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Assessing fear of missing out (FoMO): an early indication digital mental health among adolescents

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Abstract: The prolonged isolation during the pandemic has raised concerns about the potential increase in digital technology use among adolescents. However, adolescents are considered particularly vulnerable to problems of digital mental health. The present study aimed to assess adolescents' Fear of Missing Out (FoMO) during public health emergencies in Malaysia. This study conducted a survey of adolescents ($n=781$) in April-June 2021 to assess the risk of FoMO. The study shows that descriptive analysis for overall FoMO score is moderate level ($M=2.53$, $SD=0.84$). Moreover, there was a statistically significant between Time Spent on Social Media ($M=5.93$, $SD=3.67$) and FoMO ($M=2.53$, $SD=0.84$), the direction of the correlation was positive, which means that students who spent more hours using social media tend to increase their level of FoMO [$r(781) = 0.201$, $p<0.01$]. These findings show early indications of digital mental health among adolescents. Therefore, positive aspects of online activities should be promoted. In the meantime, we must consider how the awareness about the detrimental effects of digital media use should be raised. Therefore, significant improvements in health communication among adolescents are needed to increase their understanding and knowledge of applying proper digital mental health practices and adapting to the new norms during the pandemic.

Keywords: assessing; adolescent; fears of missing out (FoMO); public health emergencies

Introduction

Upon the outbreak of Coronavirus (COVID-19) at the beginning of 2020, its emergence led to a global panic that drew

upon an immediate call for a Public Health Emergency of International Concern (PHEIC). This stirred many nations to administer a lockdown; some called it the Movement Control Order (MCO). This halted numerous sectors, including economics, tourism, commerce, and impacted the general public. Such a situation also warranted caution among many governments to take proactive measures by administering temporary school closures in an effort to reduce the spread of COVID-19. This situation, however, paralyzed the learning process of almost 90 % of adolescents and children, who were incapable of attending schools physically; the only viable option was through online learning which was enabled by technology as a medium of learning [1]. This problem was prolonged until mid-2021 due to the rise of COVID-19 cases when different COVID-19 variants emerged, including the Lambda and Delta variants, which were estimated to cause fatalities. School closure henceforth paved new lifestyles among the adolescents since they were mostly at home and isolated for a certain duration that limited their social activities [2, 3]. Most adolescents generally view school closure and social distancing as a challenging phase since they are attuned to the normality of unrestricted movement and prioritize their relationship with peers as compared to their parents [4, 5]. Such a change causes a greater challenge to their well-being. Their physicality at home also causes their higher rate of interaction with the telephone or other gadgets for the purpose of socializing via online [6, 7].

The latest Global Digital Statshot report observed the number of social media users around the world exceeded four billion [8]. This dramatic increase of social media use was due to its exceeding use at home at 70 %, especially among adolescents [9–11]. Despite positive impacts from the use of social media (e.g., assistance to others, greater accessibility to numerous available information), there are simultaneous negative consequences from such exposure, which impact mental well-being, including depression and anxiety [12, 13]. Adolescents' frequent exposure to screen time, which to a point becomes a state of their uncontrolled dependency on social media, may lead to mental health. A greater concern is likely to emerge when adolescents are given more screen time with regard to using social media, where they are exposed to the risk of developing FoMO – a syndrome of “fear of missing”

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an incident, current development, and trends in social media [14–17]. FoMO, which is described as a phenomenon observed on social networking sites, includes two processes [1]: perception of missing out, followed by [2] a compulsive behavior to maintain these social connections. It is a universal phenomenon that drew initial attention among researchers, especially between 2013 and 2021. These researchers vary from those from Israel [18], Belgium [19], the United Kingdom [20], Turkey [21], Germany [22], and China [23]. Research studies on FoMO, however, are considered to be recent and underdeveloped, especially on COVID-19 [24].

Self-Determination Theory (SDT) explains how people feel more motivated to take action when they believe that what they do will impact the outcome [25]. SDT also suggests that people who fulfill their needs for autonomy, connection, and competence are able to be self-determined. Two key assumptions within the SDT were that people are often striving for growth in their lives and that an internal source of motivation (intrinsic motivation) is important, while three main components of SDT were introduced, which were autonomy, competence, and relatedness. Autonomy is explained as the need to feel and be in control of their goals and objectives. The feeling of being able to control what they do and how it will pan out plays a major role in making people become self-determined. Additionally, competence describes the need to learn and master various skills that would be useful in life. People who feel that they have acquired the necessary skills to succeed are more than likely to take action towards achieving their goals as opposed to those who have yet to master the required skills. Meanwhile, relatedness described an essential part of self-determination in which a person experienced a sense of belonging and developed attachment to other people. Interestingly, FoMO can be viewed as a motivational state due to unfulfilled needs of SDT, such as using social media to maintain a sense of belonging (relatedness), lack of control due to compulsive checking (autonomy), and comparing personal achievements with others on social media (competence). Thus, FoMO can be described as a maladaptive response due to need frustration that is developed due to unfulfilled psychological needs as suggested by the SDT theory [14, 26].

Several studies conducted in Southeast Asian countries (ASEAN) show that more than 50 % of the population in Indonesia and Singapore experience FoMO [27]. These countries have almost the same characteristics as Malaysia in terms of social media usage penetration, where in Malaysia, 91.7 % followed by Singapore at 89.5 %, and Indonesia at 68.9 %. [27]. This shows early indicators of digital mental health problems involving the use of social media in ASEAN. Research on digital mental health is very limited, and there are still major challenges in

understanding the experience of social media users with FoMO symptoms in their daily lives of its users. Some researchers argue that news sharing on social media is a social experience aimed at sharing social news in the virtual community. FoMO also explains that those who spend more time on social media are also more likely to have higher levels of FoMO and feel vulnerable [27, 28]. This means those who rely on social media as a primary source of information may feel the urge to be connected with others via news sharing and inadvertently or advertently share their experience.

Numerous past studies identified that FoMO has an impact on mental health such as stress [20, 29], anxiety [23, 30], depression [31, 32], lack of sleep [28, 33], demotivation in academics [34, 35], addiction to the use of handphones and other problems relating to the misuse of social media [36, 37]. Past studies also indicated that FoMO reduces the level of temporal happiness, which contributes to a lower rate of satisfaction with the current state of the situation [38]. In fact, past studies also further elaborated on the symptoms of FoMO, such as frequent viewing of the handphones or a dissatisfactory level of internet connection to a point of causing difficulties to keep up with the current developments in social media [12, 19, 22]. To add, some even expressed dissatisfaction with others' postings in social media, especially those that feature wealth, happiness, or others with a high volume of followers. Others hoped for compliments and responses from viewers [14, 16, 39]. Nonetheless, it is notable that past studies have given the least attention to identifying adolescents with risk and their experiences with regards to FoMO during the public emergencies [40]. Adolescents can be regarded as a highly risky group when discussing FoMO since they are likely to be influenced either emotionally or behaviorally during their development process [27, 30, 41].

Unless this aspect is given ample attention, such a problem will likely increase depression and reduce living quality and its satisfaction. In fact, it is not too far-fetched to conclude that COVID-19 has caused major changes in the number and presentation of digital information (e.g., video streaming on Netflix, TikTok). This change has impacted adolescents' personalities by increasing their tendency towards digital content. This is worrying since schools are returning to their regular operations, where adolescents are likely to have less screen time, besides needing to keep pace with social media content, thus causing FoMO. This research aims to assess the experience of FoMO among adolescents during public health emergencies and its relation to social media usage. The findings may contribute to the development of training programs for self-regulation on digital use and awareness of the risk of FoMO among social media

users, particularly adolescents, notably during post post-Pandemic.

Methodology

This research was conducted entirely during the second month of the state of alarm in Malaysia (which began on 11 April 2021). The state of alarm implied the isolation and confinement of the entire population; all schools and educational institutions were closed down, along with non-essential businesses. Malaysians were only allowed to go out for essential matters, such as food shopping or going to the hospital. We conducted a sequential quantitative methods study to assess FoMO using a survey. The study protocol was approved by the Research Ethics Committee, Faculty of Education for ethical in education and psychology research in Malaysia (GP 2021-K020654). All participants gave informed written consent, and the adolescents needed parental permission to participate, in accordance with the Ministry of Education of Malaysia, which allows for independent consent for adolescents aged below 18 years.

Survey instrument

The questionnaire was mainly inspired by a study done by Przybylski et al. [14]. A unidimensional scale consisting of 10 items set on 5-point Likert-type responses, which measures the degree of adolescents' experiences of fears of missing out during the COVID-19 pandemic, particularly involving their friends and the use of social media to stay connected. The scale was translated and back-translated into the Malay language by a group of experts. A pilot study including 50 students was conducted to confirm the validity of the instrument, to test for its reliability, and to assess its clarity and time-adequacy in completing the questionnaire. The calculated Cronbach's alpha was 0.835, and the inter-item correlation was 0.73.

Data collection

Malaysia ranks fourth among the 238 countries with 32,365,999 people, with more than 27 million internet and social media users between 15 and 24 years (16.63 % of Malaysia's population). From the data, there are approximately 1,301,758 students (aged from 17 to 19) from 2,240 schools who are currently enrolled in high school. These students were affected by the high school closure as mandated by the government during the Movement Control

Order (MCO). For this study, student participation was solicited via online recruitment and, posting of flyers on social media. The inclusion criteria were as follows: those who were [1] full-time students [2], aged between 17 and 19 [3], willing to cooperate with the investigation, and obtained informed consent online [4], owned social media accounts such as *TikTok*, *Instagram*, *Facebook*, and *Twitter*. The exclusion criteria were as follows: those who refused to participate or cooperate. We sent reminders after 2 and 4 weeks to all of the participants to prompt those who had not yet completed the survey. There were no financial incentives given for completing the survey.

Data analysis

The participants' responses were then quantified and statistically processed. No missing data were recorded either at an item level or at a scale level. The data was analyzed using the Statistical Package for the Social Sciences (SPSS) version 22.0 for Windows. To identify the situations valued as threatening and the level of FoMO, basic statistical analyses were conducted (calculation of means and standard deviations). In order to make descriptive analysis, scores weighted between 1 and 2 were considered indicative of a low level of experience of FoMO, scores between 2.01 and 3 as indicative of a moderately low level of FoMO, scores between 3.01 and 4 as moderately high, and scores over 4.01 as a high level of possible of FoMO.

The Bivariate correlation is a statistic that indicates the degree to which two variables are related to one another. In this study, we analyzed using Pearson's correlation coefficient between the studied variables, between the time spent on social media and FoMO. The sign of a correlation coefficient (+ or) indicates the direction of the relationship between -1.00 and $+1.00$. Variables may be positively or negatively correlated. A positive correlation indicates a direct, positive relationship between two variables. A negative correlation, on the other hand, indicates an inverse, negative relationship between two variables [42]. In addition, we also tested for the mean difference between the groups in terms of time spent on social media (Low=0–4 h, Moderate=5–7 h, and High=8 h and above). Time spent on social media t-means difference and ANOVA statistics were used to establish the association between the independent and dependent variables.

Demographic

see Table 1.

Table 1: Summary of demographic and social media use.

Characteristic	Total (781)	Percent, %
Sex		
Men	359	45.80
Female	425	54.20
Age, Years		
Middle adolescence (14–17 years)	348	44.50
Late adolescence (17–21 years)	432	55.44
Time spent on social media		
Low (0–4 h)	555	70.8
Moderate (5–7 h)	156	19.9
High (8 h and above)	73	9.30

Results

Research Question 1: What is the level of FoMO among adolescents during the pandemic?

According to the analysis of weighted means, there are two major FoMO that were assessed, which are social anxiety and social media connectedness (Table 2). The study shows that descriptive analysis for the overall FoMO score is at a moderate level ($M=2.53$, $SD=0.84$). Specifically, social anxiety is at a low level moderately ($M=2.39$, $SD=1.27$), followed by means of social media connected at a low level moderately ($M=2.51$, $SD=1.28$). The results show that adolescents who experience Fears of Missing Out (FoMO) have the tendency to the risk of FoMO during prolonged isolation in the pandemic COVID-19.

Research Question 2: Is there a statistically significant association between FoMO and students' usage of the social media?

In order to draw an association between FoMO and students' usage of social media, the Pearson correlation was conducted, and the assumption was assessed. There was a statistically significant between Time Spend On Social Media ($M=5.93$, $SD=3.67$) and FoMO ($M=2.53$, $SD=0.84$). The direction of the correlation was positive, which means that students who spent more hours using social media tend to increase their level of FoMO [$r(781)=0.201$, $p<0.01$]. However, it's a weak correlation, which means that the intensity or the magnitude of the relationship between these two variables is significant, but of a weak correlation. The small effect size suggests that the actual effects of students' usage of social

Table 2: Descriptive information experience of FoMO.

FoMO	Mean	Standard deviation
Social anxiety		
I fear others have more rewarding experiences than me.	2.49	1.27
I fear my friends have more rewarding experiences than me.	2.43	1.22
I get worried when I find out my friends are having fun without me.	2.41	1.26
I get anxious when I don't know what my friends are up to.	2.23	1.24
Social media connected		
It is important that I understand my friends "in jokes."	3.30	1.25
Sometimes, I wonder if I spend too much time keeping up with what is going on.	2.45	1.27
It bothers me when I miss an opportunity to meet up with friends.	2.23	1.17
When I have a good time it is important for me to share the details online (e.g. updating status).	3.00	1.19
When I miss out on a planned get-together it bothers me.	2.23	1.17
When I go on vacation, I continue to keep tabs on what my friends are doing.	2.35	1.19

M, Mean; SD, standard deviation.

media on FoMO may be limited and should be interpreted with caution. Therefore, social media usage may not be solely responsible for determining FoMO as other factors, like personality traits such as neuroticism and extraversion, have been shown to exhibit positive correlations with FoMO [43].

Research Question 3: Is there any statistical differences between the FoMO and students' usage of the social media 4 h and below, between 5 and 7 h, and 8 h and above?

An analysis of one-way ANOVA was performed to measure the construct of fear of missing out among three groups of students. All the assumptions are fulfilled, such as the test of normality, skewness, and Homogeneity of variance. A statistically significant difference was found among three groups of students' use of social media on the fear of missing out, $F(2,700)=13.07$, $p<0.001$. The mean students' usage of social media is 2.41 for those who use it 4 h or less, 2.51 for those who use it 5–7 h, and 2.79 for those who use it

8 h or more. The alpha level is reduced to a 90 % confidence interval to control the Type I error in LSD Post-hoc tests. However, the result shows the same at the 95 % level. Bonferroni Post-hoc tests were also calculated to check any contrary figures. They show the same result. Thus, the analysis concludes that post-hoc tests indicate that the students' usage of social media 4 h and below & students' usage of social media 8 h and above, differed significantly in their fear of missing out ($p < 0.001$). Likewise, there were also significant mean differences in students' usage of social media between 5 and 7 h and students' usage of social media more than 7 h ($p < 0.001$). Eta Squared $\eta^2 = 0.04$ indicates a small effect.

FoMO and adolescents' mental health

Online social anxiety

The COVID-19 pandemic and lockdown have brought a significant impact on adolescent well-being. Engaging actively in social networking sites (SNS) has become a soothing experience for adolescents to get rid of loneliness, emptiness, and sadness [41]. Uncontrolled time allocation on social media during this lockdown has a significant implication for their mental well-being. Results from this study show that Malaysian adolescents show early warning signs that students have FoMO. For some adolescents, social media is the best platform for self-presentation in attracting social connections and gaining recognition [10, 11]. This scenario indirectly raises a possibility of distress for some individuals. As this study shows, adolescents start to feel uncomfortable when their peers or others have more rewarding experiences, have more fun, and live better than what they have been going through. It is assumed that adolescents who experience FoMO may experience feelings of envy [35], social anxiety and decreased life satisfaction [28, 34]; feeling uncomfortable and envious [38], and depression [23, 32]. In the long term, constant monitoring and following of what their friends are doing will increase FoMO [19–21]. This phenomenon also influences adolescents' behavior, especially concerning the effects of FoMO in their academic performance [34]. To resolve the impact caused by social media, there is a critical need to conduct more nuanced investigations, especially related to the role of family in supporting and controlling the use of digital devices.

Social media connection

COVID-19 has developed a newfound physical constraint in terms of interaction, which has led teenagers to become

actively involved with social media as a means of expressing their feelings, conveying, and sharing information with the public about themselves. Posting numerous times and sharing content that is uploaded onto social media is one way to get attention and forge closeness with peers as well as other social circles. Past research shows that uploading status and keeping up with updates on social media, which contains various related information on self-information, can be classified as self-disclosure [26, 28, 31]. Time spent over replying to feedback on received comments is a way to fill the void and loneliness. Despite the general emotional struggle during the pandemic, these teenagers were able to see that their existence and presence were reinstated and appreciated as well as accepted. Besides retaining active interactions with the existing social circle, uploaded posts and content were capable of attracting new acquaintances. Studies have shown that public self-disclosure also draws on numerous positive impacts, including reducing the effects of loneliness [36], strengthening relational closeness [16, 17, 39], extending a sense of connectedness [18], and improving the subjective well-being [39]. In fact, there are research findings that have indicated teenagers' sense of connectedness and excitement towards social media, besides its provision of emotional expression through social networks, which lead to the formation of a new self-image. This self-profile would create a desired self-image since it provides the promotion of an ideal self-branding and marketing. Some report that if their ideas are well received, followed by positive comments along with a high volume of followers, this serves as a reward to continuously share over social media. Here, a new feeling is formed, which is acceptance of social users towards themselves. Such a reward will influence their behavior to continuously update about themselves on social media and their perception about symbols such as 'like', 'share', and 'follow account'. Despite their knowledge about the falsity of content creation in social media, these adolescents ensure that they are able to shape a well-received positive self-image, which abides by social standards in social media. The reality is these adolescents try to shape a new identity through different applications so that they can change, alter, and edit their self-profile, which indirectly reduces their self-confidence towards natural appearance, that is presumed to be less attractive or appealing.

Additionally, the findings of the study align partially with the Self-Determination Theory (SDT), which suggests that unfulfilled psychological needs cause a person to develop a compensatory behavior, such as through the excessive use of social media, in order to feel a sense of belonging or relatedness. However, the weak correlation between social media usage and FoMO may imply that time is not the main predictor of FoMo, and other factors, such as

individual psychological needs or the overall interaction experiences, may contribute to a greater role in developing FoMO. Thus, future interventions may need to consider focusing on other components of social media use, such as healthier use patterns or offline social connections in order to overcome FoMO.

Limitations of the study

Several limitations of the study should also be acknowledged. Firstly, the study relies mainly on the use of self-report questionnaires that may introduce bias, as the participants might over or underestimate their personal use of social media or choose desirable answers. Secondly, the use of online methods for recruitment may contribute to selection bias, as participants may only be represented by those who are more active online as compared to those who are less active. Finally, the findings of the study may have limited generalizability and may not apply on other cultural or developmental contexts. Future research may benefit from the use of a more diverse sample or a longitudinal research design to further strengthen the validity of the findings.

Conclusions

Strategies that were applied to contain the spread of COVID-19, such as school closures and limited extracurricular activities, have resulted in an increase in screen time, which is found to be associated with FoMO. While school closures may be short-lived, increased access to, the adoption, and dependence of digital devices could have a long-term negative impact on adolescent well-being. Although studies have shown that the level of FoMO is moderate, there is a positive relationship between the use of social media and FoMO. In other words, those who spend more time on social media are also more likely to have higher levels of FoMO and feel vulnerable. These findings show early indications of digital mental health that need serious attention among teenagers, especially in Malaysia. Raising awareness among adolescents about screen time is key to mitigating FoMO that may become entrenched during this period. Broadly, this research highlights the use of social media in addressing the digital well-being communication gap among adolescents to help them adapt to these new norms. It is important that new findings about screen time and FoMO be communicated to the parents, psychologists, technologists, educators, and the community at large, since they have implications for individual well-being. Importantly, the findings from the study may contribute to the potential development of training programs specifically for

self-regulation of screen time management skills and awareness of the risk of FoMO among social media users, particularly adolescents. Additionally, evidence-based strategies that include school-based digital literacy program that promotes healthier digital usage and programs that include parental involvement might be more effective in fostering balanced digital habits. Future research should also explore not only for adolescents, parents, and teachers should do differently, but for how technologists should do differently in terms of designing products that take into account psychological factors.

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Informed consent: All participants gave an informed written consent and the adolescents need parental permission to participate, in accordance with the Ministry of Education of Malaysia, which allows for independent consent for adolescents aged below 18 years.

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Use of Large Language Models, AI and Machine Learning

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