

# ONLINE LEARNING AND MENTAL HEALTH ISSUES: WHAT DO WE KNOW?

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Online learning and mental health issues: What do we know?  
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## ABSTRACT

By the end of 2019, Covid-19, a novel virulent and potentially lethal virus, had hit the world. The global population lacked natural immunity against the virus and the non-existence of efficient vaccines and treatments made isolation the preferred option. This was enforced by many governments. World-wide educational communities responded to these measures with online learning where possible. Online lectures and content and activities on learning management systems (LMS) (where available) became the new normal way of teaching and learning. Chandra (cited in Akpınar, 2021) estimates that up to 90% of the global student population was studying at home (many online) during the pandemic. This created a unique opportunity for researchers to investigate the effect not only of the Covid pandemic, but also of the online response, on students' mental health. Pre-Covid-19 research at the time expressed concerns about the use of certain online technologies and/or certain ways of using them as challenges to those vulnerable to mental health issues. Andreassen et al. (2016) describe single younger people, social networkers, addictive gamers, and those who are easily distracted and/or impulsive (including those with overt or covert attention-deficit/hyperactivity disorder [ADHD], and OCD) as vulnerable. A flood of studies regarding the possible links between Covid-19, online learning and mental health were published during and soon after the 2020–2022 period. Rutkowska et al. (2021; 2022) found that all 3804 student participants in their two studies reported increased stress levels due to online studies, nearly half reporting depression and 18% of the 2022 study participants reporting suicidal thoughts. Fontes-Perryman and Spina (2021) report that excessive users of technology share characteristics with obsessive-compulsive disorder (OCD) sufferers, such as fear of missing out on new information, poor inhibitory control and a strong urge to control. From these worrying findings a plethora of questions arise: Could the measures taken to curb the viral spread (and not online learning *per se*) have caused the reported negative mental health effects during the pandemic? Were there certain aspects of how online learning was rolled out during the pandemic that made it more stressful than it needs to be? If online learning *per se* affects students' mental health negatively, what aspects thereof have negative effects? Are some students more at risk, and, if so, who? If online learning exacerbates and/or precipitates mental health issues, what can be done to keep vulnerable students in this mode of education safe? Contrary to the negative effects mentioned above, there is some evidence that online learning may also have positive effects on students' mental health. For example, Bolatov et al. (2021) found improved mental health among the 619 senior medical students in their study after going online. This literature review will attempt to collate evidence on these and other findings regarding possible mental health effects of online learning during the Covid-19 pandemic. Suggestions to ensure mentally safe online learning environments include: implementation of mental health support (individually and/or in groups) and avoiding poor course design features that may contribute to stress (an aspect that educators can control). The advice from Rutkowska et al. (2022), Placencia and Muljana (2019), Anderson (2003), Vygotsky (1978), Alberts (2020) and others regarding good course design is emphasised, while also reminding readers to take caution when applying the findings from global studies in local contexts.

## KEYWORDS

Mental health disorders, stress, ADHD, OCD, Covid-19, course design, anxiety, suicide and depression, online/e-learning, quality instruction, course design



## INTRODUCTION

The Aotearoa New Zealand 2020 academic year started as usual in mid-February, but with a strong awareness of Covid-19 sweeping across the world. Managers encouraged staff to get ready for online delivery on short notice. By 23 March (Unite Against Covid-19, n.d.), within a month of the start of the academic year, Aotearoa New Zealand went into Level 4 lockdown, suspending all face-to-face education delivery with 24 hours' notice. From then on, staff 'invented' as they delivered. This was a worldwide trend noted by Van Thuy et al. (2022) and also reported in Brazil (Camargo et al. 2020) and India (Mosleh et al., 2022).

Many courses were not designed for online delivery; they were adapted to suit online delivery. For example, at the institute where this researcher works, staff compiled online labs using self-made videos of dissections and experiments, and augmented those with YouTube videos to act as equivalents for on-campus labs. In order to have student-teacher interactions, they learned to use Zoom and Teams. To provide for student-student interactions, giving opportunities for social interaction and learning from one another, they used breakout rooms on the video platforms, LMS discussion boards and group assignments, including online presentations. Some resources were developed from scratch and most evolved from existing resources.

For students, the adaptation must have been huge. Some did not have the necessary infrastructure to study solely off-campus: they had to borrow laptops from the institute, and internet connections were sometimes only on their phones. The digital divide may have led to unequal access for the student population. For example, in Aotearoa New Zealand digital.govt.nz (2022a) reports that "Māori, Pasifika, those living in social housing, unemployed people, those not actively seeking work ... are less likely to have internet access"(p. 1). By May 2021, Māori households were 16% less likely to have internet access compared to non-Māori households (digital.govt.nz, 2021). Similarly the digital literacy rates of Pacific people are reported to be lower than for non-Pacific populations, despite the fast rate at which banks, medical providers, and government institutions are moving online (digital.govt.nz, 2022b). Most students experienced the Covid-19-intense-online period as a stressful and overwhelming time. They reported that they missed the physical face-to-face encounters with lecturers and other students, felt demotivated, lost focus during lectures (even fell asleep), and some often felt like staying in bed the whole day. Procrastination was a common issue.

Anecdotal reports such as the ones mentioned above motivated the researcher to find out what recent research has discovered regarding the relationships between online learning interactions and mental health. Because a flood of research linking online learning and mental health issues became available during the pandemic, Covid-19 was brought into the research question. Disentangling the mental health issues due to Covid-19-awareness and restrictions, and mental health issues due to online learning *per se*, became a challenge.

On the one hand the Covid-19 pandemic was a huge stressor in itself, and on the other hand it necessitated online learning. The World Health Organization states that "the Covid-19 pandemic has had a severe impact on the mental health and wellbeing of people around the world while also raising concerns of increased suicidal behavior ... no comprehensive summary of the current data on these impacts has until now been made widely available" (World Health Organization, 2022, March). Social isolation, a strategy taken by many governments to reduce the transmission of Covid-19, led, according to Chandra (cited in Akpınar, 2021), to up to 90% of the global student population studying at home, many online. Akpınar (2021) states that "online learning has been acknowledged to be a major source of mental health issues among tertiary level students" (p. 6). Also, Rutkowska et al., (2021; 2022) and Hamaideh et al. (2022) report links between online learning and mental health issues such as stress, anxiety, depression and suicidal ideation.

Since the beginning of 2020, the Covid pandemic made online lecture sessions and the tools of learning management systems (LMS, including Blackboard, Moodle and Canvas) the main and often only way for learning interactions to take place. According to Anderson's Equivalency Theorem, a successful learning environment promotes a mix of different interactions (cited in Meintjes et al., 2022) namely, students interacting with content, other students, and their teachers. Anderson (2003) states that at least one of these interactions has to take place at a high level to ensure deep and meaningful learning. Going online especially limited spontaneous student-student

and student–teacher interactions. Adapting to the Covid-19 situation, resources were adapted on the go, possibly also negatively influencing student–content interactions. There was little time to consider the implications of the exclusive and high-intensity use of online technologies on students’ mental health.

Mental health issues in this article refer mainly to stress. Increased and chronic stress may be a factor in precipitating anxiety, depression, suicidal ideation and even disorders including obsessive-compulsive disorder (OCD), anxiety disorder, bipolar disorder and suicide. Stress will be described in detail in the Findings section. Anxiety, depression, suicide and OCD are defined and/or described in more detail here.

The World Health Organization (n.d.) defines depression as being characterised “by persistent sadness and a lack of interest or pleasure in previously rewarding or enjoyable activities” (Fact Sheet). Sleep and appetite can be disturbed and tiredness and poor concentration are common.

Excessive fear and worry and related behavioural disturbances are seen in anxiety disorders. The fear may be general or related to specific situations (such as social situations or separating from certain people), and may bring on panic attacks (World Health Organization, 2022, June).

Obsessive compulsive disorder (OCD) is characterised by a cycle of obsessions (unwanted, intrusive thoughts, images, or urges that trigger intensely distressing feelings and anxiety) and compulsions (behaviours an individual engages in to attempt to get rid of the obsessions and/or decrease distress) (International OCD Foundation, n.d.). The onset of OCD is usually gradual, following stressful events. Symptoms worsen when the individual experiences greater stress (Murayama et al., 2020). The disruptive effect of a crisis and trauma, including conflict and a sense of isolation, increases the risk of suicide for anyone. The risk of suicide is linked to mental disorders in high-income countries (Knipe et al., 2019).

The research question is: Did online learning *per se* negatively affect the mental health of students globally during the Covid-19 pandemic? If so, what aspects of online learning had negative effects? What is recommended to keep students in this mode of education mentally safe?

In this paper the researcher tries to get a clear picture of:

1. Any mental health issues caused by online learning *per se* versus those linked to other issues inherent in the Covid-19 situation.
2. How the educational community can minimise any negative mental health issues linked specifically to online learning.

## METHOD

This study is a literature review. It aims to relate and collate the researcher’s own experience and the findings from different published research studies about the relationships between the upsurge in mental health issues during the Covid-19 pandemic and online learning and teaching interactions. Relevant articles were found through online searches on databases (including Ebscohost, ERIC, Psycinfo, IEEE Xplore, www.irrodl.org, ejournals.bc.edu, doaj.org, Google Scholar, JSTOR and ResearchGate), and using keywords on their own and in combination. The keywords related to mental health disorders (for example stress, depression, anxiety, ADHD, OCD, depression and suicide), online/ e-learning, good teaching practice, quality instruction, course design and Covid-19.

One peer-reviewed conference paper was used (Placencia & Muljana, 2019). The following criteria were applied to journal-published English-language articles:

1. being published before the intense online learning period, explaining basic concepts regarding quality instruction, online learning, online course design, and mental health in a pre-Covid environment (up to 2019);
2. being published during or soon after the intense online learning period as a response to Covid-19, namely between 2020 and 2022;

3. reporting on responses to Covid-19 in different parts of the world (Table 1) and the effects of these responses on student mental health;
4. reporting on the effects on student mental health of going online in response to Covid-19;
5. representing the findings of a variety of types of studies (quantitative, qualitative, quasi-experimental and mixed method) as shown in Table 2.

**Table 1. A selection of research papers reviewed for this study illustrating the global participation in studying possible relationships between Covid-19, online learning and mental health.**

WEST EUROPE AND EAST EUROPE	MIDDLE EAST, SOUTH AND SOUTH EAST ASIA AND AFRICA	OCEANIA, THE AMERICAS AND THE FAR EAST
<i>Kazakhstan</i> Bolatov et al., 2021  <i>Poland</i> Rutkowska et al., 2021, 2022 Dyrek et al., 2022  <i>Spain</i> Sánchez-Cabrero et al., 2021  <i>The Netherlands</i> Koelen et al., 2022  <i>United Kingdom</i> Akpinar, 2021  <i>Italy</i> Moccia et al., 2020 Pedrosa et al., 2020	<i>Lebanon</i> Fawaz & Samaha, 2021  <i>Saudi Arabia</i> El Keshky et al., 2021  <i>Pakistan</i> Abbasi et al., 2020 Artani et al., 2019  <i>Malaysia</i> Van Thuy et al., 2022 Etajuril et al., 2022  <i>India</i> Chandra, 2020; 2022  <i>Bangladesh</i> Sultana et al., 2021 Saha et al., 2021	<i>Australia</i> Heim & Heim, 2021 Stanton et al., 2020  <i>USA</i> Lazarevic & Bentz, 2021  <i>Canada</i> Grubic, 2020  <i>Brazil</i> Camargo et al., 2020  <i>Japan</i> Sakai et al., 2022  <i>China</i> Gao et al., 2020

Studies of different types were also included, as shown in Table 2.

**Table 2. A selection of research papers reviewed for this study showing different approaches taken by researchers in studying possible relationships between Covid-19, online learning and mental health.**

LITERATURE REVIEWS	QUANTITATIVE CORRELATION STUDIES	MIXED METHOD	QUASI-EXPERIMENTAL	META-ANALYSES
Fawah & Samaha, 2020 Camargo et al., 2020 Heim & Heim, 2021 Akpinar, 2021	Data from surveys, questionnaires. Students' satisfaction levels, stress levels and perceived stress levels, anxiety, depression and suicidal ideation. Bolatov et al., 2021 Sánchez-Cabrero et al., 2021 Rutkowska et al., 2021, 2022 Etajuril et al., 2022 Dyrek et al., 2022	Combining data from questionnaires and interviews. Saha, et al., 2021	Comparing the experience of stress in groups of students exposed to either an online or a face-to-face version of the same course. Lazarevic & Bentz, 2021	Using the PRISMA template to systematically narrow down the 1892 articles found via a keyword search to 25 studies. Van Thuy et al., 2022

Articles investigating specific aspects regarding increased stress, mental health, quality education and online learning from before the pandemic (Table 3) were purposefully selected for the light they could shed on these specific aspects.

**Table 3. A selection of pre-pandemic research papers reviewed for this study investigating possible relationships between online learning and mental health.**

ASPECTS REGARDING EDUCATION, STRESS AND MENTAL HEALTH	WORKS CONSULTED
Quality education	Vygotsky, 1978; Anderson, 2003
Possible negative mental health effects of technology use	Andreassen et al., 2016
Students' risk for mental health issues and suicide	Reavley, et al., 2012; Masango et al., 2008
The effects of increased screen time on feelings	Twenge & Campbell, 2018; Stiglic & Viner, 2019
Stress and its effects and the difference between stress and perceptions of stress	Artani et al., 2019; Salmela et al., 2016; Peer et al., 2015; Mortagy & Boghikian-Whitby, 2010
Physiological changes in the body linked to high/continuous stress	Ranabir & Reetu, 2011
The links between stress levels and academic performance	Oketch-Oboto & Okunya, 2018; Sohail, 2013
What happens if a person is subjected to numerous life changes (stressors)	Holmes & Rahe, 1967
Poor course design as a contributor to stress	Placencio & Muljana, 2019
Protective factors that can prevent high stress from developing into mental health issues	Uebelacker et al., 2013; Hunter et al., 2019

The answers found in the pre-Covid studies above were then integrated into and used to explain the phenomena observed during the Covid period. All the found information was sorted into categories: stress, positive effects of increased stress and negative effects of increased stress. The negative effects on mental health were further sorted into those issues related to the pandemic (such as social isolation) and those related directly to online learning *per se* (such as online course delivery). These two categories were then further expanded to the different factors. A broad study overview is given in Figure 1.

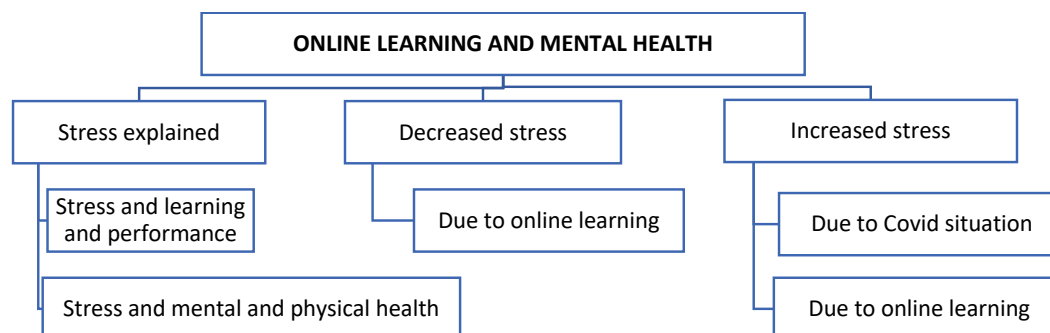


Figure 1. Outline of the study.

## FINDINGS

### Stress

While stress perceived as low to moderate helps people perform and protect themselves, too much, too long and overwhelming stress can lead to fight, flight or freeze responses. For a person's mental and physical wellbeing, it is important to learn how to cope with stress (World Health Organization, 2021).

Different factors are involved in causing and influencing stress and perception of stress:

1. *Change causes stress*: Stress is caused by "any type of change that causes physical, emotional or psychological strain" (Scott, 2022, para. 1).
2. *Perceived stress*: Stress is "emotional arousal experiences ... when viewed by our bodies as threats to our homeostasis" and "the subjective perception of mental and emotional tension" caused by the change (Lazarevic & Bentz, 2021, pp. 1–3). It can, for example, be viewed as a threat or an opportunity. Artani et al. (2019) define stress as the "perceived loss of an individual's ability to adapt with evolving changes in life."
3. *Influencing capacity to adapt*: Stress influences the person's capacity to adapt to real or perceived life changes (Artani et al., 2019).
4. *Intensity and duration of change and response to it determine wellbeing*: The response to stress determines a person's overall physical and mental wellbeing. This differs from person to person. Common mental disorders become apparent when an individual fails to cope with chronic stress (Artani et al., 2019).
5. *Stress accumulates*: Stress from different changes in a person's life, even positive changes, accumulates. According to Holmes and Rahe (cited in Artani et al., 2019) the sum total of stresses can be used to predict the risk of physical and mental health issues. Artani et al. (2019) state that serious mental health conditions (including suicide) can be predicted with high accuracy, and more common ones (depression and anxiety) with moderate accuracy using the Recent Life Changes Questionnaire (RLCQ).

### Stress, learning and performance

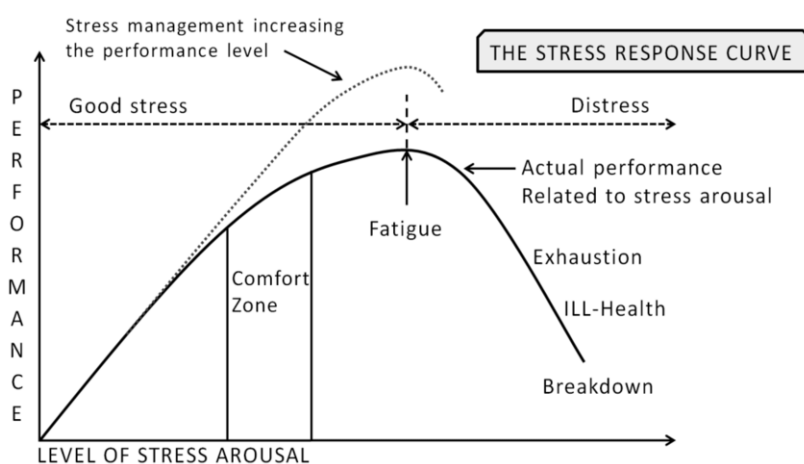


Figure 2. The stress response curve (Salmela et al., 2016).

Despite the negative connotations of the word 'stress', if seen as goal relevant and manageable (i.e., challenging), it may increase motivation, performance and wellbeing (Travis et al., 2020). Also, Deng et al. (2022) and Peer et al. (2015) found that students seeing stress as a motivational factor in their lives said that it drives them to excel. Physiologically, this makes sense, since the activation of the sympathetic nervous system, when in acute stress, gives a burst of energy with the release of the catecholamine hormones epinephrine and nor-epinephrine (Ranabir

& Reetu, 2011). Figure 2 illustrates the non-linear relationship between stress, motivation and performance as represented by Salmela et al. (2016). Moderate stress during the learning process is thought to enhance memory formation, while at the same time hindering memory retrieval. Higher stress levels are associated with poor academic performance (Sohail, 2013; Oketch-Oboto & Okunya, 2018; Sánchez-Cabrero et al., 2021).

In a learning situation, stress or perception of stress can be kept manageable if the learning environment is designed to promote learning interactions to take place in the Zone of Proximal Development (ZPD) (Figure 3), just outside the comfort zone. Vygotsky (1978, p. 86) defines the ZPD as “the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers.”

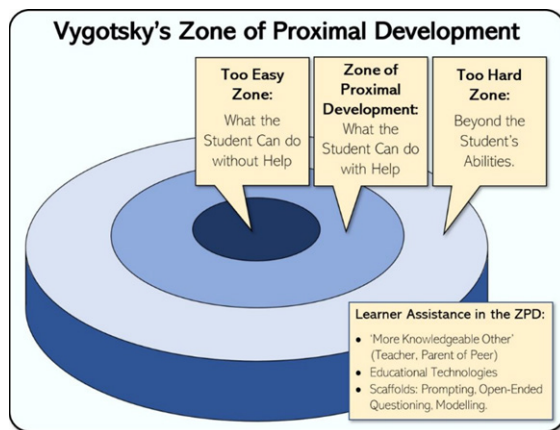


Figure 3. Vygotsky's Zone of Proximal Development (ZPD) (Cornell & Drew, 2022).

In both face-to-face delivery and online learning, the presentation of the content, the activities, the lecturer and peers facilitate learning, making the outcomes reachable through staircasing (for example, by sequencing content from simple to more complex) and scaffolding (for example by breaking content down into smaller chunks) and thereby bringing learning into the ZPD. In face-to-face environments, student–student interactions are often spontaneous and unplanned. In online learning, planning of student–student interactions should (especially initially) be specifically planned, mediated and encouraged.

As could be predicted from the descriptions above about the effects of stress on mental health, both positive effects and negative effects as a result of online learning were found. Since the time when the Covid-19 pandemic started to influence learning at the beginning of 2020, Covid isolation and online learning became intertwined as factors affecting mental health.

## Positive effects of stress

In a 2010 longitudinal study over eight years, Mortagy and Boghikian-Whitby (2010) found that students' perception of online learning became more positive over time, whereas the perception of face-to-face learning remained constant.

Bolatov et al. (2021) found an improvement in mental health among the 619 senior medical students that formed part of their quantitative study. Dyrek et al. (2022) report that senior medical students were highly accepting of lectures and seminars conducted online.

From the results of a quasi-experimental study, Lazarevic and Bentz (2021) deduced that different aspects of course delivery can modify students' *perception of stress*, which in turn can modify their results. They found that students *opting for* an online option of their course experienced less perceived stress than those enrolled in a face-to-face delivery of the course: the students found it easier to access learning materials, to find time to study, to meet



expectations from friends and family, and they experienced a reduction in social stress (situations endangering “relationships, self-esteem and sense of belonging” [p. 9]).

Sánchez-Cabrero et al. (2021) reported that students with high grades were very satisfied with the experience: possibly a sign that they adapted well to the new environment. In particular, students comfortable in digital technologies found it a less stressful experience and were overall very satisfied. Mortagy and Boghikian-Whitby (2010) found that more students dropped out early in online courses. Those that continued were satisfied, making the researchers believe that online education is not for everyone.

## Negative effects of stress

A body of research has accumulated since 2020 showing links between the Covid-19 pandemic, online learning and increased stress in the majority of students leading to an increase in mental health issues. Sakai et al. (2022), and Heim and Heim (2021) concluded from Japanese, Swiss, Greek, Israeli and Chinese studies that mental health issues in university students, particularly anxiety, depression and suicidal thoughts, increased worldwide during the Covid-19 pandemic. Rutkowska et al. (2021), in a quantitative correlation study on the links between online studies and mental health *per se*, found that all 3051 student participants reported increased stress levels, with 47% reporting depression in the online learning mode. In 2022 they found online learning to be related to increased levels of stress and depressive symptoms in more than 50% of the 753 study participants with 18% reporting suicidal thoughts.

The situation of being a student is stressful. One would not normally enrol in a programme that is not challenging and that does not put you under a certain amount of stress. Numerous reports about students experiencing increased stress due to all the changes brought on by the Covid-19 situation are to be expected, especially if students have just started their studies (a time of huge change). The high incidence of mental health issues (Rutkowska et al., 2021; 2022; Fawaz & Samaha, 2021; Van Thuy et al., 2022; Dyrek et al., 2022), including anxiety, depression and suicidal ideation, can be seen as a sign that stress became distress (Figure 2) for many: an increase in students experiencing an inability to cope with change due to its intensity and/or duration and insufficient/inappropriate preparation/support.

Contrary to the positive effects of stress described earlier, unmanageable stress levels may negatively affect both physical and mental health, bringing on endocrine dysfunction and psychological disorders including depression. Very high stress, in the distress zone in Figure 2 (driving epinephrine/nor-epinephrine release, causing depletion of the body's reserves) or chronic stress (activating the pituitary–adrenal axis and characterised by the release of cortisol), may inhibit performance and bring on maladaptive behaviours and health conditions (Travis et al., 2020). Adolescents and young adults are, because of their life stage and often being single (Masango et al., 2008), in a high-risk group for mental health issues (Fawaz & Samaha, 2021). Mental health conditions affect a student's ability and their motivation to study. Depression, for example, is characterised by sadness, hopelessness, powerlessness and feeling overwhelmed. Depressed students may leave tasks undone, lack attention and have difficulty reading (Van Thuy et al., 2022), which further exacerbates stress.

Deng et al. (2022) explain that when people cannot handle their inner and outer feelings due to stress, their morale is diminished. The students who perceived stress as a negative factor experienced “irritability/anger management difficulties, depressed mood, anxiousness/nervousness, hopelessness, concentration difficulties, and social isolation” (Peer et al., 2015, p. 5). Feeling overwhelmed, depressed and hopeless may be the signs of activation of the parasympathetic nervous system (giving up, preparing to ‘shut down’).

## Increased stress due to the Covid-19 situation

Certain stressors may be linked to the Covid -19 situation itself and may not be related to online learning *per se*. A few of these Covid-19-related factors are discussed below.

### *The Covid-19 pandemic necessitating social isolation*

Social isolation meant non-essential workers, students, school children and pre-schoolers stayed at home, often indoors, with less exposure to sunshine, increased screen time, boredom, isolation from friends and family, lack of physical contact, inability to participate in activities (like going to class, shops, church and gym), and an increase in alcohol consumption and smoking (Slurink et al., 2022). Further, this often led to physical inactivity (Fawaz & Samaha, 2021) and obesity (Sultana et al., 2021). Also, Stanton et al. (2020) found that changes in physical activity, sleep, tobacco and alcohol use may be blamed for depression, anxiety and stress during Covid-19.

Some students ended up with financial problems as they could not go to work (Van Thuy et al., 2022). Female students, according to Rutkowska et al. (2021), are more likely to be affected negatively by isolation than men. For parents, social isolation meant added responsibilities (such as supervising their children's studies and looking after pre-schoolers).

In the learning environment, social isolation meant lowering student–student interaction and student–lecturer interaction: isolation limited informal and formal talking to peers and lecturers (Akpınar, 2021). Opportunities to talk to peers about academic work as well as co-constructing knowledge with them were limited, as were opportunities to share concerns and fears with them.

Isolation may have made the use of social media more ubiquitous, bringing with it its own issues (as listed in the following section).

### *Social media, online gaming and technology addiction*

Social media (outside of the LMS) may be one contributing factor exacerbating mental health issues: researchers in Wuhan, China, (Gao et al., 2020) blame the 'infodemic' for mental health issues, as social media platforms exposed people to an overload of information (often also misinformation) that may have led to fear, anxiety and even depression.

A meta-analysis study by Keles et al. (2020) links social media use to depression, anxiety and psychological distress in adolescents (10–19 years old). The time spent, the activity, investment and addiction correlated with depression, anxiety and psychological distress.

Before the Covid-19 pandemic, Andreassen et al. (2016) report that female students are more likely to become addicted to social media. Social networkers tend to become more anxious than depressed, and addictive gamers more depressed than anxious. Fear of missing out on new information, poor inhibitory control and a strong urge to control characterise both obsessive-compulsive disorder (OCD) sufferers and excessive technology users (Fontes-Perryman & Spina, 2021). Indications are that people who are easily distracted and/or impulsive (which may include those with overt or covert attention-deficit/hyperactivity disorder [ADHD], and OCD) may use technology as a form of self-medication (Andreassen et al., 2016).

### *The abruptness of the change to online learning in response to Covid-19*

Examples of how the abrupt changes contributed to stress are reported in recent research and are listed below:

- Van Thuy et al. (2022) are of the opinion that in Malaysia the swift, unprecedented and intensive switch to online learning due to Covid-19 caused feelings of powerlessness and loneliness, as well as time-management issues, for students.
- Students enrolled in a face-to-face degree programme were suddenly thrown into an online one. Understandably, they were concerned about whether an online degree would be acceptable when they started looking for jobs in a competitive market (Van Thuy et al., 2022). They may also not have been confident that what they were receiving in an online environment would be equivalent to what they would have received in a face-to-face environment. They may have looked forward to the increase in social contact, getting out of the house, and/or preparing for a practical career.
- Courses were not necessarily set up for online delivery. Some courses may therefore have included activities and ways of delivery that were unsuitable for online delivery.

- Students were not necessarily prepared for online learning. Some may have experienced technology and/or infrastructure problems (Fawaz & Samaha, 2021). In some cases, this may have excluded students for the duration of problem: often at the beginning of a course, when course and assessment procedures were explained. Special note should be taken of the digital divide that exacerbates inequality. Even in OECD countries such as Aotearoa New Zealand, equal access to technology is not yet achieved (digital.govt.nz, 2021; 2022). Globally, huge inequalities exist: Saha et al. (2021) report a high digital divide in Bangladesh, leading to a widening gap in learning inequality when learning went online in a country where only 37.5% of the family units had internet access at home in 2021.
- Some students may have experienced a lack of guidance and counselling (Akpınar, 2021).
- Some research suggests that online learning *per se* may present additional challenges to students.

## Increased stress due to online learning

The introduction of online learning as a coping mechanism at the onset of the Covid-19 pandemic may have led to specific issues, including those listed below.

### *Course presentation on learning platforms (limiting student–content, student–student and student–lecturer interactions)*

As stated previously, many courses that were in use, especially at the start of the lockdown, were not designed for online delivery (Camargo et al., 2020). Many course set-ups may have served more as a repository of resources at the time than a properly designed online course. From personal experience, student reflections and some research reports, the researcher compiled the following list of possible issues that could have led to an increase in stress in students doing some courses:

- Improper balance between knowledge acquisition and participation
  - For knowledge acquisition (building), resources such as recorded lectures, online digital resources, and media such as e-books and videos are mostly placed on LMS platforms.
  - Participation entails learning through “inquiry, collaboration, and defending ideas against challenges” (Alberts, 2020, p. 8). It means engaging with the lecturer, other students and the content. In courses developed for face-to-face delivery, participatory activities would have taken place on a regular basis as part of the lessons without being explicitly included on the LMS. In face-to-face classes, synchronous class and group discussions, for example, are used often and both formally and informally. This gives students opportunities to raise their fears and concerns, and verbalise, adjust and correct their understandings. For second-language students, translation by peers contributes to their understanding. An LMS with fewer participation opportunities might therefore have been adequate in a face-to-face delivery mode. In an online environment there are fewer opportunities to promote participation, such as sharing the workload through working together, especially synchronously. Although LMS platforms and other platforms offer tools for collaboration, these could have been used sub-optimally due to unfamiliarity with these tools, especially initially, on both the lecturers’ and the students’ sides. Discussion tools on LMS platforms usually promote asynchronous communication. Alberts (2020) advises the allocation of a tutor to each team to provide guidance and support. For synchronous discussions, small-group use of video platforms, formally and informally, could be encouraged and mandated in the online environment. Still, responding to a screen may exacerbate feelings of isolation and make it hard to have constructive input (Twenge & Campbell, 2018).
- Increased cognitive load
  - Long, unbroken online lecture sessions with a low variety of activities could have led to struggles with paying attention.
  - Information overload, for example reading long passages on screen instead of in chunked, manageable sections.

- High levels of distraction (Akpınar, 2021), including unnecessary links, announcements and emails.
- Limited customised feedback and scaffolding opportunities, especially for those with insufficient background in the field.
- Unclear navigation patterns.

#### *Unfamiliarity with the optimal use of online resources (limiting student–content interactions)*

Some students may have experienced difficulty in using online platforms, such as navigating in the courses and finding materials (Akpınar, 2021). Some may have used unsuitable study techniques for high intensity use of online resources: for example, passively listening to lectures/lecture recordings without note-taking/discussion does not involve active learning, a prerequisite for successful learning (Meintjes et al., 2022). Fawaz and Samaha (2021) further report intensified procrastination (as was also reported by the author's students in their course reflections).

#### *Worries about the future*

Uncertainty about clinical/practical components in courses such as dentistry and medicine (Etajuril et al., 2022; Abbasi et al., 2020; Dyrek et al., 2022), and worries about acceptability of online qualifications in a competitive job market (Van Thuy et al., 2022) were further concerns listed in the research literature. In the online environment, practical competencies cannot be attained.

Students are described as a high-risk group *per se* for mental health issues (Reavley et al., 2012). One reason is that they are often young and single (Andreassen et al., 2016). Heightened psychological distress is prevalent in normal circumstances for young people. Glowacz and Schmits (2020, p. 2) describe young people as “the most psychologically troubled” because of “an overload of contact through social networks and a high intolerance to uncertainty.”

From their own experience and course reflections, the researcher knows that studying (whether it is face to face or online) puts huge demands on student resilience and coping strategies regarding aspects such as time-management skills, social skills and a willingness to be open to change, new information and new paradigms. It challenges students to shift perspectives of themselves, others and the world around them, take new positions in their families, redefine themselves and make life-changing decisions (such as quitting a full-time job or being the first in the family to aspire to getting a degree). Social demands may challenge them when they work on group tasks with unfamiliar students. Studying may often lead them to points where they feel overwhelmed. Since studying in its very nature stretches a person, students can often feel out of their comfort zone. They may at times feel inadequately prepared to meet the course demands. This is where the more capable/experienced peer or lecturer/mentor comes in, as shown in the Zone of Proximal Development in Figure 3. Due to isolation, students may have felt alone, even abandoned in this situation.

## DISCUSSION

Increased stress was one of the common complaints during the Covid-19 pandemic. The intensity and duration of stress are related to physical and mental health issues. From the literature it is clear that certain stressors came with the pandemic and affected the entire population. For students, there were the additional stresses of becoming and being a student and then, on top of that, the abrupt change in the mode of delivery from face-to-face to online.

From the findings reported as Positive Effects/Reduced Stress above (and summarised under A on Figure 4) one can deduce that students who were ready for online learning flourished in it: they chose it, they were digitally literate, they were resourced for it, and many were senior students who had already been through the adaptation of becoming a student. It is also important to note that where positive effects were experienced, online courses had not been thrust upon students as a solution to a situation: they were developed taking best practice into consideration.



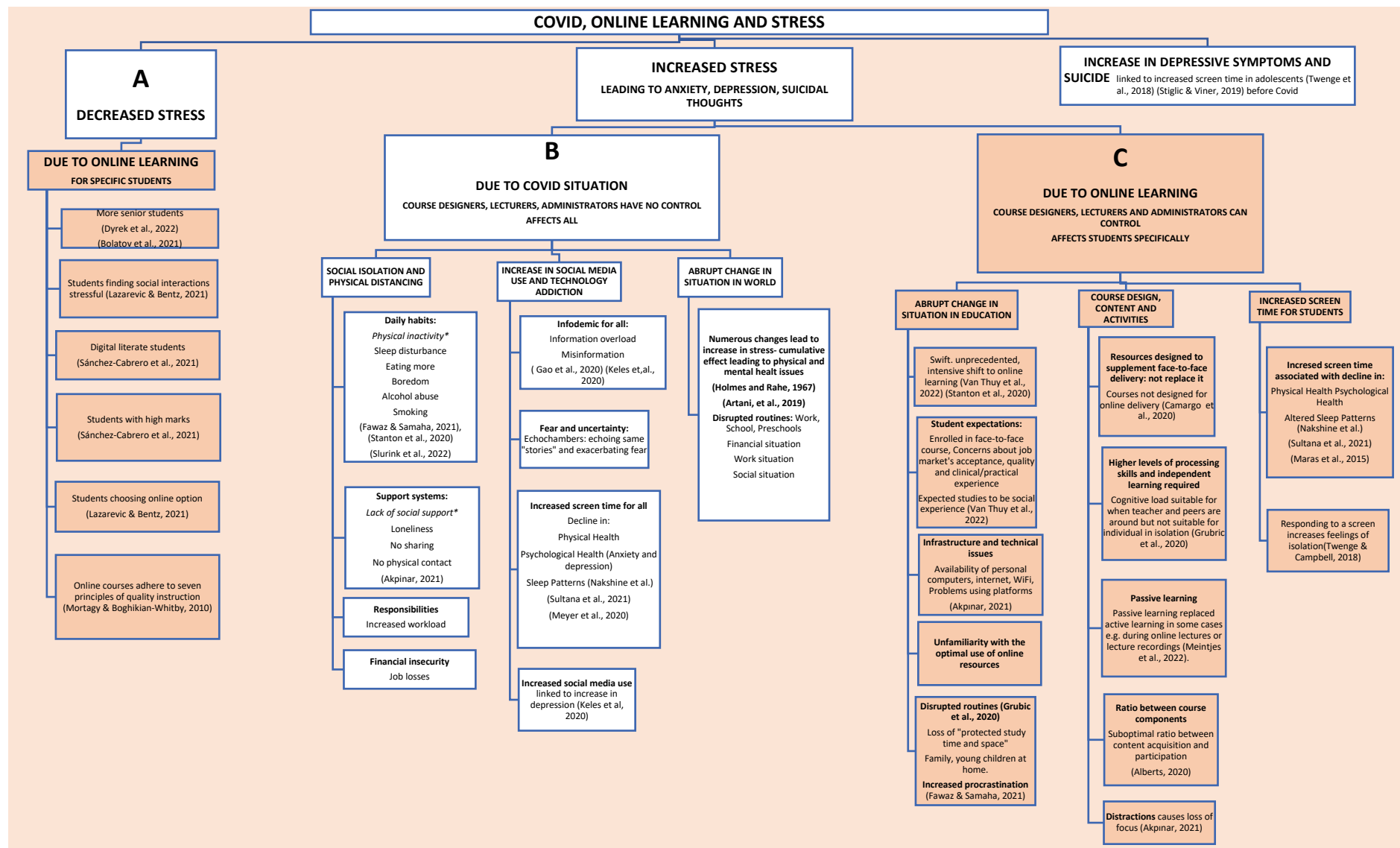


Figure 4. A selection of factors related to decreased and increased stress before and during the Covid-19 pandemic.

From the findings reported as Negative Effects/Increased Stress (summarised under B and C in Figure 4) one can deduce that the cumulative effects (Holmes & Rahe, cited in Artani et al., 2019), such as abruptly introduced online courses, prepared to supplement face-to-face delivery to students who had opted for face-to-face, the huge increase in screen time (Twenge & Campbell, 2018), the decrease in social interaction and time to *participate* in the course (versus *acquiring* the content during student-content interactions), a decrease in physical activity, and/or being under-resourced in relation to equipment, data and internet access (such as some Māori, Pacific and unemployed students) (digital.govt.nz, 2022) may have pushed student stress levels into the distress region (Figure 2).

The pandemic was a time of great uncertainty, with an unknown virus and an inability to predict the short- and long-term duration and consequences. Fear was ubiquitous: a potentially lethal virus was on the loose. This created ideal circumstances for fearmongering on social media and the spread of misinformation. Many students and family members caught Covid-19. The increase in sickness and death all around and the soaring case numbers reported daily increased the general awareness of a serious threat, affecting peoples' sense of safety and trust.

Social isolation, in itself, during lockdown periods (or when studying full-time from home) could lead to feelings of loneliness and intensified feelings of worthlessness (Van Thuy et al., 2022). Social support and physical activity could have reduced stress; these were found in a longitudinal study with 91,912 female participants by Uebelacker et al. (2013) to be moderating factors in the relationship between high stress developing into depression. The positive effects of social support and physical activity are supported by other research (Stiglic & Viner, 2019; Meyer et al., 2020; Akpınar, 2021).

The risk of mental health issues under changing conditions is greater in some people than in others. For example, young, single people, females, and people with anxious, cyclothymic and/or depressive temperaments are more likely to suffer psychological distress (Moccia et al., 2020).

## RECOMMENDATIONS

What could an institute, lecturers and course designers do to ensure that stress levels stay manageable and do not become distress? Rutkowska et al. (2022) suggest the implementation of mental health support, for example individual and/or group sessions with psychologists/counsellors.

If students miss part of the course (for example, due to late enrolment or infrastructure problems) there should be alternatives to enable them to catch up with missed opportunities around, for example, procedures such as introductory modules to unlock courses to prepare students. Fears about the quality of online courses in comparison to face-to-face courses should be explicitly addressed and expectations clarified.

When setting up courses, the need of especially younger students to belong and to get to know their peers must be considered. Get-togethers and working together (online and physically) (Koelen et al., 2022) could help in this regard. The research by Lazarevic and Bentz (2021) points to the advisability of providing choice between online or face-to-face if possible. Camargo et al. (2020) suggest the division of lectures into mini-lectures (20 minutes) with one-minute questions or exercises between them to help students to stay focused. Short breaks during online periods, for example with prompts to walk around the house – recording time it took/plants seen (Hunter et al., 2019) – and/or shorter periods and/or variety of activities, including break-out rooms. To reduce stress due to the LMS set-up, Placencia and Muljana (2019) recommend that online course navigation should be logical. Unambiguous, specific and clear labels should be used, as these affect the findability of course materials. Information should not be buried under layers of links, and scheduled announcements could be used to improve students' time-management skills. Using long pages with information, requiring scrolling, may reduce reader understanding.

Fundamental to all this is the advice from Mortagy and Boghikian-Whitby (2010, p. 1), stating that “the success of an online course depends on effective course design using a student-centred model, delivery, and assessment.” They emphasise that “research-based validated frameworks and benchmarks” should be followed “during the planning, designing, delivering, and assessing of online education.”

This study is a wide exploration of the findings of numerous studies across the world investigating links between the following four aspects: the independent variable – online learning; the dependent variable – mental health; the population – students globally; and the time frame – a specific period (the first two years of the Covid-19 pandemic). Research findings from studies before the period within the time frame were used to clarify findings of studies during the period.

The study was limited by being a literature review. No new data were collected. It was further limited by choosing recency (post-2019) as a criterion for selecting most of the research reports: a wealth of research about pre-Covid online student experience is available. Including these would have made the study very large, but a comparison between pre-, during and post-Covid online learning would have given a clearer picture of the effects of online studies *per se* on mental health. (One must realise that the Covid period presented a unique set of circumstances that will hopefully not be repeated.)

Very few qualitative/mixed method studies were included. Further research could focus more on descriptions of how students experienced their online journey before, during the pandemic and/or thereafter, whether and how their perceptions of online studies changed over time (as was done by Abbasi et al., 2020), and what external and or internal factors helped them to survive the journey.

This article looks at research from all over the world. It tries to report on the effects of the use of online learning on the mental health of the global student population. There are risks associated with transferring and applying global findings to local settings. The issues that are important in one setting may be of no significance in another (Burchett et al., 2013), and therefore decisions based on global findings may be ineffective in local settings. Munthe-Kaas, et al. (2020) mention the use of specific tools including TRANSFER (which includes collaboration with the original researchers) to ensure that systematic reviews, especially regarding medication and medical procedures, are relevant to and useful for decision making in local settings. Remedies for the situation discussed in this article may fall into the categories of: 1) increasing access to internet and devices for students, 2) support with digital literacy, and 3) appropriate mental health support; 4) improving online course design to improve student–content interactions (for example making navigation and use easier), and 5) creating sensible student–student online interactions; and 6) appealing to local communities. These six categories could all be research topics with the aim of finding out how best to serve local student communities in this regard.

In selecting quantitative studies, more attention could be given to inclusion of studies that meet certain criteria regarding, for example, ecological validity (generalisations of the findings to predict behaviours in real-world settings) and effect sizes (the magnitude of the difference between groups). Full-scale meta-analysis studies could be done.

It is envisaged that many studies can be done using this study as a starting point: comparative studies, as well as more detailed studies about the research questions and the research methods used in the published articles (such as choice of target populations and samples, data collection and analytical methods used; details of how research themes, aims, questions, methods and analysis were summarised; generalisations across countries [ecological validity] and the implications of the answers to the above questions for each study and how these findings should be viewed). Methodologies and findings could be compared in detail. From this article’s global general perspective local issues could be explored: for example, the digital divide that exists between many communities within wealthy nations and its effects on access to online learning and the mental health of students from these communities. The findings could then be compared to the worldwide or national picture. More systematic literature searches using tools (as was done by Van Thuy et al. [2022], who used the PRISMA tool to narrow down sources) could be used to find literature linking the three concepts: namely, mental health (increased stress), Covid-19 and online learning; or just mental health and online learning.

## CONCLUSION

This study explored, using a wide lens, the literature related to mental health issues in student populations across the globe during social isolation periods, mandated to curb the spread of Covid-19, and the necessitated online learning. It is envisaged that many studies could be done using this study as a starting point.

Students are generally at a high risk of mental health issues because of their life stage (19–30 years of age) (Glowacz & Schmits, 2020), often being single and because of being students. The lockdown and isolation periods would have especially affected them: even without online learning, the pandemic could have led to mental health issues for students, perhaps even more than it did with online learning. (At least the online classes kept students to a schedule, focused them on a goal and brought some contact with others.) Technology addiction and excessive social media use can increase their chances of mental health issues.

It seems, from research, that online learning *per se* could have helped to reduce stress for digitally literate students, senior students, those who find social interactions stressful and those with internal loci of control (Oketch-Oboth & Okunya, 2018). One must consider that adopting new technologies is a stressor in itself, making it harder for less digitally literate students.

Online learning could have increased stress for students who felt overwhelmed by the demands of studying, who lacked peer support, and those who looked forward to teacher–student and student–student interactions in the form of learning together and shared experiences and had to do without those. Students in courses where practical components were included may have been stressed due to the lack of chances to practise practical skills to reach competence. Where practical work needs to be done and practical skills acquired, online work should preferably not replace face-to-face sessions. Taking note of the recommendations made by researchers could help educational stakeholders to keep stress within manageable levels, especially in online courses.



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