

ANALYZING CYBER-AGGRESSION TYPOLOGIES OF INDONESIAN ADOLESCENTS USING SECOND-ORDER CONFIRMATORY FACTOR ANALYSIS

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Abstract: *This study analyzed the most dominant dimension and significant indicator explaining the typology of cyber-aggression behavior among Indonesian adolescents using the second-order confirmation factor analysis (CFA) approach. The sample included 1354 senior high school adolescents, aged 18–21 years, who were recruited using the stratified random sampling method. Data were collected using a self-reporting approach. The results of the second-order CFA showed that the Controlled-Aversive latent variable, Controlled-Appetitive, Impulsive-Appetitive, and Impulsive-Aversive had loading factor indexes of 0.96, 0.85, 0.79, and 0.63, respectively. Thus, the Controlled-Aversive typology of cyber-aggression behavior was the most dominant among Indonesian adolescents. This proactive cyber-aggression behavior is manifested in the hostile behavior of planning proactively for revenge or responding in anger due to the provocation of social interaction stimuli in cyberspace.*

Keywords: *cyber-aggression, adolescents, confirmatory factor analysis, indonesian, high school student*

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INTRODUCTION

In recent years, several studies on cyber-aggression (both as perpetrators and victims) among adolescents, particularly High School students, have been conducted. This is because adolescents in this age group serve as an ideal population in analyzing violent actions (and the victims of violence) perpetrated through the internet, which they extensively use daily. These patterns are supported by steep development of ICT (Roshchuk et al., 2022) with appropriate advantages and disadvantages, including cybercrimes (Kuzior et al., 2024; Yarovenko et al., 2023). According to Ortega-Ruiz and Gómez-Ortiz (2017), aggressive or deviant behaviors are often noticed during adolescence because it is associated with this specific developmental stage. Furthermore, individuals in this age group mostly spends their time accessing, interacting, and searching for information on social media (Tomczyk & Szotkowski, 2023). Studies on cyber-aggression revealed that many of these behaviors affect adolescents as both perpetrators and victims—a condition that has been associated with their behavior as intensive and massive technology users (Wachs et al., 2022). Furthermore, this developmental stage has often been associated with aggressive behavior, such as hate speech (Bedrosova et al., 2022). Cyber-aggression exists due to different values and perspectives among individuals and groups in cyberspace, which can lead to psychological instability (Mardianto et al., 2020, 2021, 2023).

In accordance with the cyber-aggression typology developed by Runions et al. (2016), several studies on cyber-attacks by adolescents, specifically in Indonesia, have been conducted. However, to date, no specific explanations of the frequencies of certain types have been presented. Therefore, this current study was conducted with the goal of describing and explaining the patterns and characteristics of cyber-aggression committed by adolescents in Indonesia. Subsequently, policymakers and educational institutions can apply the results of this study to provide more targeted interventions in controlling and preventing cyber-aggressive behaviors among Indonesian youth (Chamizo-Nieto et al., 2020).

Runions et al. (2016) employed the cyber-aggression concept that was developed based on the relationship between personality disorder and violence. On the basis of individual motives and self-control, Howard (2015) distinguished violent behaviors into four typological sections (2×2), consisting of intersection (impulsive vs. control) and influence (positive vs. negative). These four different types of violence are characterized by the motive of obtaining pleasure/excitement and desire/greed, which are related to positive influence and revenge, respectively. Furthermore, Howard (2015) proposed a theory called the quadripartite model of aggression (QMA) to understand aggression from two different psychological perspectives. The QMA argues that the two psychological motivations that contribute to an individual's aggression include regulatory control (RC; impulsive vs. controlled) and motivational goal (MG; appetitive vs. aversive). In particular, RC refers to how individuals perceive aggression based on their cognitive function. As part of RC, "impulsivity" is defined as an unconscious act of aggression in response to a specific emotional object, while a controlled attack refers to a deliberate action. While RC focuses on intentional actions, MG concentrates on the emotional condition representing aggression.

Moreover, aggression can be classified into two subtypes: hot-blooded/reactive and cold-blooded/proactive. These two varieties of aggression can be extremely harmful to victims depending on their motivation. The "hot-blooded type" refers to a spontaneous violent response to provocation, while the "cold-blooded type" is associated with antisocial conduct and

involves the use of purposeful or malicious acts to accomplish a goal. In accordance with frustration–anger theory, reactive aggression can be described as “hot-blooded” impulsive violence characterized by negative emotional valences, such as rage, embarrassment, humiliation, and shame (Kruglanski et al., 2023).

On the basis of the abovementioned classification and characteristics of aggressive behaviors, Runions et al. (2016) divided cyber-aggression into four typologies to better explain the reasons people attack in cyberspace. The first typology is “Impulsive-Aversive,” which refers to a reactive and spontaneous cyber-aggressive response to a perceived provocation. In this scenario, the individual feels embarrassed or provoked by heated emotions (with an indication of cyber behavior in the form of online words/behaviors) to attack other individuals considered as “enemies.” This type of cyber-aggressive behavior is often manifested in online expressions of words/behaviors that are full of hostility, thereby creating a heated atmosphere. This behavior also involves the use of harsh words to attack others as a form of spontaneous reaction to a perceived provocation that makes individuals feel embarrassed or provoked (Rivas-Rivero & Bonilla-Algovia, 2022).

The second type is “Controlled-Aversive,” which comes in the form of proactive cyber-aggressive behavior. In this typology, online statements/behaviors manifest as hostile actions that are planned proactively for revenge or to threaten someone as a result of anger (Rivas-Rivero & Bonilla-Algovia, 2022).

Furthermore, the third type is “Controlled-Appetitive,” which is a form of proactive cyber-aggression aimed to insult, ridicule, and criticize others. This typology constitutes planned enjoyment to do something to achieve a positive impression, such as feeling happy or satisfied, as a psychological reward. Online behaviors that aim to embarrass, intimidate, and attack someone as a form of planned fun to gain social attention belong to this category (Rivas-Rivero & Bonilla-Algovia, 2022).

The fourth is “Impulsive-Appetitive,” which is a reactive cyber-aggressive behavior that includes embarrassing online statements. This type involves a spontaneous attack of individuals based on the mere impulse to have fun (Rivas-Rivero & Bonilla-Algovia, 2022).

METHODS

This study employed a quantitative approach using second-order Confirmatory Factor Analysis (CFA) to validate the typology of cyber-aggression in Indonesian adolescents. The goal was to test whether the theoretical four-factor model fits the empirical data collected from a representative adolescent population.

Data Collection Procedures

In this study, data were collected using the web-based self-report personality scale technique. The objective of this self-report approach is to ascertain the psychometric properties of a single measure, such as the frequency of item validation, scale reliability, score distribution, and factor structure. The total sample comprised 1354 adolescents, aged 18–21 years, all studying high school in Indonesia. The participants consisted of 972 females (71.8%) and 328 males (28.2%). The domicile consists of 12 metropolises (6%), 98 cities (49%), and 91 towns (45%).

The technique used to recruit the participants was purposive sampling—a method of selecting subjects based on the criteria established for the study.

Measurement

The cyber-aggression scale consisted of 50 items divided into favorable and unfavorable patterns and were scored using a Likert-type scale with response choices ranging from 1 to 4. According to Souza et al. (2017), instrument testing is required before performing data analysis using validity and reliability tests. In this study, the measurement was conducted using the developed adolescents' Cyber-Aggression Scale.

Data Analysis

This research aimed to analyze the types and characteristics of cyber-aggressive behavior of Indonesian adolescents. second-order confirmatory factor analyses (CFA) were conducted. This measurement model in structural equation model (SEM) consists of two levels, which show the relationship between latent variables at the first level as indicators of a second level latent variable (Limkhunthammo et al., 2023). In this study, second-order CFA analysis was used to obtain the dominant indicators in compiling the latent variable, namely, Indonesian adolescent cyber-aggression.

Reliability

The statistical summary for a person's reliability score having 0.84 CASIA shows that each instrument has sufficient quality answers given by the person. Meanwhile, the reliability value on the CASIA instrument = 0.99 means that the item quality is very good for the given measurement conditions. The Cronbach's alpha value (KR-20) on the CASIA instrument = 0.94 indicated that the interaction between person and item is sufficient (Kyriazos & Stalikas, 2018).

Construct Validity

Construct validity describes how well the measurement follows theoretical expectations (Boone et al., 2014). The residual principal component analysis (PCA) is typically used to determine the extent to which the diversity of instruments can be measured. The two parameters considered in the PCA analysis are the total raw variance in observation (at least 20%), and the total raw unexplained variance (minimum 15%) (Linacre, 2011; Sumintono & Widhiarso, 2015). Further information is presented in Table 3.

RESULTS

CFA aims to test whether the data match the hypothesized model. The CFA is a model that connects latent variables with their indicators (Furr, 2014). Based on the analytical performance, CFA focuses on two questions: (1) Are the indicators conceptualized in a unidimensional, precise, and consistent manner? And (2) Which dominant indicator forms the study construct? Apart from this, the CFA is divided into two: first-order and second-order CFA. The difference between these two types is that the latent variables in second-order CFA

are not directly measured through assessment indicators but through other latent variables (Hair et al., 2019).

Specifically, the second-order CFA analysis was used in the current study to obtain the dominant indicator when compiling the latent variable of Indonesian adolescents' cyber-aggression. This model was analyzed with several trials and combinations of all possible indicators. Therefore, optimum results, which were considered valid and reliable, were obtained based on the indicators satisfying the suitability criteria. In accordance with the CFA objective of determining a fit latent variable, a measurement model was evaluated using the goodness-of-fit criterion. The second-order CFA modeling results on Indonesian adolescents' cyber-aggression are shown in Figure 1.

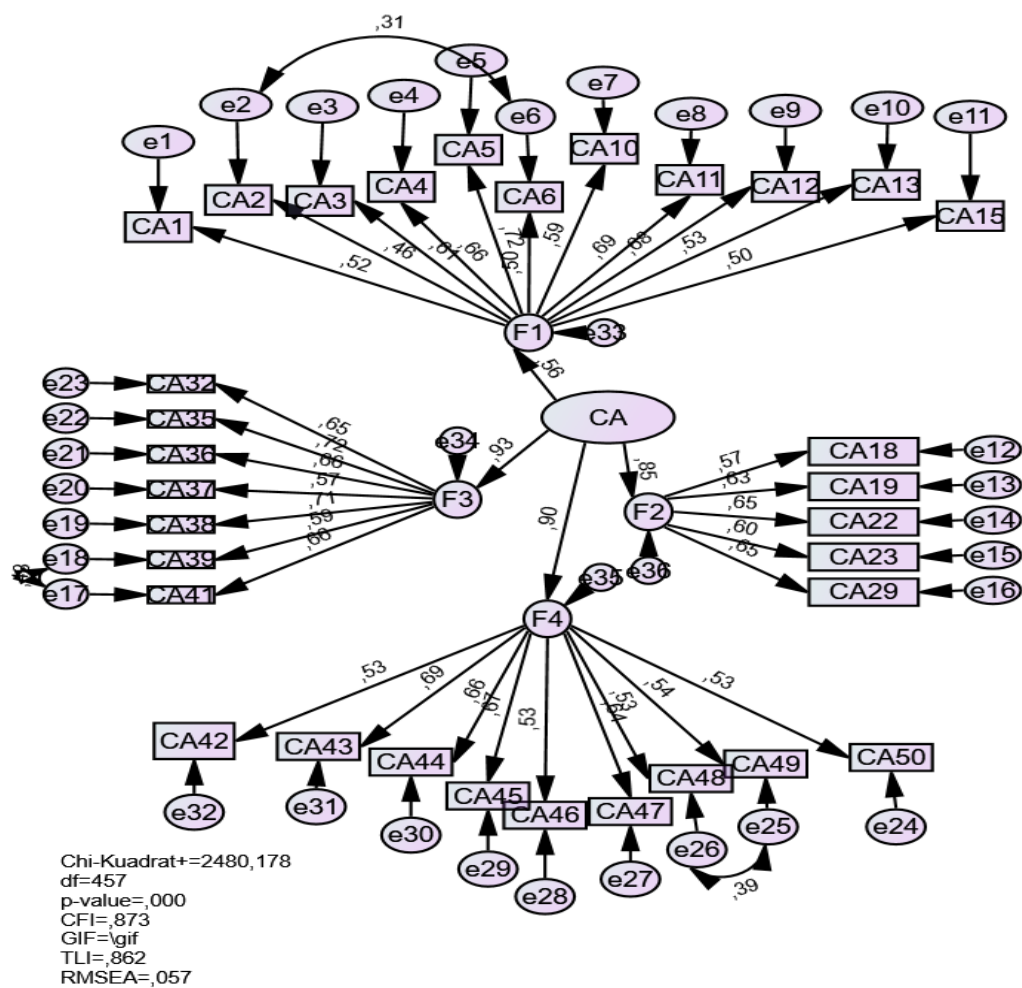


Figure 1. CFA test results of the cyber-aggression scale before the goodness-of-fit-model

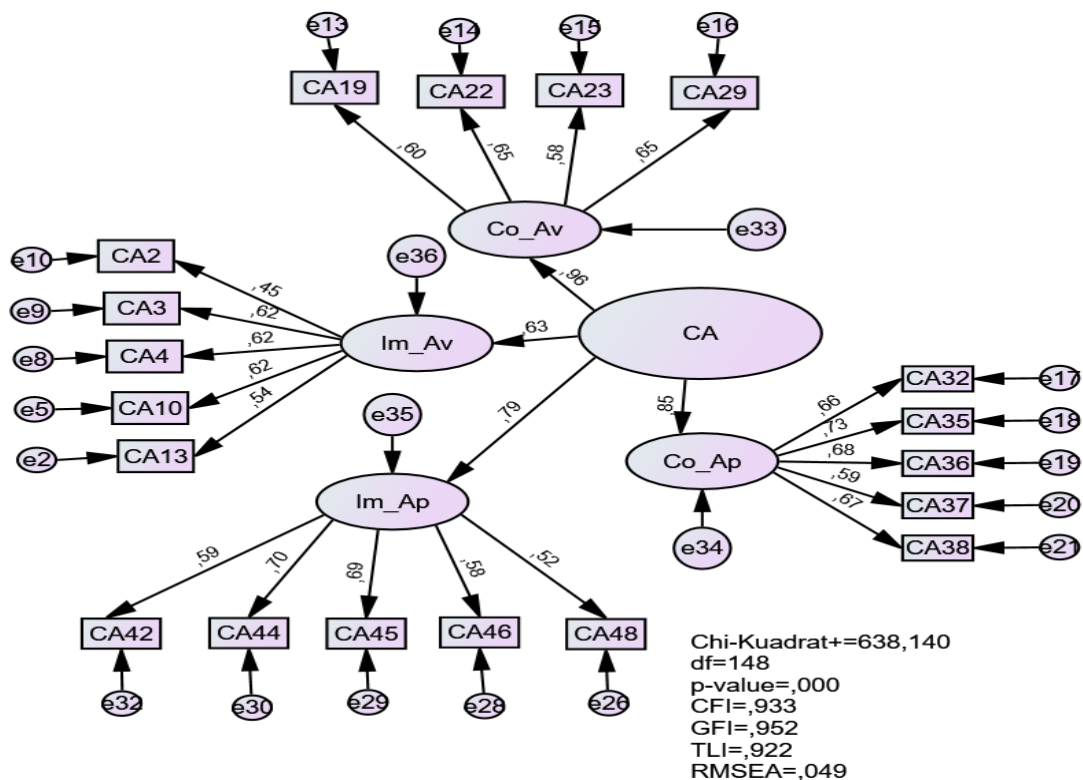
The test results in Figure 1 reveals that the model is infeasible and hypothetically unacceptable because it does not meet several standards of conformity index or absolute fit size, as well as the rule of thumb in the SEM analysis.

Table 1. Model suitability test results

Index	Goodness-of-Fit	Criteria	Description
Chi-Square	2480, 178 (p-value = 0.000)	p-value > alpha 5%	Not feasible
CMIN/DF	5.427	≤ 2.00	Not feasible
CFI	0.873	≥ 0.92	Not feasible
TLI	0.862	≥ 0.92	Not feasible
RMSEA	0.057	≤ 0.08	Feasible
GFI	0.888	≥ 0.90	Not feasible
AGFI	0.870	≥ 0.90	Not feasible

To obtain perfect goodness-of-fit results, the AMOS 26 application provides output properties for model modification analysis by displaying the symmetrical relationship between 1) one variable and another, 2) variables and errors, and between 3) one error variable and another. It is important to note that this aforementioned process is in line with the modification index guideline (Hair et al., 2014; Haryono, 2017).

Furthermore, the Cyber-Aggression Scale consists of four factors related to the cyber-aggressive behavior types: 1) Impulsive-Aversive (Im_Av), 2) Controlled-Aversive (Co_Av), 3) Controlled-Appetitive (Co_Ap), and 4) Impulsive-Appetitive (Im_Ap). The number of items utilized based on the reliability and discriminating power test result was 50. After performing the CFA, there were still 19 feasible and reliable items for measuring the adolescents' cyber-aggression, as shown in the following chart.

**Figure 2.** CFA test results of the cyber-aggression scale after the goodness-of-fit model

The items with a loading factor above 0.45 and had no cross-loading with other items were selected based on the CFA shown in Figure 3. The goodness-of-fit parameters, including AGFI, GFI, TLI, CFI, and RMSEA, showed that all indicators met the fit criteria, except for the chi-square indicator. Therefore, it can be concluded that the cyber-aggression construct measurement model corresponded to the empirical conditions. The number of initial items planned was 50, of which 19 met the load factor criteria above 0.45, representing four cyber-aggression factors. In this model, the Impulsive-Aversive factor (Im_Av) is represented by items CA2, CA3, CA4, CA10, and CA13; Controlled-Aversive (Co_Av) is indicated by CA19, CA22, and CA29; Controlled-Aversive (Co_Ap) is denoted by CA32, CA35, CA36, CA, 37, and CA 38; while the Impulsive-Appetitive (Im_Ap) is characterized by CA42, CA44, CA45, CA46, and CA48.

Table 2. Standardized factor loadings based on the CFA of CASIA (N=1354)

No	Item	(Im_Av)	(Co_Av)	(Co_Ap)	(Im_Ap)
CA2	It's easy to get angry when I get posts that insult my tribe and culture, and I strike back.	0,45			
CA3	When someone sends me a hurtful message, I reply right away.	0,62			
CA4	Quickly reply loudly to someone's post that offended me.	0,62			
CA10	Immediately react to an attack when I see an online order that makes me angry.	0,62			
CA13	When someone posts something that hurts me, I immediately reply to a post that attacks them.	0,54			
CA19	Making posts that embarrass someone who has been making fun of me on the internet.		0,60		
CA22	Expressing anger by writing insults to a certain person or group who has hurt my feelings or humiliated me.		0,65		
CA23	Sending insults that heat up people or groups that I consider enemies on social media.		0,58		
CA29	Insinuating with the ridicule of people who are pretentious on social media.		0,65		
CA32	Making posts that embarrass someone who isn't liked so that others won't like them either.			0,66	
CA35	Share posts to embarrass people you don't like.			0,73	
CA36	Using fake accounts on the internet to ruin someone's relationship.			0,68	
CA37	Make a post that satirizes someone so that he/she looks like a fool.			0,59	
CA38	Share posts that poke fun at certain ethnicities for fun with friends.			0,67	
CA42	Made a post as a joke, but other people get offended.				0,59
CA44	Joking on social media by not caring if someone's feelings are hurt.				0,70

No	Item	(Im_Av)	(Co_Av)	(Co_Ap)	(Im_Ap)
CA45	Sending posts that annoy people online because I think it's funny.				0,69
CA46	Joking on social media is so much fun that I don't worry about whether someone might be bothered by what I say.				0,58
CA48	Writing harassing words on social media groups just for fun.				0,52

Several suitable indicators were used to determine the model fit size, including 1) the chi-square and df values; 2) the absolute fit index, such as GFI, RMSEA, or SRMR; 3) the incremental fit index, namely, CFI or TLI; 4) the goodness-of-fit index (GFI), consisting of GFI, CFI, or TL; and 5) the bad match index, which involves RMSEA or SRMR. For the absolute fit index indicator, namely, the GFI, the range of values is 0–1. When the value is high, the match tends to be better.

The results of testing the second model, shown in Figure 2, shows that the standard criteria for conformity index or absolute fit size and rule of thumb are not significantly different from the first model in Figure 1. The details can be seen in Table 3.

Table 3. Model fit test results after the goodness-of-fit model

Index	Goodness-of-Fit	Criteria	Description
Chi-Square	638,140 (p-value = 0.000)	p-value > alpha 5%	Not feasible
CMIN/DF	4,312	≤ 2.00	Not feasible
CFI	0.933	≥ 0.92	Feasible
TLI	0.922	≥ 0.92	Feasible
RMSEA	0.049	≤ 0.08	Feasible
GFI	0.952	≥ 0.90	Feasible
AGFI	0.938	≥ 0.90	Feasible

DISCUSSION

The population of this study included high school students in Indonesia. Based on the results of the descriptive analysis, the majority of respondents came from Java and Sumatra, of whom 31.2% were of Minang ethnicity, 49.0% of Javanese ethnicity, and the rest consisting of members of other ethnic groups in Indonesia. Even though there was a representation of student respondents from outside the islands of Java and Sumatra in this study, the number of respondents who came from outside the regions of the two islands remained small, especially for the eastern part of Indonesia. As such, the generalization power of this study may be somewhat limited, but the good news is that theoretically the characteristics of adolescent development and the characteristics of communication behaviors in networks or cyberspaces do not have a very significant differential range (Nilan et al., 2015).

The abovementioned result simultaneously answered the main hypothesis of this study on the typology of cyber-aggression among Indonesian adolescents. The findings indicate that the model developed and tested under empirical conditions in the field is consistent with the theoretical elements of the typology and characteristics of individual cyber-aggression

compiled within the framework. This suggests that the main hypothesis in this study is accepted as the model can explain the factors that shape the typology of cyber-aggression among Indonesian adolescents. The structural equation analysis also proved that the model met the goodness-of-fit according to the following index criteria: CMIN/DF, GFI, AGFI, TLI, CFI, and RMSEA.

The model analysis showed that the latent variable for the Impulsive-Aversive obtained a loading factor index of 0.63. Furthermore, the Impulsive-Appetitive, Controlled-Aversive, and Controlled-Appetitive are 0.7, 0.96, and 0.85, respectively. It was discovered that the dominant type of cyber-aggressive behavior among adolescents is the Controlled-Aversive. This behavior is a proactive cyber-aggression in the form of hostile behavior, planned proactively for revenge or as a response to anger due to the provocation of social interaction stimuli in virtual space.

These results support the findings of previous studies, which indicate that aggressive behaviors, such as hate speech, occur on social media because individuals feel unfairly treated, morally and materially offended, and abused or bullied (Yusuf et al., 2021). Consequently, such scenarios drive individuals to express extreme hate and anger toward anyone considered an enemy through speeches and posts on social media (Jaishankar, 2008; Titley et al., 2012; Burnap & Williams, 2016; Jablonska & Polkowski, 2018).

Other factors that describe hateful behaviors according to Levin and McDevitt (Walters et al., 2016) are the different typologies of hate crimes, such as seeking sensation, self-defense, and revenge. These factors are part of the mission of certain ideological groups to terrorize other individuals or groups. As explained by McDevitt et al. (Walters et al., 2016), 66% of hate speech actors seek sensation, and perpetrators usually act in groups with one or two leaders. Levin and McDevitt also stated that 25% of perpetrators are classified as “defensive” and are mostly motivated by a perceived threat to their territory (Walters et al., 2016).

The presence or existence of outside groups is perceived as a threat by individuals, giving birth to negative emotions that, in turn, lead to hate speech and other cyber-aggressive behaviors. Other studies also explained the effects of intergroup threats on human thoughts, brains, and behaviors and showed that intergroup threats also have an impact on online visual processing, from the initial coding of the stimulus to further attention modulation. This means that intergroup threats are one of the catalysts that transform individuals from passive disregard for outside groups into active hostility (Maxwell, 2016; Chang et al., 2016).

Neuroscience theory explains that aggressiveness involves interactions between two brain circuits known as biobehavioral systems: negative valence systems (NVS) and cognitive systems (CS). According to this theory, the response to threats and information processing systems in such a way gives rise to aggression, especially in emotional states. This is because brain circuits that are activated by acute threats (in NVS) favor emotionally aggressive behaviors, which means that brain circuits that are often triggered by feelings of threat disrupt high-level cognitive processes and can trigger aggression (Verona & Bozzay, 2017). Furthermore, in the theory of threat or integrated threat, the threat perception is grouped into three types, namely, personal threat, intergroup threat, and no threat. A personal threat is a threat directed at oneself, such as individuals who receive negative criticism at school or work so they feel that their personal identities are being attacked, labeled, and/or categorized as being threatened minus the self-resources they possess (Redmond & Alderton, 2016).

CONCLUSION

The phenomenon of cyber-aggression in Indonesia is currently a serious and worrying problem, particularly when it involves adolescents. This is because cyber-aggression can have negative legal and psychological consequences on those involved. The findings of this study can be used as a basis for developing targeted interventions to effectively prevent and reduce such behaviors.

The results of the second-order CFA showed that the Controlled-Aversive latent variable of cyber-aggression has a loading factor index of 0.96. In addition, the Controlled-Appetitive, Impulsive-Appetitive, and Impulsive-Aversive have indexes 0.85, 0.75, and 0.63, respectively. Thus, it can be concluded that the dominant typology of cyber-aggressive behavior among Indonesian adolescents is Controlled-Aversive. As defined earlier, this is a proactive cyber-aggression in the form of proactively planned hostile behaviors for revenge or as a response to anger caused by provoked stimulation of social interactions in cyberspace.

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Appendix

Cyber Aggression Scale for the Indonesian Adolescent (CASIA)

No.	Statement of scale	1.	2.	3.	4.
		= Never	= Sometimes	= Often	= Always
1	When someone attacks me on social media, I immediately respond with the same behavior	1	2	3	4
2	It's easy to get angry when I get posts that insult my tribe and culture and I strike back	1	2	3	4
3	When someone sends me a hurtful message I reply right away	1	2	3	4
4	Quickly reply loudly to someone's post that offended me.	1	2	3	4
5	Easy to get emotional and reply right away when someone makes fun of me on the internet	1	2	3	4
6	Hit back hard when someone says something bad about my religion on social media	1	2	3	4
7	Commenting on someone's link/status scathingly causes the emotional atmosphere between us to heat up	1	2	3	4
8	Engage in debates that lead to disagreements with others on social media	1	2	3	4
9	Commenting on someone's post cynically causes the emotional atmosphere to heat up	1	2	3	4
10	Immediately react to attack when I see an online order that makes me angry	1	2	3	4
11	Immediately reply with even louder insults when someone bullies and attacks me on social media	1	2	3	4
12	When someone posts something that hurts me, I immediately post a reply that attacks them	1	2	3	4
13	When someone posts something that hurts me, I immediately reply to a post that attacks them	1	2	3	4
14	Sending posts that contain insults to someone on social media because they don't like their behavior	1	2	3	4
15	Respond very quickly to messages or posts that are rude to me	1	2	3	4
16	Writing swear words to unscrupulous officials on social media	1	2	3	4
17	Sending direct threats against someone who has hurt and demeaned me.	1	2	3	4
18	Writing posts to avenge the hurt on people who have been hostile to me	1	2	3	4
19	Making posts that embarrass someone who has been making fun of me on the internet	1	2	3	4
20	Using social media accounts to plot revenge when someone upsets me	1	2	3	4
21	Write comments on social media in abusive language towards other people who don't like	1	2	3	4
22	Expressing anger by writing insults to a certain person or group who has hurt my feelings or humiliated me	1	2	3	4
23	Sending insults that heat up people or groups that I consider enemies on social media	1	2	3	4
24	Various provocative images for disturbing purposes	1	2	3	4
25	I send threatening messages to enemies or people who are hostile to me via social media	1	2	3	4
26	Creating fake accounts on social media to threaten or scare someone who has hurt me	1	2	3	4
27	Thinking that it is very easy to threaten someone you don't like through social media nowadays because you can directly chat with that person	1	2	3	4
28	Share posts about celebrities you don't like so others don't like them too	1	2	3	4
29	Insinuating with the ridicule of people who are pretentious on social media	1	2	3	4
30	Sharing rumors about other people's religions on social media	1	2	3	4
31	Sharing posts that make fun of other people's religion on social media in return for insulting my religion	1	2	3	4
32	Making posts that embarrass someone who isn't liked so that others don't like them either	1	2	3	4
33	Making embarrassing posts about someone you don't like so that other people don't like it too	1	2	3	4
34	Share funny posts that make fun of someone so others laugh	1	2	3	4
35	Share posts to embarrass people you don't like	1	2	3	4
36	Using fake accounts on the internet to ruin someone's relationship	1	2	3	4
37	Make a post that satirizes someone so that it looks like a fool	1	2	3	4
38	Share posts that poke fun at certain ethnicities for fun with friends	1	2	3	4
39	Sharing funny picture posts that make fun of certain political figures as a joke	1	2	3	4
40	Making posts that satirize or embarrass someone to make them realize and change from their wrong behavior	1	2	3	4
41	Sharing posts that make fun of officials/officials on social media for jokes	1	2	3	4
42	Made a post as a joke but other people get offended	1	2	3	4

No.	Statement of scale	1. = Never 2. = Sometimes 3. = Often 4. = Always			
		1	2	3	4
43	Make fun of unknown people on social media without thinking whether they will see it or not	1	2	3	4
44	Joking on social media, by not caring if someone's feelings are hurt	1	2	3	4
45	Sending posts that annoy people online because I think it's funny	1	2	3	4
46	Joking on social media is so much fun that I don't worry about whether someone might be bothered by what I say	1	2	3	4
47	Sharing satire writings that make fun of certain tribes and ethnicities on social media for jokes	1	2	3	4
48	Writing harassing words on social media groups just for fun	1	2	3	4
49	Insulting friends in social media groups for jokes	1	2	3	4
50	Share memes that insult political figures in social media groups to keep other members of the group entertained	1	2	3	4