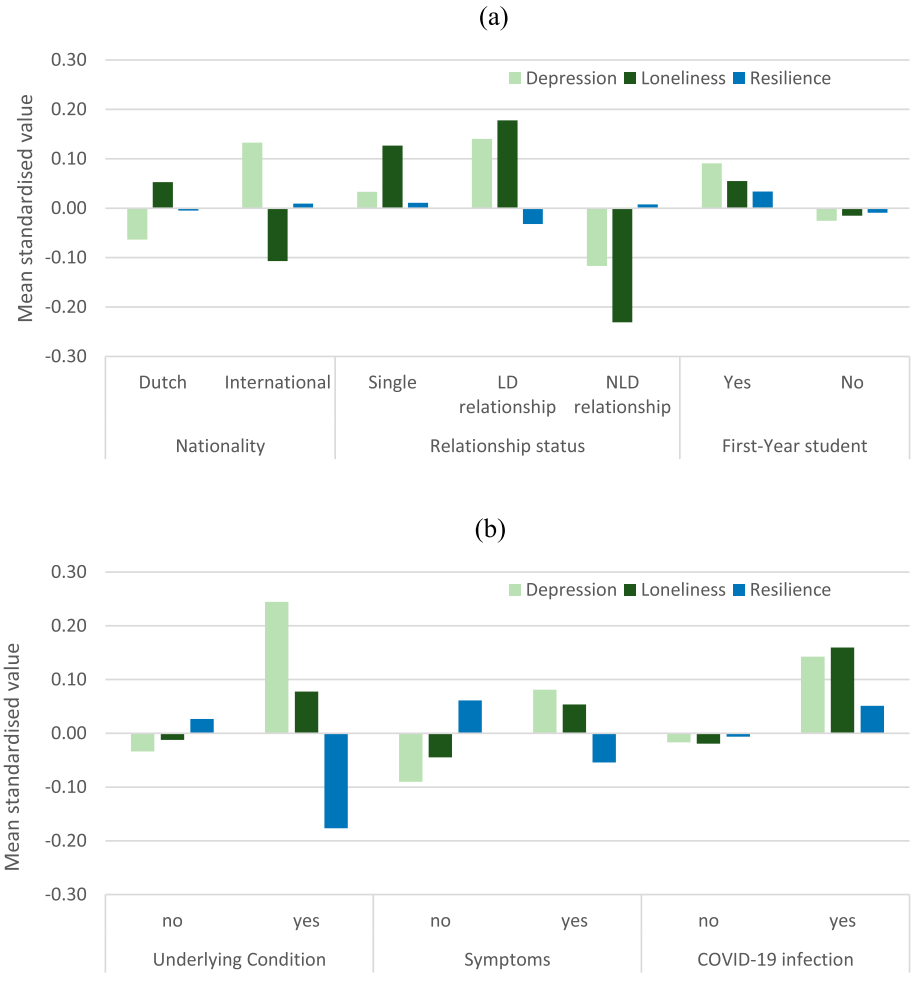

Figure 2. Standardized means of the psychological well-being measures distributed according to group affiliation based on social (a) and physical (b) group differences. Note. LD = long-distance; NLD = non-long-distance.

We ran multiple regressions for each outcome measure, in which 5% to 20% of the variance was explained (see Table 5). ERT and students' social integration significantly predicted all three psychological well-being measures. Whereas a well-implemented

Table 4. Pearson correlations between psychological well-being and learning environment characteristics

	1	2	3	4	5	6	7	8
1 Depression	1	–	–	–	–	–	–	–
2 Loneliness	.43**	1	–	–	–	–	–	–
3 Resilience	−.21**	−.20**	1	–	–	–	–	–
4 ERT	−.34**	−.21**	.45**	1	–	–	–	–
5 Students' engagement	−.08**	−.01	.03	.11**	1	–	–	–
6 Teachers' role	−.12**	−.10**	.10**	.33**	.20**	1	–	–
7 Social integration	−.01	.02	.09**	.12**	.22**	.18**	1	–
8 Academic integration	−.05**	−.07**	.05**	.08**	.11**	.21**	.22**	1

Note. *$p < .05$, **$p < .01$; ERT = emergency remote teaching.

Table 5. Summary of the multiple regressions with depression, loneliness, and resilience as the outcome variable, respectively, and students' perception of their learning environment as predictor.

	Depression			Loneliness			Resilience		
	B	SE B	β	B	SE B	β	B	SE B	β
ERT	−.28	.02	−.33**	−.27	.03	−.20**	.54	.02	.46**
Students' engagement	−.03	.01	−.05**	.02	.02	.02	−.01	.01	−.01
Teachers' role	−.01	.01	−.01	−.04	.02	−.04	−.06	.02	−.06**
Social integration	.03	.01	.04*	.06	.02	.06**	.04	.02	.04*
Academic integration	−.02	.01	−.03	−.05	.02	−.06**	.02	.01	.03
Adjusted R^2	.12			.05			.20		
F	75.0			31.2			143.5		

Note. *$p < .05$, **$p < .01$; *B* = unstandardized coefficient beta; *SE B* = standard error of *B*; β = standardized coefficients beta.

ERT protected students from feeling depressed and lonely, social integration resulted in the contrary. For resilience, in contrast, both ERT and students' social integration proved beneficial. Beyond that, students' engagement favorably affected their depression and students experienced less loneliness when they were academically integrated. However, the more receptive and committed students perceived their teachers to be, the less resilient students reported being.

The results surrounding students' social integration and teachers' role thus appear somewhat counterintuitive, especially considering the correlations reported previously. Therefore, we investigated them exploratorily in greater depth. Considering that ERT correlated most strongly with psychological well-being, we compared two multiple regression models, with and without ERT as predictor (see Table S8 in the supplementary material). The comparison affirmed that ERT distorted how teachers influenced students' psychological well-being. When we excluded ERT, the teachers' role constituted a favorable predictor for all three psychological well-being measures (depression: $\beta = -.11$, $p < .001$; loneliness: $\beta = -.10$, $p < .001$; resilience: $\beta = .07$, $p < .001$). This effect was masked as soon as we entered ERT into the regression. The unexpected findings surrounding students' social integration remained unaffected though for loneliness when excluding ERT ($\beta = .05$, $p = .02$), and became insignificant for depression ($\beta = .03$, $p = .21$). The explained variances of the models excluding ERT decreased significantly to 1–2%, highlighting ERT's considerable predictive power.

Discussion

The main objective of this study was to examine how students' social, physical well-being, and LE relate to their psychological well-being and what we can learn from that for post-pandemic academia. Building on prior research, we proposed that social and physical well-being indicators influence students' depression, loneliness, and resilience and that understanding how pandemic-related LE adaptations relate to well-being is an essential step towards creating a healthier academic system in the future.

Students' social well-being

The proposed social well-being indicators related to students' psychological well-being, in line with most of our hypotheses. Pandemic-related restrictions interrupted social

connection, so it seems logical that factors enhancing social well-being lead to improved well-being. Our findings suggest sharing concerns with close ones as the most relevant predictor. Students' frequent contact with social resources, however, were solely associated with feeling less lonely. These findings only partly confirm prior findings (Lim et al., 2020). Instead, the quality of social resources, as in sharing concerns, appears more critical than the quantity, as in frequent contact with social resources. Prior research has suggested that the quality and quantity of social interaction has been restricted due to COVID-19 measures, further emphasizing a sense of social disconnection (Ford, 2021).

Additionally, we examined various group differences regarding students' psychological well-being. First, international students reported elevated depressive symptoms compared with Dutch students, confirming hypothesis H1.a. Surprisingly however, internationals suffered less from loneliness than Dutch students. This counterintuitive result may derive from international students who might have returned home to their families, where they could receive sufficient social support. Second, our hypothesis H1.b, stating that relationship status influences students' well-being, was confirmed. When compared with singles or students in LD relationships, students in NLD were less lonely and reported fewer depressive symptoms. These results correspond to prior research highlighting the relevance of close others for mitigating depression (Shah et al., 2020). Contrary to H1.c, we observed no effects, especifically for first-year students. Considering that first-year students seemed especially vulnerable even before COVID-19 (Farrer et al., 2016), these non-findings are surprising. However, we assume that first-year students may have returned to their parents' homes and experienced sufficient support there.

Students' physical well-being

Our findings surrounding students' physical well-being (H2) are not as clear. Their drug consumption predicted psychological well-being, although inconsistently: students' current drug use related to feeling lonelier and more depressed, but also to enhanced resilience. However, more frequent consumption compared with pre-pandemic was associated with lower resilience. Other researchers have reported inconsistency surrounding drug consumption and psychological well-being during COVID-19 as well. For example, Grogan et al. (2020) note the potential of smoking as a coping mechanism, which could explain the respective discrepancies. Beyond that, both current and increased physical exercise habits at least partly related to students' psychological well-being. These findings align with prior research (Shah et al., 2020) and confirm our hypothesis. In terms of resilience, however, the results seemed contradictory. When students reported increased exercise habits compared with pre-pandemic, they also reported lower resilience. Conceivably, an increase in exercise habits may have derived from compensating for lacking alternative activities that otherwise could have contributed to students' resilience even more. Due to social distancing, students may have been missing the social contact through sports. Despite these contradictions, our results generally highlight that physical well-being overall is associated with students' psychological well-being. Yet, research has suggested a general increase of alcohol consumption and decrease of exercise habits during the initial months of the pandemic (Naughton et al., 2021). These unfavorable lifestyle changes were particularly apparent among younger people, emphasizing the relevance of students' physical health promotion for academia.

Regarding group differences based on physical characteristics (H2.a), having experienced recent symptoms was the sole factor that differentiated students' psychological well-being. Namely, students who experienced symptoms seemed more depressed. Although these findings align with previous research (González-Sanguino et al., 2020), it remains unclear why we found no further significant group differences. That said, the relationship between underlying medical conditions and psychological well-being has not been consistently reported before either (e.g., Palgi et al., 2020).

The learning environment's influence

Regarding our second research aim, investigating the LE, our most striking finding was the considerable predictive power of ERT itself. This result indicates that the positive effects of the LE on student well-being found previously (e.g., Niemiec & Ryan, 2009) remain relevant even in times of crisis. Creating an adequate and supportive remote LE was linked to students' psychological well-being far more than the remaining predictors. Moreover, our data show that teachers' receptiveness and commitment to students related to students feeling less resilient, contrary to previous studies (Baik et al., 2019; Niemiec & Ryan, 2009). However, the positive predictive power when removing ERT from the multiple regression hints at teachers' generally favorable impact on students' well-being as illustrated before (Trolian et al., 2020). Thus, we assume that ERT might mask teachers' protective influence on students' depression and loneliness. Missing out on personal contact with teachers and the general positive input students normally experience may explain this finding. Therefore, our results emphasize the relevance of creating healthy remote teaching settings on the one, and the importance of investing in teacher–student relationships beyond remote teaching on the other hand.

Other than ERT, students' social integration was the only other predictor that was connected to all three outcome measures. Surprisingly, being socially integrated related to students feeling more depressed and lonelier. Particularly given social distancing measures, these results appear contradictory. However, looking closer at the items assessing social integration may explain this relation, as it also assessed whether being in touch with fellow students contributed to students' study processes. When social relationships are disrupted, such an item may be easily misinterpreted. Being separated from one's fellow students and thus not able to benefit from their insights may explain why students scoring high on depression and loneliness would agree to such a statement. Even in remote LEs, educators should encourage contact between students, such as with assignments designed to force them to collaborate with peers.

Limitations

Despite the valuable insights this study provides, some doubts persist. Our use of secondary data restricts our considerations to concepts chosen by the original authors. Enriching the measures with specific concepts could have improved the interpretability of the study. Moreover, the considerable variation in sample sizes for specific groups indicates that the results of comparison analyses need to be taken with caution. Likewise, using such a big sample might have also resulted in overestimating group differences regarding their significance. Beyond that, the data focused on only one university in a specific

cultural context. Academic settings can differ substantially, depending on their educational culture, so acknowledging a broad international context could enhance the study's power. Finally, the present study was cross-sectional; therefore, no causal conclusions can be drawn based on the data.

Practical implications and further research

Uncertainty in education – as is the case during a pandemic – may lead to radical changes. The COVID-19 pandemic's profound impact on education revealed several challenges regarding the system's reorganization. Specifically in times of crisis, in which systems are forced to reorganize, educational challenges may turn into academic opportunities to reshape and improve the academic system, even beyond the pandemic (Geertsema & Bolander Laksov, 2019). Within this reshaping process, specific aspects may be more relevant than others. Our results surrounding ERT and its effective implementation could serve as a basis for creating a sustainable, healthy LE in post-pandemic times. In addition, the teaching role must not be neglected; teachers' receptiveness seems to support student well-being, at least when excluding the ERT's compelling impact. Therefore, teachers should be made aware of their impact on students' health in their professional roles. Beyond that, focusing on social integration and students' connectedness seems to be a promising avenue for future academic interventions as it not only relates to students' higher emotional well-being, but also to better adaptability (Besser et al., 2020). In line with our findings, promoting the quality of social interaction and sharing concerns must be facilitated in academic contexts to promote students' psychological well-being. Additionally, educational developers should draw upon similar research from before the pandemic to enrich suggestions from COVID-19 research (e.g., Brewer et al., 2019). Like that, we may be able to create a psychologically healthy academic system based on lessons learned before and during COVID-19.

For continued research, we note that a lack of social connectedness and social well-being has been associated with less favorable physical health behavior, such as exercising (Ford, 2021). To explore potential interaction effects, researchers should investigate the interplay between these aspects more profoundly to clarify the inconsistencies surrounding physical well-being in COVID-19 times. Beyond that, our data relies on a cross-section design; therefore, no causal conclusions can be drawn as long as the predictors that we identified are not confirmed by longitudinal research. Finally, as with most findings surrounding the LE, ours are based on exploratory analyses. Therefore, confirmatory research may be necessary to validate our results and suggested implications.

Conclusion

Emphasizing the dynamics within the academic system, the present study broadens the academic horizon for supporting students' social, physical and psychological well-being. Specifically, our findings propose several opportunities to improve student well-being systemically within the learning environment and thus provide directions for future academic interventions also beyond the scope of the COVID-19 pandemic. Such interventions may focus on aspects surrounding the remote LE and the teachers' role therein as well as promoting students' social connectedness and physical exercising behavior. Taken

together, the present study provides valuable insights that can contribute to reshaping the post-pandemic academic system.

Notes

1. Contrary to the pre-registration, we excluded social and physical well-being as outcome variables for the sub-hypotheses.
2. https://osf.io/zcmpq
3. The supplementary material comprises the SPSS syntax used, further additional information on the sample, the scales used and their internal consistencies, and more in-depth analyses that were excluded due to space limitations.

Acknowledgements

This study is part of the COVID-19 International Student Well-Being Study (C19 ISWS). C19 ISWS is the result of a study design, study protocol and questionnaire developed by a team of the University of Antwerp, Belgium (prof. Sarah Van de Velde, dr. Veerle Buffel and prof. Edwin Wouters; see Van de Velde et al., 2021).

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

Lisa Kiltz http://orcid.org/0000-0003-3026-8203
M. Fokkens-Bruinsma http://orcid.org/0000-0001-7551-6843

References

Ahmed, M. Z., Ahmed, O., Aibao, Z., Hanbin, S., Siyu, L., & Ahmad, A. (2020). Epidemic of COVID-19 in China and associated psychological problems. *Asian Journal of Psychiatry*, *51* (*April*), 102092. https://doi.org/10.1016/j.ajp.2020.102092

Baik, C., Larcombe, W., & Brooker, A. (2019). How universities can enhance student mental well-being: The student perspective. *Higher Education Research & Development*, *38*(4), 674–687. https://doi.org/10.1080/07294360.2019.1576596

Besser, A., Flett, G. L., & Zeigler-Hill, V. (2020). Adaptability to a sudden transition to online learning during the COVID-19 pandemic: Understanding the challenges for students. *Scholarship of Teaching and Learning in Psychology*. Advanced online publication. https://doi.org/10.1037/stl0000198

Bonanno, G. A. (2020). *Psychological science and COVID-19: Remaining resilient during a pandemic.* APS Backgrounder Series. https://www.psychologicalscience.org/news/backgrounders/backgrounder-1-resilient.html

Bore, M., Pittolo, C., Kirby, D., Dluzewska, T., & Marlin, S. (2016). Predictors of psychological distress and well-being in a sample of Australian undergraduate students. *Higher Education Research & Development*, *35*(5), 869–880. https://doi.org/10.1080/07294360.2016.1138452

Brewer, M. L., van Kessel, G., Sanderson, B., Naumann, F., Lane, M., Reubenson, A., & Carter, A. (2019). Resilience in higher education students: A scoping review. *Higher Education Research & Development*, 38, 6, 2019, 1105–1120. https://doi.org/10.1080/07294360.2019.1626810

Chen, P., Mao, L., Nassis, G. P., Harmer, P., Ainsworth, B. E., & Li, F. (2020). Coronavirus disease (COVID-19): The need to maintain regular physical activity while taking precautions. *Journal of Sport and Health Science*, *9*(2), 103–104. https://doi.org/10.1016/j.jshs.2020.02.001

Chen, S., & Bonanno, G. A. (2020). Psychological adjustment during the global outbreak of COVID-19: A resilience perspective. *Psychological Trauma: Theory, Research, Practice, and Policy*, *12*(S1), S51–S54. https://doi.org/10.1037/tra0000685

Eley, D. S., & Stallman, H. (2014). Where does medical education stand in nurturing the 3Rs in medical students: Responsibility, resilience and resolve? *Medical Teacher*, *36*(10), 835–837. https://doi.org/10.3109/0142159X.2014.917159

Farrer, L. M., Gulliver, A., Bennett, K., Fassnacht, D. B., & Griffiths, K. M. (2016). Demographic and psychosocial predictors of major depression and generalised anxiety disorder in Australian university students. *BMC Psychiatry*, *16*(1), 1–10. https://doi.org/10.1186/s12888-016-0961-z

Firkey, M. K., Sheinfil, A. Z., & Woolf-King, S. E. (2021). Substance use, sexual behavior, and general well-being of U.S. college students during the COVID-19 pandemic: A brief report. *Journal of American College Health*, 70(8), 2270–2275. https://doi.org/10.1080/07448481.2020.1869750

Ford, M. B. (2021). Social distancing during the COVID-19 pandemic as a predictor of daily psychological, social, and health-related outcomes. *The Journal of General Psychology*, *148*(3), 249–271. https://doi.org/10.1080/00221309.2020.1860890

Geertsema, J., & Bolander Laksov, K. (2019). Turning challenges into opportunities: (re)vitalizing the role of academic development. *International Journal for Academic Development*, *24*(1), 1–6. https://doi.org/10.1080/1360144X.2019.1557870

Gergen, K. J. (1985). The social constructionist movement in modern psychology. *American Psychologist*, *40*(3), 266–275. https://doi.org/10.1037/0003-066X.40.3.266

González-Sanguino, C., Ausín, B., Castellanos, MÁ, Saiz, J., López-Gómez, A., Ugidos, C., & Muñoz, M. (2020). Mental health consequences during the initial stage of the 2020 coronavirus pandemic (COVID-19) in Spain. *Brain, Behavior, and Immunity*, *87*(May), 172–176. https://doi.org/10.1016/j.bbi.2020.05.040

Grogan, S., Walker, L., McChesney, G., Gee, I., Gough, B., & Cordero, M. I. (2020). How has COVID-19 lockdown impacted smoking? A thematic analysis of written accounts from UK smokers. *Psychology & Health*, 37, 1, 2022, 17–33. https://doi.org/10.1080/08870446.2020.1862110

Hagemeier, N. E., & Dowling-McClay, K. (2020). The impact of transitions related to COVID-19 on pharmacy student well-being. *American Journal of Pharmaceutical Education*, *85*(4), 8291–8291. https://doi.org/10.5688/ajpe8291

Holmes, E. A., O'Connor, R. C., Perry, V. H., Tracey, I., Wessely, S., Arseneault, L., Ballard, C., Christensen, H., Cohen Silver, R., Ford, T., John, A., Kabir, T., King, K., Madan, I., Michie, S., Przybylski, A. K., Shafran, R., Sweeney, A., Worthman, C. M., … Bullmore, E. (2020). Multidisciplinary research priorities for the COVID-19 pandemic: A call for action for mental health science. *The Lancet Psychiatry*, *7*(6), 547–560. https://doi.org/10.1016/S2215-0366(20)30168-1

Lim, M., Lambert, G., Thurston, L., Argent, T., Eres, R., Qualter, P., Panayiotou, M., Hennessey, A., Badcock, J., & Holt-Junstad, J. (2020). *Survey of health and wellbeing – monitoring the impact of COVID-19, report*. Iverson Health Innovation Research Institute.

Mamun, M. A., Sakib, N., Gozal, D., Bhuiyan, A. I., Hossain, S., Bodrud-Doza, M., Al Mamun, F., Hosen, I., Safiq, M. B., Abdullah, A. H., Sarker, A., Rayhan, I., Sikder, T., Muhit, M., Lin, C.-Y., Griffiths, M. D., & Pakpour, A. H. (2021). The COVID-19 pandemic and serious psychological consequences in Bangladesh: A population-based nationwide study. *Journal of Affective Disorders*, *279*, 462–472. https://doi.org/10.1016/j.jad.2020.10.036

Masten, A. S. (2001). Ordinary magic: Resilience processes in development. *American Psychologist*, *56*(3), 227–238. https://doi.org/10.1037/0003-066X.56.3.227

Naughton, F., Ward, E., Khondoker, M., Belderson, P., Marie Minihane, A., Dainty, J., Hanson, S., Holland, R., Brown, T., & Notley, C. (2021). Health behaviour change during the UK COVID-19 lockdown: Findings from the first wave of the C-19 health behaviour and well-being daily

tracker study. *British Journal of Health Psychology*. 26, 2, 2021, 624–643. https://doi.org/10.1111/bjhp.12500

Niemiec, C. P., & Ryan, R. M. (2009). Autonomy, competence, and relatedness in the classroom. *Theory and Research in Education*, *7*(2), 133–144. https://doi.org/10.1177/1477878509104318

Palgi, Y., Shrira, A., Ring, L., Bodner, E., Avidor, S., Bergman, Y., Cohen-Fridel, S., Keisari, S., & Hoffman, Y. (2020). The loneliness pandemic: Loneliness and other concomitants of depression, anxiety and their comorbidity during the COVID-19 outbreak. *Journal of Affective Disorders*, *275*(June), 109–111. https://doi.org/10.1016/j.jad.2020.06.036

Pollak, Y., Dayan, H., Shoham, R., & Berger, I. (2020). Levels of stress and resilience related to the COVID-19 pandemic among academic medical staff in Serbia. *Psychiatry and Clinical Neurosciences*, *74*(11), 602–604. https://doi.org/10.1111/pcn.13122

Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, *1*(3), 385–401. https://doi.org/10.1177/014662167700100306

RIVM (Rijksinstituut voor Volksgezondheid en Milieu. (n.d.). *Tijdline van coronamaatregeln*. RIVM. https://www.rivm.nl/gedragsonderzoek/tijdlijn-maatregelen-covid

Roberts, R. E., Lewinsohn, P. M., & Seeley, J. R. (1993). A brief measure of loneliness suitable for use with adolescents. *Psychological Reports*, *72*(3_suppl), 1379–1391. https://doi.org/10.2466/pr0.1993.72.3c.1379

Shah, S. M. A., Mohammad, D., Qureshi, M. F. H., Abbas, M. Z., & Aleem, S. (2020). Prevalence, psychological responses and associated correlates of depression, anxiety and stress in a global population, during the coronavirus disease (COVID-19) pandemic. *Community Mental Health Journal*, *57*(1), 101–110. https://doi.org/10.1007/s10597-020-00728-y

Shigeto, A., Laxman, D. J., Landy, J. F., & Scheier, L. M. (2021). Typologies of coping in young adults in the context of the COVID-19 pandemic. *The Journal of General Psychology*, *148*(3), 272–304. https://doi.org/10.1080/00221309.2021.1874864

Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The brief resilience scale: Assessing the ability to bounce back. *International Journal of Behavioral Medicine*, *15*(3), 194–200. https://doi.org/10.1080/10705500802222972

Stallman, H. M. (2010). Psychological distress in university students: A comparison with general population data. *Australian Psychologist*, *45*(4), 249–257. https://doi.org/10.1080/00050067.2010.482109

Taylor, S. (2019). *The psychology in pandemics: Preparing for the next global outbreak of infectious disease*. Cambridge Scholars Publishing.

Trolian, T. L., Archibald, G. C., & Jach, E. A. (2020). Well-being and student–faculty interactions in higher education. *Higher Education Research & Development*, 41, 2, 562–576. https://doi.org/10.1080/07294360.2020.1839023

Van de Velde, S., Buffel, V., Bracke, P., Van Hal, G., Somogyi, N. M., Willems, B., & Wouters, E. (2021). The COVID-19 international student well-being study. *Scandinavian Journal of Public Health*, 49, 1, 114–122. https://doi.org/10.1177/1403494820981186

von Schlippe, A., & Schweitzer, J. (2015). *Lehrbuch der systemischen Therapie und Beratung II*. Vandenhoek & Ruprecht. https://doi.org/10.13109/9783666462566

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., McIntyre, R. S., Choo, F. N., Tran, B., Ho, R., Sharma, V. K., & Ho, C. (2020). A longitudinal study on the mental health of general population during the COVID-19 epidemic in China. *Brain, Behavior, and Immunity*, *87*(April), 40–48. https://doi.org/10.1016/j.bbi.2020.04.028

Yang, R. (2020). China's higher education during the COVID-19 pandemic: Some preliminary observations. *Higher Education Research & Development*, *39*(7), 1317–1321. https://doi.org/10.1080/07294360.2020.1824212