Research Paper

Confirmatory Factor Analysis of Social Media Addiction Instruments in Early Adolescents

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ABSTRACT: *Social media addiction is an individual behavior resulting from excessive use of online applications that negatively impacts daily life, particularly in early adolescence. Measuring social media addiction requires a valid and reliable instrument to accurately describe the condition. The social media addiction measurement instrument in this study was developed from the Bergen Facebook Addiction Scale (BFAS) compiled by Andreassen. This study aims to validate the Social Media Addiction Scale in early adolescents in Indonesia. The scale consists of 18 items that have undergone a back-translation process and validated through content validity testing by professional judgment. Data analysis was performed using JASP software through reliability testing and Confirmatory Factor Analysis (CFA). The reliability results showed a Cronbach's Alpha value of 0.894, indicating very good internal consistency. All items also had a discrimination index above 0.30. The CFA results indicate that the Social Media Addiction Scale measurement model has a good model fit. Indices such as RMSEA (0.031), SRMR (0.048), GFI (0.992), CFI (0.997), and TLI (0.997) are in the good fit category. Thus, the Social Media Addiction Scale developed from the BFAS is declared valid and reliable and suitable for use in measuring the level of social media addiction in early adolescents in Indonesia.*

KEYWORDS: *BFAS, CFA, Indonesia, Social Media Addiction, Measurement, Early Adolescents*

I. INTRODUCTION

The development of digital technology and the internet over the past decade has brought about significant changes in human communication and social interaction patterns. Social media has become one of the most influential digital innovations because it allows users to create, share, and exchange content quickly and widely [1]. The popularity of social media has increased dramatically worldwide, including in Southeast Asia[2]. UNICEF (2020) also emphasized that social media is now not only a communication tool but also a space for social interaction, entertainment, and self-expression across age groups.

Indonesia is one of the countries with the highest rates of social media usage in the region. By 2024, the number of social media users in Indonesia is estimated to reach 221.6 million people, or approximately 79.5% of the population, with daily usage duration exceeding three hours, exceeding the global average [2]. This figure demonstrates the high level of public dependence on digital platforms for communication, entertainment, and social activities.

This phenomenon is particularly prominent among adolescents, who, since the beginning of the exponential growth of social media, have adopted the cultural norm of being "always online" [3]. Adolescents extensively use social media to communicate with peers and family, seek information, and regulate emotions[4]. In Southeast Asia, individuals aged 16–24 spend up to 60% of their real-time time in the digital world, with online device usage reaching over 10 hours per day, or nearly three full days per week[5]. Generation Alpha, adolescents born after 2010, is even the group most familiar with digital technology from an early age[6].

While social media use does offer various positive impacts, such as opportunities for relationship building, identity exploration, emotional closeness, and self-image development [7][8]–[10], numerous studies have also highlighted its negative impacts. In addition to the risks of online aggression, cyberbullying[11], and other potential digital crimes, one of the most concerning issues is excessive social media use, or social media addiction. The term "addiction" is used because this behavior exhibits characteristics of psychological

dependence similar to addiction to other substances or behaviors[12], even impacting academic performance, social relationships, and daily functioning.

Kuss & Griffiths [13] define social media addiction as a subtype of internet addiction, falling under the category of behavioral addiction. Referring to Griffiths' addiction model, social media addiction is characterized by six main components: salience, mood modification, tolerance, withdrawal, conflict, and relapse[13], [14]. To measure this construct, the most widely used instrument is the Bergen Facebook Addiction Scale (BFAS) developed by Andreassen et al., as it is based on a robust theoretical model and has been widely adapted internationally.

However, psychological instruments developed in one cultural context cannot be directly applied to another without adaptation and validation. The BFAS was originally designed to measure Facebook addiction, not social media platforms as a whole. With the rapid development of digital platforms and changing adolescent usage patterns, an instrument that measures social media addiction more generally (general social media addiction) is needed. Therefore, the adaptation and validation of the social media addiction scale is crucial, especially in the Indonesian context, which has unique digital characteristics and adolescent behaviors.

Given the high intensity of social media use in Indonesia and the increasing risk of addiction in adolescents, this research is crucial. This study seeks to test the construct validity of the Social Media Addiction scale, adapted from the BFAS, through a Confirmatory Factor Analysis (CFA) approach. This step aims to ensure that the scale can be used accurately, reliably, and in accordance with the characteristics of Indonesian youth as one of the most active social media user groups.

II. METHODS

This study used a quantitative approach to test the construct validity of Social Media Addiction in early adolescents in Indonesia using Confirmatory Factor Analysis (CFA). This approach was chosen because it can test the fit between theoretical models and empirical data, especially when the instrument used is an adaptation of an original scale with a narrower scope. The study population was early adolescents aged 12 to 15 who are active social media users. This age group was selected because they are at a developmental stage highly influenced by the need for social acceptance and online activities. All participants were users of popular social media platforms such as WhatsApp, Instagram, Facebook, TikTok, Twitter, and YouTube, enabling them to provide relevant responses to the construct of social media addictive behavior.

The study sample was determined using a purposive sampling technique based on age characteristics and social media usage. The minimum sample size was calculated using the Lemeshow formula, which is commonly used to determine sample size when the population is known. This allows for more representative research results, taking into account time, cost, and effort efficiency[15]. The social media addiction measurement instrument used was the Bergen Social Media Addiction Scale (BSMAS), a development of the Bergen Facebook Addiction Scale (BFAS). The BFAS was originally designed to measure addiction on a single platform, Facebook. Therefore, when this instrument is used to measure social media addiction more broadly, a process of adaptation and retesting is required to ensure that the original factor structure remains accurate and relevant. In this study, a version of the BSMAS adapted into Indonesian through back-translation by Napitupulu & Rangkuti [16] used. This instrument consists of 18 items structured around the six components of addiction according to Kuss & Griffiths[17]: salience, mood modification, tolerance, withdrawal, conflict, and relapse. All items use a five-point Likert scale ranging from (1) Very Rarely to (5) Very Often, with higher total scores indicating higher levels of social media addiction.

Data were collected using an online questionnaire delivered to participants through a digital survey platform. Before completing the questionnaire, participants were given an explanation of the study's purpose and guaranteed data confidentiality. Given the participants' early adolescent age, consent was obtained along with consent from their parents or guardians. Data analysis was conducted using JASP software through Confirmatory Factor Analysis (CFA). This analysis aimed to test whether the six-factor model underlying the BFAS and BSMAS maintained its suitability when used to measure overall social media addiction in Indonesian adolescents. Several model fit indices were used, including Chi-Square/df, Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Standardized Root Mean Square Residual (SRMR). Furthermore, construct reliability was evaluated using Composite Reliability (CR) and Average Variance Extracted (AVE) to assess the internal consistency and convergent validity of each component.

The analysis process began with a data fit check, including multivariate normality and outlier detection. Next, the six-factor model was estimated to assess its fit with the empirical data. If necessary, model modifications were made based on Modification Indices (MI) and theoretical foundations. The results of the analysis then become the basis for determining whether the Indonesian version of BSMAS is suitable for use as a social media addiction measurement instrument that has a broader scope than a specific social media platform.

III. RESULT AND DISCUSSION

Result

The analysis begins with a presentation of the respondents' demographic characteristics in Table 1. This provides an overview of the adolescents included in the study (n = 277) and serves as a basis for interpreting the subsequent analyses.

Table 1. Demographic Data

Aspects	Characteristics	Frequency	Percentage
Gender	Male	82	70%
	Female	195	30%
Social Media	WhatsApp	270	97%
	Instagram	211	76%
	TikTok	247	89%
	YouTube	203	73%
	Facebook	52	19%
	Twitter	6	2%

Gender Characteristics. Based on demographic data, the respondents in this study consisted of 277 early adolescents, with a dominant proportion of female respondents (195 respondents) and 82 male respondents (30%). This predominance of female respondents indicates a higher participation of female adolescents in completing the questionnaire, which aligns with the tendency for female adolescents to be more active in using social media on various digital platforms.

Social Media Usage Characteristics. Based on social media platform usage, WhatsApp was the most widely used app by respondents, with 270 respondents (97%), followed by TikTok (247%) and Instagram (211%) and YouTube (203%). Meanwhile, Facebook (19%) and Twitter (2%) showed low usage rates among this age group. This pattern aligns with adolescents' preference for short video-based platforms and instant communication, which offer fast and expressive interaction. Overall, the demographic characteristics of the respondents indicate that the adolescents in this study have high levels of social media exposure and active use of various digital platforms. This strengthens the relevance of the research context regarding measuring social media addiction in early adolescents in Indonesia.

After describing the demographic characteristics of the respondents, the next step was to conduct a construct validity analysis using Confirmatory Factor Analysis (CFA). This analysis aims to ensure that the indicators on the Social Media Addiction Scale accurately represent the construct being measured. As part of the validity test, factor loadings were evaluated to determine the strength of each item's contribution to the latent factor it represents. The complete factor loading results are presented in Table 2 below.
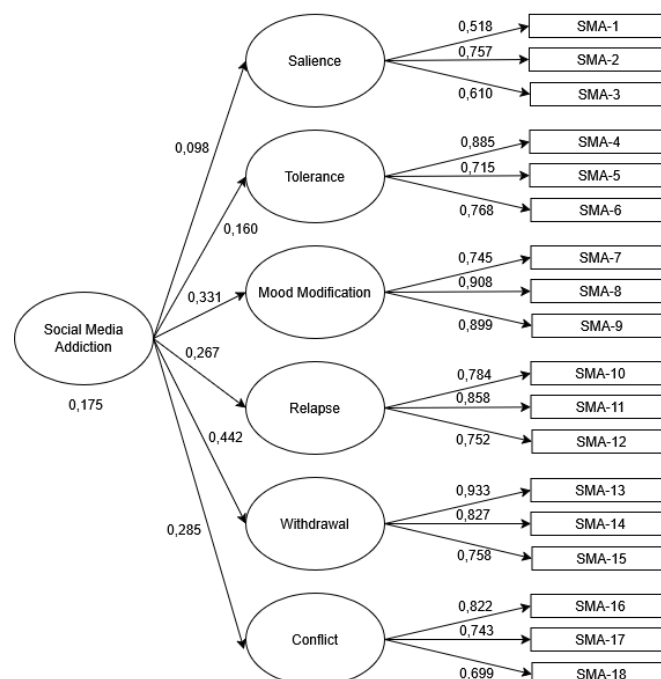
Figure 1. CFA Model Social Media Addiction Scale

Based on the results of the Confirmatory Factor Analysis (CFA), all indicators on the Social Media Addiction Scale demonstrated factor loading values that met the model's feasibility criteria. As shown in the table, loading values ranged from 0.518 to 0.908, indicating that all indicators strongly contributed to the latent constructs they measured. Furthermore, all indicators demonstrated high z-values and p-values <0.001, confirming that the relationship between the indicator and each factor was statistically significant. This strengthens the convergent validity of each dimension, as the indicators consistently reflected the constructs they represented.

The 95% Confidence Interval (CI) for each item was relatively narrow, all positive, and none approached 0. This indicates that the loading estimates were stable and had a good level of precision. Overall,

Model Fit Test	Value	Benchmark Value of Model Similarity	Model Similarity to Data	Description
X^2	0.023	> 0.05	Below standard	*Poor fit*
SRMR	0.048	≤ 0.8	Meets standard	*Good fit*
RMSEA	0.031	< 0.5 to 0.08	Meets standard	*Acceptable Fit*
GFI	0.992	≥ 0.95	Meets standard	*Good fit*
CFI	0.997	≥ 0.95	Meets standard	*Good fit*
TLI	0.997	≥ 0.95	Meets standard	Good fit

Description: RMSEA=Root Mean Square Error of Approximation; GFI=Goodness of Fit Indeks; CFI=Comparative Fit Index;

these results indicate that the six factors, Salience, Tolerance, Mood Modification, Relapse, Withdrawal, and Conflict have reliable indicators and support the established measurement model structure. Therefore, this Factor Loadings table confirms that the Social Media Addiction Scale measurement model has strong construct validity and is suitable for further analysis.

The next step is to test the instrument's reliability to determine the internal consistency of the items on the Social Media Addiction Scale. Reliability testing is necessary to ensure that all indicators function stably and produce consistent measurements. The results of the reliability test can be seen in Table 3 below.

Table 3. Frequentist Scale Reliability Statistics

Estimate	Cronbach's α
Point estimate	0.894

Table 3 shows the results of the reliability test of the Social Media Addiction Scale using the Cronbach's Alpha method. The Cronbach's Alpha value obtained was 0.894, which is well above the minimum acceptable threshold of 0.70. This indicates that the scale has excellent internal consistency. Therefore, this instrument is suitable for further analysis in the validity and model fit testing stages. Furthermore, the results of the pilot testing of the 18 items on this scale showed that all items had a discrimination index above 0.30. Therefore, each item on this scale is able to differentiate well between individuals with high and low levels of social media addiction. These results indicate that all items meet good psychometric requirements, making the Social Media Addiction Scale suitable for use in research to measure the level of social media addiction in individuals.

In this study, a model fit test was conducted to verify whether the applied model fits the data obtained. The purpose of the model fit test is to assess the extent to which the developed model accurately reflects the empirical data. Table 4 explains the suitability between the model used and the data that has been collected. The results of the CFA analysis are shown in table 4. Byrne [18].

TLI=Tucker-Lewis Index; SRMR= Standardized Root Mean Squared Residual

Based on the results of the Confirmatory Factor Analysis (CFA) using JASP software, several indicators of model goodness of fit were obtained, referring to Byrne's [18] criteria. In general, the results indicate that the Social Media Addiction Scale measurement model has a good fit to the research data. First, the Chi-Square (X^2) value of 0.023 indicates that the model does not meet the p-value ≥ 0.05 criterion, and is therefore considered a poor fit. However, the Chi-Square index is known to be sensitive to sample size, so the assessment of model goodness of fit should not be based solely on this indicator.

The SRMR index of 0.048 meets the ≤ 0.08 criterion, indicating good model fit. Similarly, the RMSEA value of 0.031 is in the very good range (<0.05), indicating a low level of model approximation error, thus the model is considered an acceptable fit. Furthermore, the other three fit indices, GFI (0.992), CFI (0.997), and TLI (0.997), all exceeded the minimum threshold of 0.95, indicating a very good fit for the empirical data. These three indicators indicate that the model's factor structure optimally explains the data.

Overall, although the Chi-Square indicator fell short of the criteria, all other incremental fit and absolute fit indicators demonstrated excellent results. Therefore, the measurement model can be concluded as a good fit and suitable for the measurement of Social Media Addiction in the early adolescent population in Indonesia.

Discussion

The results of this study indicate that the Social Media Addiction Scale, adapted from the Bergen Facebook Addiction Scale (BFAS), has good psychometric qualities when used with young adolescents in Indonesia. The validity and reliability obtained support the scale's ability to consistently and accurately measure the construct of social media addiction in the Indonesian cultural context.

First, the results of the construct validity test using factor loading analysis showed that all items had values above 0.30, indicating that each indicator adequately represented the dimensions of social media addiction. This finding aligns with research by Andreassen et al. [19] and Monacis et al. (2017), which stated that the six components of addiction (salience, mood modification, tolerance, withdrawal, conflict, relapse) constitute a stable structure and can be replicated across cultural contexts. The ability of each item to contribute significantly reinforces the relatively universal construct of social media addiction, although social media usage behavior can vary across cultures.

Furthermore, the reliability test yielded a Cronbach's Alpha value of 0.894, which is considered excellent. This indicates strong internal consistency between items on the scale. These results are consistent with Napitupulu & Rangkuti [16] findings, which reported high reliability values for the initial adapted version of this scale. They also support previous studies that the BFAS and its derivatives have stable reliability across various populations[13], [19]. High reliability indicates that this scale is capable of stably measuring social media addiction in early adolescents.

In the model fit test, most fit indicators, such as RMSEA, SRMR, CFI, TLI, and GFI, showed good fit. This indicates that the theoretical model underlying this scale is consistent with the empirical data obtained, thus making the proposed factor structure acceptable. Although the Chi-square value did not meet the criteria, this is acceptable considering that Chi-square is highly sensitive to sample size, as noted by Byrne [18]. Overall, other fit indicators strongly indicate that the measurement model of this scale is stable across the Indonesian adolescent population.

These findings have important implications. In the Indonesian context, where adolescents are the most active social media users, the need for an accurate and culturally appropriate instrument is crucial. This scale can serve as a relevant measurement tool for research in developmental psychology, adolescent mental health, and studies on the impact of digital behavior. Furthermore, the scale's validity helps strengthen the literature on social media addiction in adolescents, particularly in developing countries, where research on digital addiction is still limited.

From a theoretical perspective, this study reaffirms Griffiths' (2005) six-component addiction model as a robust framework for understanding addictive behavior on social media. The consistency of the findings suggests that despite the constant change in digital platforms, the psychological mechanisms of addiction remain explainable through the basic principles of behavioral addiction.

Overall, the results of this study indicate that the 18-item version of the Social Media Addiction Scale is a valid, reliable, and appropriate instrument for use in the early adolescent population in Indonesia.

IV. CONCLUSION

This study aimed to test the validity and reliability of the Social Media Addiction Scale, adapted from the Bergen Facebook Addiction Scale (BFAS), in early adolescents in Indonesia. The analysis showed that all items on the scale had adequate factor loadings (≥ 0.30), thus validly representing the construct of social media addiction. The reliability test yielded a Cronbach's Alpha value of 0.894, indicating excellent internal

consistency. Furthermore, the goodness of fit results from the CFA analysis using JASP indicated that the measurement model used fit the empirical data.

Overall, this study concludes that the 18-item version of the Social Media Addiction Scale is a valid and reliable instrument for measuring social media addiction in early adolescents in Indonesia. This scale can be used in academic research and psychological assessments requiring measurement of addictive behaviors related to social media.

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