THE PSYCHOLOGICAL IMPACT (POSITIVE AND NEGATIVE) AND BEHAVIOURAL CHANGES IN ONLINE LEARNING ON STUDENTS USING FACTOR ANALYSIS

NUR'AINUL MIFTAHUL HUDA [1)], NURFITRI IMRO'AH [2)]
[1)]*nur'ainul@fmipa.untan.ac.id,* [2)]*nurfitriimroah@math.untan.ac.id*

[1)] Mathematics Department, Universitas Tanjungpura
[2)] Statistics Department, Universitas Tanjungpura
Jl. Prof. Dr. H. Hadari Nawawi, Bansir Laut, Kota Pontianak, Kalimantan Barat

ABSTRACT

The psychological impact of a pandemic is one focus that cannot be ignored. One of the objects most impacted is students (in this study, it is focused on university students). The covid-19 pandemic has changed everything that could previously be held face-to-face into online learning. Mobility is forced to be reduced; students are asked to be more independent and must be able to adapt quickly to online learning methods. These changes cause many psychological impacts that arise, starting from positive, negative, and behaviour al changes. This study provides an overview of the psychological effects of students on learning during the pandemic. The view regarding the gender of students, whether it impacts the psychological impact, is also considered in this study. The most important thing discussed is grouping the psychological effects on students into several factors using factor analysis. The data used is questionnaire data to students who experience learning methods from offline to online learning. The results show consecutively two, three, and four main factors: positive impact, negative impact, and behaviour change.

Keywords: Psychological, Covid-19, Factor analysis

ABSTRAK

Dampak psikologis dari pandemi menjadi salah satu fokus yang tidak bisa diabaikan. Salah satu objek yang paling terkena dampak adalah mahasiswa (dalam penelitian ini difokuskan pada mahasiswa). Pandemi Covid-19 telah mengubah segala sesuatu yang sebelumnya bisa dilakukan secara tatap muka menjadi pembelajaran daring. Mobilitas terpaksa dikurangi; siswa diminta untuk lebih mandiri dan harus mampu beradaptasi dengan cepat dengan metode pembelajaran online. Perubahan tersebut menimbulkan banyak dampak psikologis yang muncul, mulai dari perubahan positif, negatif, dan perilaku. Penelitian ini memberikan gambaran tentang efek psikologis siswa terhadap pembelajaran selama pandemi. Pandangan mengenai jenis kelamin siswa, apakah berdampak pada dampak psikologis, juga dipertimbangkan dalam penelitian ini. Hal terpenting yang dibahas adalah mengelompokkan efek psikologis pada siswa menjadi beberapa faktor dengan menggunakan analisis faktor. Data yang digunakan adalah data angket kepada siswa yang mengalami metode pembelajaran dari pembelajaran luring ke daring. Hasil penelitian menunjukkan secara berurutan dua, tiga, dan empat faktor utama: dampak positif, dampak negatif, dan perubahan perilaku.

Kata Kunci: Psikologi, Covid-19, Analisis Faktor

INTRODUCTION

Covid-19 has dramatically impacted people's mental health and behaviour.

In psychology, research on stress during the Covid-19 pandemic and how to treat it

has been carried out by several researchers in several countries, including Indonesia

The Psychological Impact (Positive and Negative) and Behavioural Changes
in Online Learning on Students Using Factor Analysis – Nur'ainul Miftahul
Huda and Nurfitri Imro'ah

(Kaligis et al., 2020), China (Xiong et al., 2020), and the US (Browning et al., 2020). Although impacts are felt across populations, college students are among those most impacted by Covid-19 due to uncertainty regarding academic achievement, future career, and social life during college, among others (Browning et al., 2020). Recently, some of the psychological impacts of the Covid-19 pandemic on students were studied (Aristovnik et al., 2020). Many experiences increased stress, anxiety and depressive symptoms due to the changing delivery and uncertainty of universities worldwide (Gijzen, 2020).

One of the problems for college students is online learning. Although it was going on for more than one year, it still is a big problem. Students are forced to change learning patterns from studying in class, meeting directly with lecturers and other students to online learning, dealing with layers during lecture hours. Consequently, students may need additional resources and services to deal with the illness's physical and mental health effects. University students are recognized as a vulnerable population, suffering from more difficulties, depression, substance and eating disorders than the general population. Consequently, as the nature of their educational experience changes radically – such as where to live during the Covid-19 pandemic – this vulnerable population grows. Covid-19 risk factors can make students more likely to experience these impacts. This study aimed to determine the psychological impact of Covid-19 on students, develop a profile to characterize the level of the psychological impact of students during the pandemic and the potential demographics related to lifestyle and awareness of infected people.

Tanjungpura University is the only state university in West Kalimantan. The reach of students on this campus come from various regions, both inside and outside West Kalimantan. The study shows how many per cent of students outside West Kalimantan and the percentage of West Kalimantan students. Signal limitations are a problem that often arises during lectures, especially for students in districts that have difficulty signaling. Adequacy of internet quota is also a problem that is often faced; This is also influenced by the family's economic situation, which also declined during the pandemic. Some of these problems certainly cause

The Psychological Impact (Positive and Negative) and Behavioural Changes
in Online Learning on Students Using Factor Analysis – Nur'ainul Miftahul
Huda and Nurfitri Imro'ah

psychological problems for students. In this current study, the psychological impacts of Covid-19 are investigated and associated risk factors on college students at Mathematics and Natural Science Faculty Tanjungpura University. Our goals are threefold: to identify the psychological impact of Covid-19 on students, analysis of positive and negative impacts, and changes in behaviour during bold learning to students. The first section discusses the background. Discussions related to population studies, measures, and factor analysis are discussed in the second section. Furthermore, it is concluded in the third section, namely the conclusion.

METHODOLOGY

The population of this study were students at the Faculty of Mathematics, Tanjungpura University, Pontianak, for the 2020/2021 academic year. Four departments were selected as samples of the nine existing departments, namely Mathematics, Statistics, Information Systems, and Chemistry. The number of samples used is 272 students. The data used are cross-sectional data collected through web-based questionnaires so that in this study, students are referred to as respondents. In detail, a summary of all respondents is given in Table 1. The domicile variable in this questionnaire was taken for the location of residence for the last three months. On average, almost half of the respondents are in the capital city, around 42.28%. Though, the age variable is calculated as of July 1, 2021.

The following variable that describes the respondent's condition is the activity proportion variable. There are three main activities during the Covid-19 pandemic, namely screen time, outdoor, and exercise. The following three items were used to ask respondents to indicate how many hours they spend their time for screen time, outdoor, and exercise, consecutively:

1. Spending time in front of screens (smartphones/computers, watching television, online games),
2. Reducing activities outside the home (in parks, cafe, in neighbourhoods/yards),
3. Engaging in moderate or strenuous physical activity (brisk walking, running).

The Psychological Impact (Positive and Negative) and Behavioural Changes
in Online Learning on Students Using Factor Analysis – Nur'ainul Miftahul
Huda and Nurfitri Imro'ah

Table 1. Summary of the respondents (%). The blue text in domicile is the city, while the others is regency. The interval of age is from 18 to 23 years old.

Major	Statistics (33.09%)	Mathematics (26.84%)	Information System (22.43%)		Chemistry (17.28%)	
Domicile	Pontianak (42.28%)	Kubu Raya (9.19%)	Sambas (8.46%)	Sanggau (7.35%)	Singkawang (5.88%)	Ketapang (5.51%)
	Sintang (5.15%)	Bengkayang (3.31%)	Kapuas Hulu (2.94%)	Kayong Utara (2.57%)	Mempawah (2.21%)	Landak (2.21%)
	Sekadau (1.84%)	Melawi (1.10%)				
Age	18 (26.47%)	19 (43.75%)	20 (16.91%)	21 (8.46%)	22 (2.21%)	23 (1.47%)
Gender	Male (33.46%)	Female (66.54%)				

Figure 1 shows the descriptive use of the respondents' time during the pandemic in the form of a boxplot. For screen time activities, 50% of respondents prioritize their time in front of the screen; it can be concluded that the proportion is more in 50 - 80%. While outside activities are at an average of 30%, the highest priority is to spend time outside at only 60%. However, the time to exercise has an average of 20%.
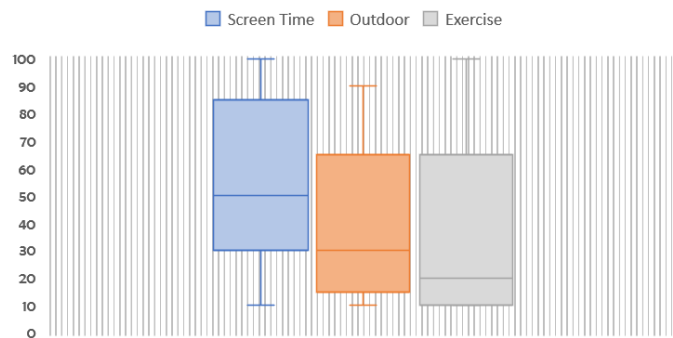
ACTIVITY PROPORTION (%)

Figure 1. Activity proportion of respondents. The blue, orange, and grey boxplots respectively show the screen time, outdoor, and exercise activities.

In this study, researchers also looked at the effects of positive, negative, and behavioural changes based on gender. The aim is to see if gender is associated with positive, negative, and behavioural changes during pandemic. The number of males

and females respectively was 181 and 91 respondents (Table 1). The activity proportion based on gender can be seen in Table 2.

Tabel 2. Activity proportion based on gender.

Activity (>50%)	Male	Female
Screen Time	35 (38.46%)	85 (46.96%)
Outdoor	9 (9.89%)	20 (11.05%)
Exercise	7 (7.69%)	12 (6.63%)

RESULTS AND DISCUSSION

The psychological impact in this study was measured by three indicators, namely positive and negative impact and behaviour change. There are seven surveys for positive impact, then 14 surveys for both negative impact and behaviour change. Each item explained one of the immediate positive impacts (i.e., freedom, trust, adaptation, productivity), negative impacts (i.e., being anger, depression, stress, and sadness) identified during the development of the positive and negative impact schedule (PANAS) (Watson and Clark, 1994). Figure 2(a) and 2(b) respectively shows the proportion between agree (yes) or disagree (no) for positive and negative impact, and behaviour change.

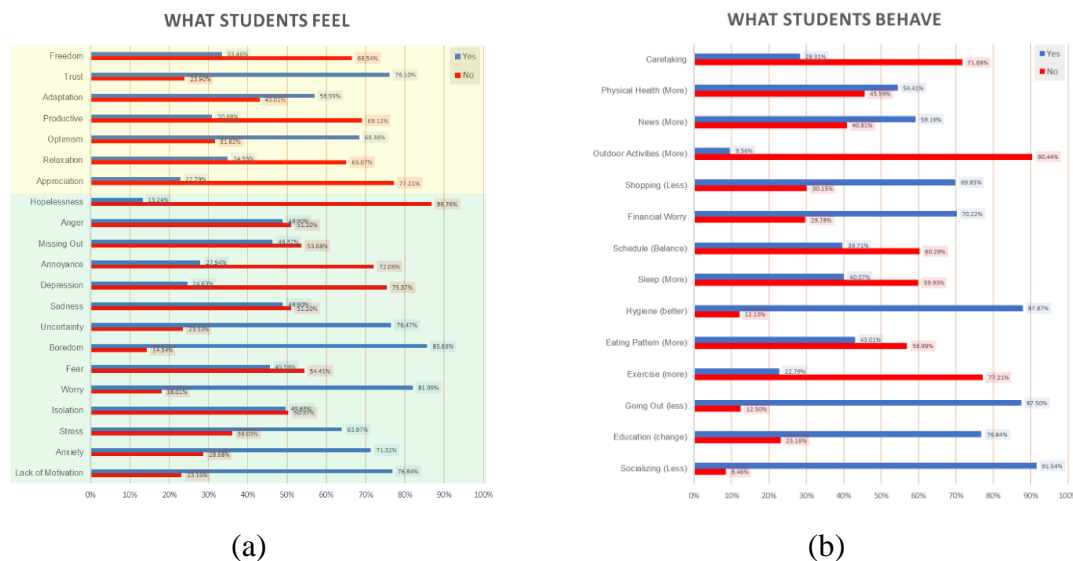(a)   (b)

Figure 1. (a) Questionnaires about what students feel, yellow shading indicates positive impact (7 surveys), while green indicates negative impact (14 surveys), (b) Questionnaires about what students behave.

In Figure 2(a), the most significant negative effect percentage is shown in boredom, which is 85.66% feeling bored during a pandemic. In contrast, the smallest is shown, like hopelessness, which is 13.24%. More than 50% feel uncertainty, boredom, worry, stress, anxiety, and lack of motivation. While for positive impact, the most prominent trait is given to the trust, which is 76.10%. In comparison, the smallest is given by appreciation, which is 22.79%. More than 50% feel optimism, adaptation, and trust. While figure 2(b) shows a significant change from the socialization behaviour, which is 91.54% agreeing that they reduce socialization during the pandemic. As for outdoor activities, 90.44% stated that they did not agree to do more outdoor activities. Meanwhile, changes in behaviour to maintain cleanliness (hygenic) also experienced significant changes, namely 87.87%. These changes follow the pandemic and government policies, namely avoiding crowds, social distancing, and maintaining cleanliness (especially washing hands).

Beyond the medical risks, the Covid-19 pandemic has a psychological impact on the population's mental health. The psychological impact of the pandemic on students is also seen in terms of gender. One of the results highlighted in the latest study is gender different psychological impacts of the Covid-19 pandemic. In this article, the female gender chooses by susceptibility to stress, post-traumatic stress disorder (PTSD), and depression, and showed higher levels of anxiety and depression (Salari et al., 2020). In this study, the correlation between gender and positive impact, negative impact, and behaviour change will be seen based on the Chi-Square Test. The null and alternative hypotheses of this test, respectively, do not exist, and there is a correlation between gender and positive impact, negative impact, and behaviour change.

a. **Positive Impact**

The Psychological Impact (Positive and Negative) and Behavioural Changes
in Online Learning on Students Using Factor Analysis – Nur'ainul Miftahul
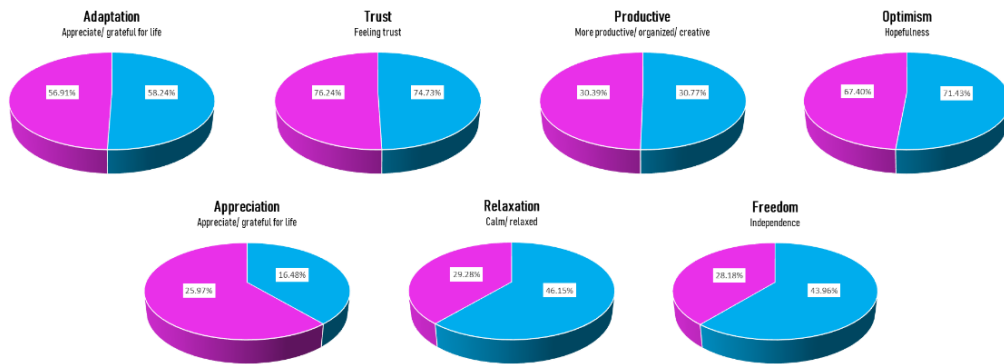Huda and Nurfitri Imro'ah

Figure 3. Positive impact's proportion based on gender. The colors pink and blue represent females   and males, respectively. The subtitles show the details of each impact survey.

Visually, first row in the figure 3 shows the proportion of each gender was similar, that is adaptation (56.91;58.24), trust (76.24;74.73), productive (30.39;30.77), and optimism (67.40;71.43). While the difference feelings between male and female are given in appreciation (25.97;16.48), relaxation (29.28;46.15), and freedom (28.18;43.96). Statistically, it can be seen from chi-square test, the p-value is 0.1112 (greater than the significance level 5%). It means there is no significant correlation between gender and feelings in positive impact.

b. Negative Impact

Visually, the first and second row in the figure shows the proportion of each gender was different, that is an annoyance (33.70;16.48), missing out (56.91;25.27), stress (71.27;49.45), sadness (56.35;32.97), fear (51.93), anger (54.14;37.36), and depression (27.07;20.88). While the third and fourth rows give almost similar proportion between females and males, that is uncertainty (79.56;70.33), hopelessness (13.81;12.09), worry (85.08;74.73), lack of motivation (79.01;72.53), anxiety (73.43;67.03), isolation (49.72;49.45), and boredom (87.85;81.32). Statistically, it can be seen from the chi-square test; the p-value is 0.1118 (greater than the significance level of 5%). It means there is no significant correlation between gender and feelings of negative impact. Figure 4 shows the pie chart of negative impact.
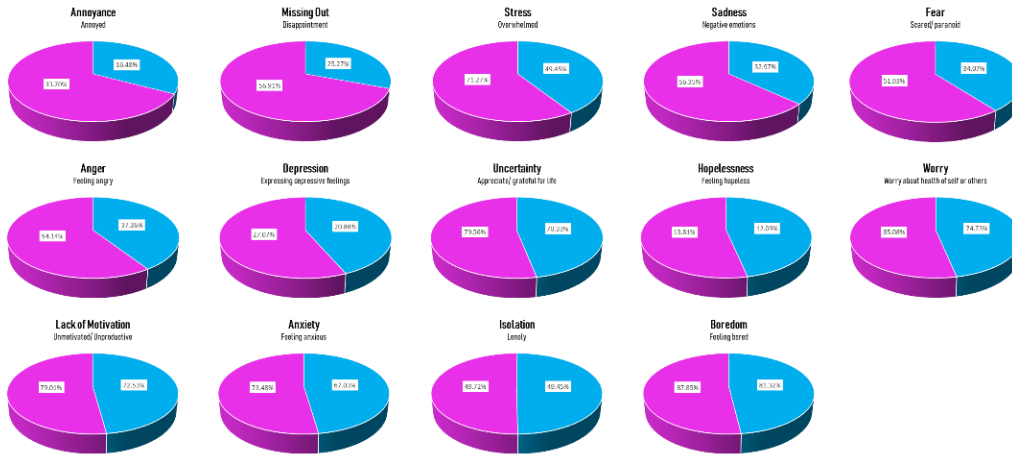
Figure 4. Negative impact's proportion based on gender. The colors pink and blue represent females and males, respectively. The subtitles show the details of each impact survey.
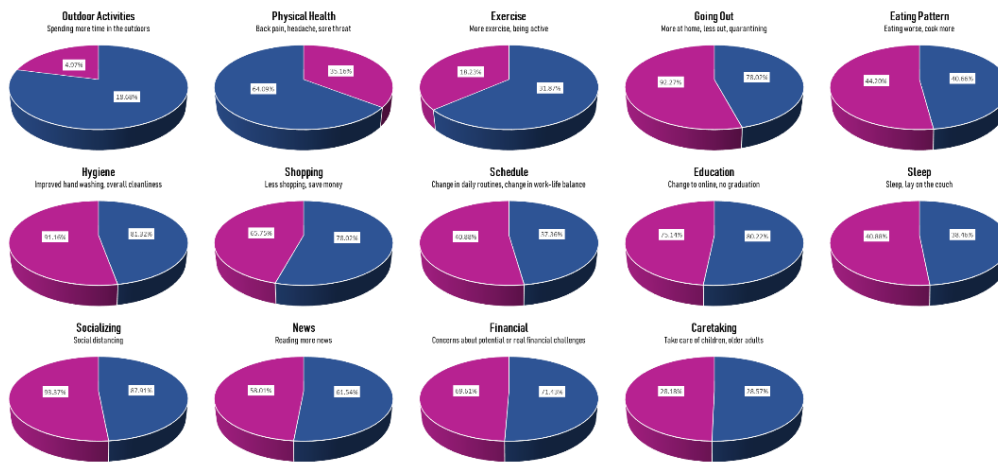
c. Behaviour Change

Figure 5. Behaviour change's proportion based on gender. The colors dark pink and dark blue represent females and males, respectively. The subtitles show the details of each impact survey.

In contrast to positive and negative effects, the behavioural change variable shows a significant difference between males and females. Visually, it can be seen in the outdoor activities, physical health, and exercise variables, followed by several other behaviours (see Figure 5). This significant difference is also supported by the chi-square test results, which has a p-value of 0.0039 (smaller than the 5%

significance level). Statistically, it can be concluded that there is a correlation between gender in behaviour change during the Covid-19 pandemic.

Exploratory Factor Analysis

Factor analysis refers to a set of statistical procedures designed for the number of unobservable constructs helpful in explaining correlation patterns between various measures. Unobservable constructs that explain the correlation pattern between these measures are referred to as general (Porter and Fabrigar, 2016). Exploratory factor analysis is chosen due to the unconfirmed number of factors. There are three main steps in factor analysis, those are assessment of suitability, factor extraction, and interpretation.

First, the dataset was further evaluated using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (to assess the appropriateness of the data set) and Bartlett's test of sphericity (to test the variables in the population correlation matrix are uncorrelated). Table 3 gives the KMO and Barlett test for the three indicators: positive impact, negative impact, and behaviour change. The statistic that is computed in the KMO test is a measure of 0 to 1. Interpreting the statistic is relatively straightforward; the closer to 1, the better. As the value is above 0.5, the sample all in three indicators is adequate for Factor Analysis. Bartlett's test tests the hypothesis that the correlation matrix is an identity matrix, which would indicate that the variables are unrelated and therefore unsuitable for detection. A small value (less than 0.05) of the significance level indicates that factor analysis can help your data. All indicators show significant values.

Tabel 3. Result of KMO and Barlett's test for positive impact, negative impact, and behaviour change. The blue text shows the assumptions are fulfilled.

Test		Positive	Negative	Behaviour Change
KMO Measure of Sampling Adequacy		0.60	0.84	0.57
Barlett's Test of Sphericity	Approx. Chi-Square	100.75	765.83	369.23
	Sig.	< 0.0001	< 0.0001	< 0.0001
	Df	21	91	91

The Psychological Impact (Positive and Negative) and Behavioural Changes
in Online Learning on Students Using Factor Analysis – Nur'ainul Miftahul
Huda and Nurfitri Imro'ah

Second, the least number of factors that can best represent among the set of variables is determined. In this study, two techniques are used to determine it: Kaiser's criterion (based on eigenvalue) and scree plot. The remarkable factors having eigenvalue greater than one are retained. An eigenvalue greater than one is considered significant, indicating that more common variance than unique variance is explained by that factor. The cumulative proportion of eigenvalues is also computed. For the cumulative proportion, more than 70% is indicated that the number of factors is sufficient to explain the other variables.

Table 4 shows the eigenvalue and cumulative proportion for each variable. A scree plot graphs eigenvalue on the vertical axes, with eigenvalue numbers constituting the horizontal axis. It can be used for identifying the optimum number of factors. Factor extraction should be stopped at the point where there is an elbow or levelling of the plot. Figure 6 gives the three screes plot for each variable. The determination of the number of factors based on the screen plot is subjective. In this study, researchers see two factors for positive impact, three factors for negative effects, and four factors for behaviour change. This determination is also, of course, adjusted for the eigenvalue (more than one) and the cumulative proportion (more than 70%).

The third stage, the last stage, in factor analysis, is the interpretation of the grouping results. Based on the number of factors obtained previously, it is shown in the following figure 7. In factor analysis, the term loading pattern is known, determining the factor with the most significant influence on each variable. Loads that are close to -1 or 1 indicate that these factors significantly impact the variables. Loading close to 0 indicates that the factor has a weak influence on the variable. Adjustment and meditation are significant factors in the positive impact. The nature of trust is very dominant in self-adjustment, which means that students feel that the pandemic makes them more trustworthy. In meditation, relaxation is the most dominant trait because calm is the key in a pandemic like this. From the opposite side, negative, depression is the most dominant trait in emotional distress. Then boredom and anxiety become the most dominant traits in the hard time and anxiety

The Psychological Impact (Positive and Negative) and Behavioural Changes
in Online Learning on Students Using Factor Analysis – Nur'ainul Miftahul
Huda and Nurfitri Imro'ah

order factors. Concerning behaviour change, caretaking is the dominant factor in ensuring safety and hygiene habits because guarding against family members from being infected with the virus is indeed more stringent during the pandemic. Meanwhile, in the lifestyles factor, shopping is the dominant factor. Behaviour change in shopping is to reduce shopping beyond the main needs. In detail, the grouping of each variable can be seen in Figure 7.

Table 4. Eigenvalue (italic text) and proportion, cumulative proportion in percent (successively below the eigenvalues) for positive impact, negative impact, and behaviour change. The blue shading shows the number of factors used based on the cumulative proportion (greater than 70%) and eigenvalue greater than one.

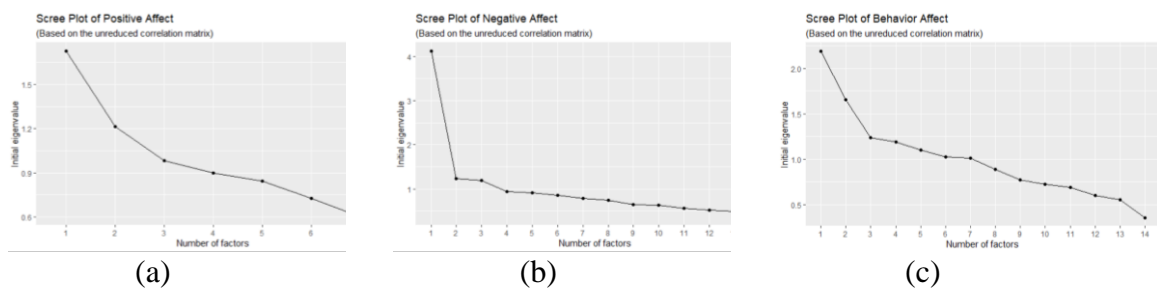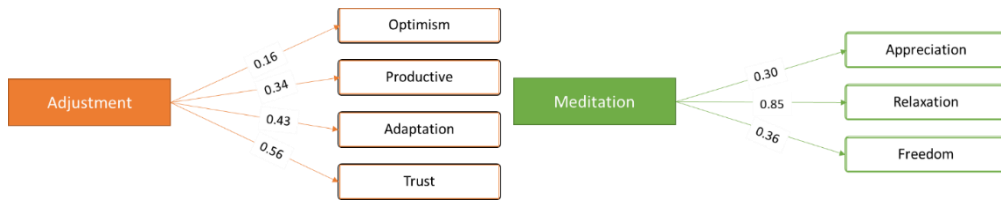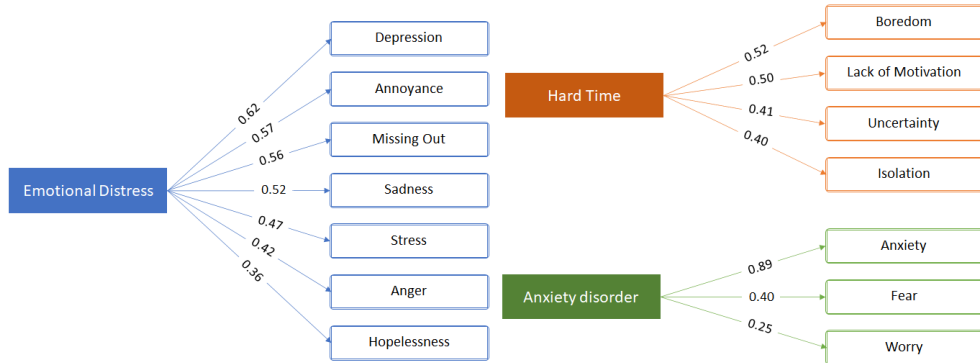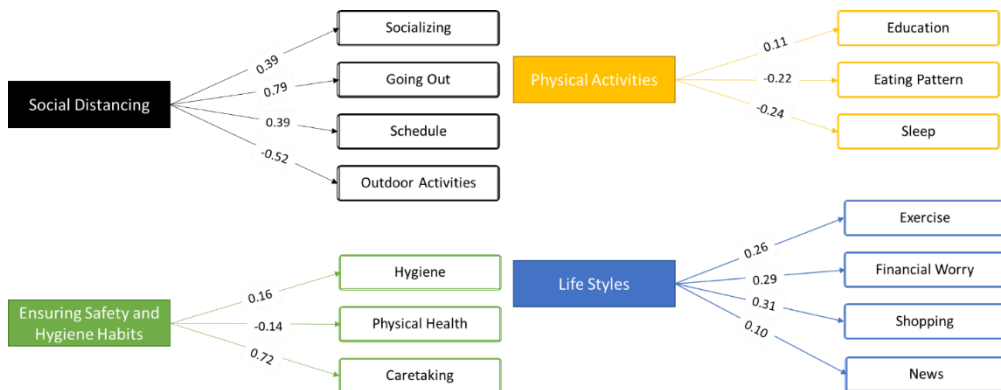|							Factors						
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14
Positive													
1.73	*1.22*	*0.98*	*0.9*	*0.85*	*0.73*	*0.6*							
0.51	0.26	0.10	0.08	0.06	0.00	0.00							
(51)	(77)	(86)	(94)	(100)	(100)	(100)							
Negative													
4.12	*1.23*	*1.19*	*0.94*	*0.91*	*0.85*	*0.78*	*0.75*	*0.65*	*0.63*	*0.56*	*0.52*	*0.5*	*0.37*
0.50	0.11	0.10	0.07	0.06	0.05	0.04	0.03	0.02	0.01	0.01	0.00	0.00	0.00
(50)	(60)	(71)	(78)	(84)	(88)	(92)	(95)	(97)	(98)	(99)	(100)	(100)	(100)
Behaviour													
2.19	*1.66*	*1.24*	*1.19*	*1.1*	*1.03*	*1.01*	*0.89*	*0.77*	*0.73*	*0.69*	*0.6*	*0.56*	*0.36*
0.29	0.20	0.11	0.10	0.08	0.07	0.06	0.04	0.02	0.02	0.01	0.00	0.00	0.00
(29)	(49)	(60)	(70)	(77)	(84)	(91)	(94)	(97)	(99)	(100)	(100)	(100)	(100)

Figure 6. The scree plot for (a) Positive impact, (b) Negative impact, and (c) Behaviour change. The eigenvalues are plotted as dots within the graph.

(a)

(b)

(c)

Figure 7. Grouping based on the number of factors in each variable, (a) Positive impact, (b) Negative impact, and (c) Behaviour change. The naming of factors is based on developing psychological theories.

The Psychological Impact (Positive and Negative) and Behavioural Changes
in Online Learning on Students Using Factor Analysis – Nur'ainul Miftahul
Huda and Nurfitri Imro'ah

CONCLUSIONS

The psychology of students during the pandemic, especially in online learning, was significantly impacted, both in terms of positive, negative, and behavioural changes. The proportion of student activities indicates this psychological impact on screen due to online learning. However, from a gender perspective, there is no correlation between gender and positive and negative impacts. Except for the behavioural change variable, there is a correlation between gender and behaviour change, especially in outdoor activities, psychological health, and exercise. Many studies, including several student populations, identified women as at greater risk of experiencing psychological distress during the Covid-19 pandemic. Although preliminary evidence suggests men are more susceptible to infection, our study supports the assertion that women are more affected by the long-term effects of the pandemic.

Of the three variables used, namely positive, negative, and behavioural changes, after factor analysis, it can be seen that students tend to feel adjustment and meditation during the pandemic. Negatively, this pandemic has caused students to feel emotional distress, hard time, and anxiety disorder. This negativity is of particular concern to reduce the psychological impact of the pandemic from the opposing side. In changing behaviour, this pandemic has brought students to be more social distancing, carry out physical activities, ensure safety and hygiene habits, and change their lifestyles. This behaviour change must be accompanied by more positive impacts than the perceived negative impacts.

REFERENCES

Aristovnik, A., Kerzic, D., Ravselj, D., Tomazevic, N., and Umek, L. 2020. Impacts of the Covid-19 pandemic on life of higher education students: A global perspective. *Sustainability*. 12(20), 8438.

Browning, M.H.E.M., Larson, L.R., Sharaievska, I., Rigolon, A., McAnirlin, O., Mullenbach, L., Cloutier, S., Vu, T.M., Thomsen, J., Reigner, N., Metcalf, E.C., D'Antonio, A., Helbich, M., Bratman, G.N., and Alvarez, H.O. 2020. Psychological impacts from Covid -19 among university students: Risk factors across seven states in the United States. *Plos One*. 16(1), e0245327.

Gijzen, M., Shields-Zeeman, L., Kleinjan, M., Kroon, H., Roest, H., and Bolier, L. 2020. The bittersweet effects of Covid -19 on mental health: Results of an

online survey among a sample of the Dutch population. *International Journal of Environmental Research and Public Health.* 17, 9073.

Kaligis, F., Indraswari, M.T., and Ismail, R. I. 2020. Stress during Covid -19 pandemic: mental health condition in Indonesia. *Medical Journal of Indonesia.* 29(4), 422-426.

Porter, R.D. and Fabrigar, L.R. 2016. *Factor Analysis*. Oxford: California.

Salari, N., Hosseinian-Far, A., Jalali, R., Vaisi-Raygani, A., Rasoulpoor, S., Mohammadi, M., Rasoulpoor S., and Khaledi-Paveh, B. 2020. Prevalence of stress, anxiety, depression among the general population during the Covid -19 pandemic: a systematic review and meta-analysis. *Globalization and Health.* 16(57), 2020:1-11.

Watson, D. and Clark, L.A. 1994. *The PANAS-X: Manual for the Positive and Negative Affect Schedule – Expanded Form.* Ames: The University of Iowa.

Xiong, J., Lipsitz, O., Nasri, F., Lui, L.M.W., Gill, H., Phan, L., Chen-Li, D., Iacobucci, M., Ho, R., Majeed, A., and McIntyre, R.S. 2020. Impact of Covid -19 pandemic on mental health in the general population: A systematic review. *Journal of Affective Disorders*. 277, 55-64.

Volume 9 Nomor 2, November 2021
Halaman 135-148

148

The Psychological Impact (Positive and Negative) and Behavioural Changes
in Online Learning on Students Using Factor Analysis – Nur'ainul Miftahul
Huda and Nurfitri Imro'ah