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Rasch-Based DIF Analysis of Self-Harm Behaviors: Gender, Ethnicity, and Age Factors in an Indonesian Context

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Original Article

Rasch-Based DIF Analysis of Self-Harm Behaviors: Gender, Ethnicity, and Age Factors in an Indonesian Context

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Abstract. This study was conducted because self-harm behavior in adolescents has become a serious problem that requires in-depth attention, especially in Indonesia, where this phenomenon continues to increase. Factors such as gender, ethnicity, and age are believed to play an important role in influencing self-harm behavior, but comprehensive empirical studies on the interaction of these three factors are still limited. The objectives of this study were to identify differences in self-harm behavior based on gender, ethnicity, age, and investigate the interaction between these three factors. The research method used a quantitative design with a survey approach. The sample consisted of 812 adolescents who were randomly selected from various regions in Indonesia, and data were collected through questionnaires measuring the level of self-harm behavior and demographic factors. Data were analyzed using ANOVA in the Rasch model. The results showed that females have higher rates of self-harm than males. Bugis (B) and Flores (F) cultures show higher self-harm scores compared to other age groups. In addition, the 15-17 age group shows higher self-harm scores compared to other age groups. The conclusion of this study is that there are significant differences in self-harm behavior in adolescents based on gender, ethnicity, and age

Keywords: Self-Harm; Gender; Ethnicity; Age; Rasch Model

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Introduction

Self-harm behavior among adolescents represents a complex psychological phenomenon that reflects difficulties in emotional regulation and coping with environmental stressors, particularly within high-pressure social and educational contexts. Self-harm was common in China (27.6%), and some types were as common as 32.0% (Han et al., 2018). It was common among teens and young adults aged 12 to 21 around the world (3.1 to 15.5%) (Morey et al., 2017; Quigley et al., 2017). The competitive nature of the education system, which is predominantly interpreted as academic-related stress, may be the cause of the increased prevalence of self-harm (Lim et al., 2019). Certain studies on suicide also ascribed the high suicide prevalence in Asian American groups to the heavy academic burden (Leung & Lai, 2023; Polanco-Roman et al., 2024). The circumstance of suicide is frequently described using the 'iceberg model', which is also used to describe self-harm, as it is recognized as a 'hidden

behaviour'. A hospital presentation was the outcome of less than 13% of self-harm episodes (Junker et al., 2017). The majority of participants in a cohort study, 55.8%, did not seek mental health services after engaging in self-harm.

The prevalence of self-harm and suicidal tendencies is very high among adolescents. Numerous terminologies were implemented in prior investigations regarding self-harm. This article defines "self-harm" as intentional self-injurious behaviours, regardless of the degree of suicidal intent. This information is explicitly stated in the text if the cited research employs alternative definitions. According to population-based research, approximately 10% of young people have a documented history of self-harm (Hawton et al., 2012). A lifetime history of self-harm was reported by 13.4% of female adolescents and 4.3% of young men in a multi-centre study conducted in Europe (Hawton et al., 2012). The advent of suicidal behaviour is typically observed in the late adolescent or early twenties (Quarshie et al., 2023; Turgumbayev et al., 2023).

In addition, gender has a significant influence on the prevalence of self-harm. Several studies have shown that female adolescents tend to show higher levels of self-harm compared to male adolescents (Bresin & Schoenleber, 2015; Schrijvers et al., 2012). There are substantial gender disparities in suicidal behaviour during adolescence and young adulthood, with young female experiencing a higher prevalence of suicidal ideation and suicide attempts (Beautrais, 2002). The same is true for non-suicidal self-injury (NSSI), which exhibits a greater gender disparity in clinical samples than in community samples (Bresin & Schoenleber, 2015). The "suicidal gender paradox" is a phenomenon that indicates that, despite the fact that female have a higher prevalence of self-harm than men, men are more likely to perish from suicide than female (Beautrais, 2002; Bresin & Schoenleber, 2015; Schrijvers et al., 2012). Men are more likely to perish from suicide than female, and female self-harm more frequently than men. However, it is unclear whether the risk-increasing effect of self-harm, or its signal value, differs between male and female. It is conceivable that self-harm in young males is a more severe indicator of later adverse outcomes, such as suicide, due to the fact that it is less common among young male (Chandler, 2022). Adolescent self-harm increases the risk of subsequent suicidal behaviour in early adulthood; however, gender disparities have either not been identified or have been identified in various ways (Goldman-Mellor et al., 2014; Larkin et al., 2014).

Age is another factor to consider in the context of self-harm (Diggins et al., 2017; Stewart et al., 2023). Brager-Larsen et al. (Aeratag et al., 2013), about half of our participating adolescents reported having had at least one suicide attempt. Age-related differences indicate that early adolescence represents a critical period for the onset of self-harm behaviors (Gandhi et al., 2018). Similarly, ethnic and cultural backgrounds may shape how individuals interpret and respond to psychological distress (Yeo et al., 2020). These variations highlight the importance of examining whether measurement instruments function equivalently across different demographic groups. Different ethnic groups may have different cultural norms and values, which can influence how individuals cope with stress and pressure (Forshee, 2006). Global geographical disparities in self-harm and suicide rates have been identified; for instance, annual suicide rates in certain South American nations were low, whereas elevated rates were noted in Russia and several Eastern Bloc countries (McKenzie et al., 2003). Moreover, elevated rates of suicide and self-harm have been observed among Black and minority ethnic (BME) populations, particularly South Asian female in the United Kingdom (Knipe et al., 2024). Nonetheless, the rationale behind the cultural disparities in self-harm and suicide remains ambiguous, underscoring the necessity for comprehending this correlation and emphasizing the significance of addressing this divergence.

Despite the growing body of research on self-harm, most studies have primarily focused on identifying prevalence differences across demographic groups such as gender, age, and ethnicity. However, limited attention has been given to whether the instruments used to measure self-harm function equivalently across these groups. It remains unclear whether observed

differences reflect true behavioral variations or are influenced by measurement bias, particularly Differential Item Functioning (DIF) (Boone et al., 2014; Tennant et al., 2011).

This study is novel in that it does not merely examine differences in self-harm behavior across demographic groups, but evaluates whether such differences are influenced by measurement bias using Rasch-based DIF analysis across gender, age, and ethnicity within the Indonesian context. Therefore, this study aims to examine Differential Item Functioning (DIF) in self-harm behavior instruments across gender, age, and ethnicity using the Rasch model, in order to determine whether observed differences reflect true behavioral variation or measurement bias.

Method

Participants

Participants were recruited using a stratified convenience sampling approach through online distribution across various regions in Indonesia. The survey link was disseminated via social media platforms, email networks, blogs, and professional groups, particularly among guidance and counseling communities. Participants consisted of 161 males (19.8%) and 651 females (80.2%), with an age range between 11 and 60 years. Based on age category, participants were grouped into five groups: 11-14 years (5%), 15-17 years (3.2%), 18-20 years (58%), 21-40 years (31.8%), and 41-60 years (1.9%). In terms of ethnicity, participants came from various tribes in Indonesia, including Aceh (2.8%), Sunda (8%), Java (31.9%), Minang (4.7%), Betawi (7.6%), Bugis (0.98%) Batak (32.8%), Papua (1.8%), and Flores (0.8%). A small number of participants (8.5%) did not choose their ethnic origin.

Materials and Apparatus

Data collection was conducted using a self-harm scale developed by Munisa (2025). The self-harm scale measures four aspects, namely: 1) mutilation, 2) self-harm, 3) overdose, and 4) suicide attempts, for example one of the items is "Have you ever intentionally injured your skin?". Before filling out the research instrument, participants were asked to provide personal information, including identity, gender, cultural background, and age. These demographic data were collected to allow for a more detailed analysis of how these factors may influence self-harm. In the instrument development process, validity has a fundamental role because it is related to the accuracy and validity of the test in reflecting the variables to be studied (Syahputra et al., 2025). The results of the instrument analysis show that person reliability is 0.75 and item reliability is 0.99. This indicates that the self-harm instrument has very good quality for the measurement conditions carried out (details in table 1).

Table 1. Instrument Quality (18 items)

Estimation	Values
Raw variance explained by measures	47.1%
Item Reliabilities	0.99
Person Reliabilities	0.75
Cronbach Alpha (KR-20)	0.87
Separation index of Item	13.34
Mean Item	0.00
Mean person	1.72
Mean INFIT MNSQ item	1.07
Mean INFIT MNSQ person	0.99
Mean OUTFIT MNSQ item	0.96
Mean OUTFIT MNSQ person	0.96

This shows that the quality of the answers given by the person on each test is good and the quality of the items used in the measurement is very good. Meanwhile, the value of each test on Cronbach's alpha (KR-20) is 0.87, this shows that the interaction between person and item is very good. Furthermore, the value of raw variance explained by measures is 48%, this shows that the minimum unidimensional requirement of 47.1% has been fulfilled (Linacre, 2022). In addition, the item response sensitivity pattern value of +1.08 logit (INFIT MNSQ) and the overall item response pattern sensitivity value of +0.95 logit (OUTFIT MNSQ) indicate that they are in the ideal range.

Procedures

This study employed a cross-sectional comparative design. Group differences were examined using Rasch-based Differential Item Functioning (DIF) analysis to identify whether item responses varied across demographic groups (gender, age, and ethnicity). Data were collected through an online survey platform distributed via social media, email, and professional networks across various regions in Indonesia. The questionnaire consisted of 18 items with four response categories and was designed to assess self-harm behaviors. Prior to participation, all respondents were provided with information regarding the purpose of the study and were required to give informed consent. For participants under the age of 18, parental or guardian consent was obtained. Participation was voluntary, and respondents were assured of the confidentiality and anonymity of their responses. Given the sensitive nature of the topic, participants were also provided with information on mental health support services upon completion of the survey.

Design or Data Analysis

Data were analyzed using the Rasch measurement model to transform ordinal responses into interval-level logit measures, allowing for more precise estimation of participants' self-harm tendencies (Ifdil et al., 2024; Syahputra, Neviyarni, et al., 2024; Trevor G Bond & Christine Fox, 2015). The Rasch model was selected due to its ability to evaluate item functioning and ensure measurement invariance across groups. To examine potential bias in item responses across demographic groups, Differential Item Functioning (DIF) analysis was conducted for gender, age, and ethnicity. DIF analysis enables the identification of items that function differently across groups despite similar levels of the underlying trait, thereby distinguishing true group differences from measurement bias (Boone et al., 2014). Items were considered to exhibit meaningful DIF if they showed substantial differences in logit values across groups based on established Rasch criteria.

Results and Discussions

This section presents the results of the Rasch analysis, including unidimensionality, item fit statistics, and Differential Item Functioning (DIF) across gender, ethnicity, and age.

Unidimensionality and local dependency

Rasch principal component analysis proves that Self-Harm Scale has a sizable explainable variance of 47.1% (16.02 in Eigenvalue units), well above the predetermined minimum criteria (>40%), with an unexplained variance below 15% in the 1st contrast (5.9%; 1.99 in Eigenvalue units), 2nd contrast (4.7%; 1.58 in Eigenvalue units), and 3rd contrast (3.5%;

1.18 in Eigenvalue units). These findings indicate that the unidimensional assumption for Self-Harm Scale has been achieved. Based on the results of the local dependency assumption test, we identified the two highest correlations in Self-Harm Scale with a positive direction of 0.62 in item code I0016 (Pernahkah Anda berpikir serius untuk bunuh diri?) and 0.57 in item code I0015 (Pernahkah Anda berpikir serius untuk melukai salah satu bagian tubuh Anda?). And the highest correlation also occurs 0.42 in item code I0017 (Pernahkah Anda mencoba bunuh diri?). The high correlation between these items indicates the potential for local dependence, meaning that respondents' responses to one item are strongly related to their responses to other items. These three items intend to convey the psychological condition of the respondent in a certain context. Considering that the standard residual correlation of each pair of items in the Self-Harm Scale is not > + 0.70 in the positive direction of (Linacre, 2009), we conclude that local dependency does not affect the items. Given the standard residual correlation of each pair of items on the Self-Harm Scale not > + 0.70 in a positive direction.

Item measure and fit indices

Item measure and fit indices provide information about the relative difficulty of each item and how well the items conform to the Rasch model expectations. These indices are essential for identifying whether the items consistently measure the intended construct and for detecting potential misfit. To evaluate whether an item is functioning consistently with the expected results. Misfit items also indicate the respondents' misconceptions about the items (Sumintono, B., & Widhiarso, 2015). MNSQ ranging in 0.5 < MNSQ < 1.5, ZSTD ranging in -2.0 < ZSTD < +2.0 indicates that the data is in accordance with the model (Boone et al., 2014; Linacre, 2022). The "Model S.E" column represents the "Standard Error of Measure" for each item. The standard error in the proposed instrument is within the range of items included in the acceptable criteria because 0.32 < x < 0.80 (Abdullah & Lim, 2013).

Table 2. The summary of item measure (I = 13, N = 846).

Code Item	Measure	S.E Model	Infit		Outfit		Pt. Measure Corr.	Exact OBS%	Match EXP%
			MNSQ	ZSTD	MNSQ	ZSTD			
I0007	1.51	0.11	1.25	1.60	1.00	0.09	0.26	92.8	92.1
I0018	1.30	0.10	1.43	2.89	.92	-0.29	0.30	92.2	90.1
I0002	1.23	0.10	1.17	1.27	1.31	1.40	0.28	89.4	89.3
I0014	1.16	0.10	1.23	1.82	0.78	-1.12	0.34	89.2	88.4
I0017	0.84	0.08	0.92	-0.72	0.76	-1.41	0.42	85.1	84.0
I0011	0.43	0.07	1.36	3.87	1.06	0.45	0.39	75.2	76.5
I0008	0.35	0.06	0.91	-1.13	0.71	-2.33	0.50	80.0	75.1
I0003	0.23	0.06	1.12	1.58	0.89	-0.81	0.45	70.6	72.6
I0001	0.05	0.06	1.00	0.02	1.05	0.42	0.49	68.7	68.2
I0015	-0.25	0.05	0.76	-4.25	0.64	-4.07	0.61	66.0	61.4
I0016	-0.30	0.05	0.89	-1.92	0.86	-1.52	0.58	61.8	59.6
I0006	-0.44	0.05	1.11	1.88	1.10	1.07	0.52	52.2	56.6
I0004	-0.56	0.05	0.83	-3.26	0.75	-3.22	0.63	57.8	53.6
I0005	-0.62	0.05	1.11	2.03	1.06	0.74	0.55	51.3	53.5
I0010	-1.01	0.04	0.94	-1.26	0.91	-1.38	0.65	46.3	45.6
I0012	-1.12	0.04	1.24	4.60	1.35	4.86	0.56	37.9	43.0
I0009	-1.36	0.04	1.22	4.43	1.37	5.62	0.57	43.0	43.9
I0013	-1.45	0.04	0.84	-3.51	0.82	-3.34	0.71	46.8	42.0

Exp:
MNSQ = Mean square value
ZSTD = z-standard
OBS = Observation
EXP = Expectation

Table 2 shows a summary of the item estimation results for the Self-Harm Scale (18 items, N = 846), including measure values, standard errors, fit statistics (Infit and Outfit MNSQ/ZSTD), item-total correlations, and the percentage of observed fit with model expectations. The item measure ranges from 1.51 (I0007, the most difficult/rare item) to -1.45 (I0013, the easiest/common item), indicating that the scale is capable of capturing self-harm behaviors ranging from rare to common. The percentage of observed fit (OBS%) is also relatively close to the expected value (EXP%), which strengthens the instrument's validity. Overall, these results confirm that the Self-Harm Scale has good measurement quality with a balanced item distribution and adequate consistency in measuring self-harm tendencies.

Wright Map

The analysis of the variable maps also shows that the validity of the self-harm scale can be confirmed through the ability of each item to capture the diversity of respondents' tendencies across different levels of self-harm.

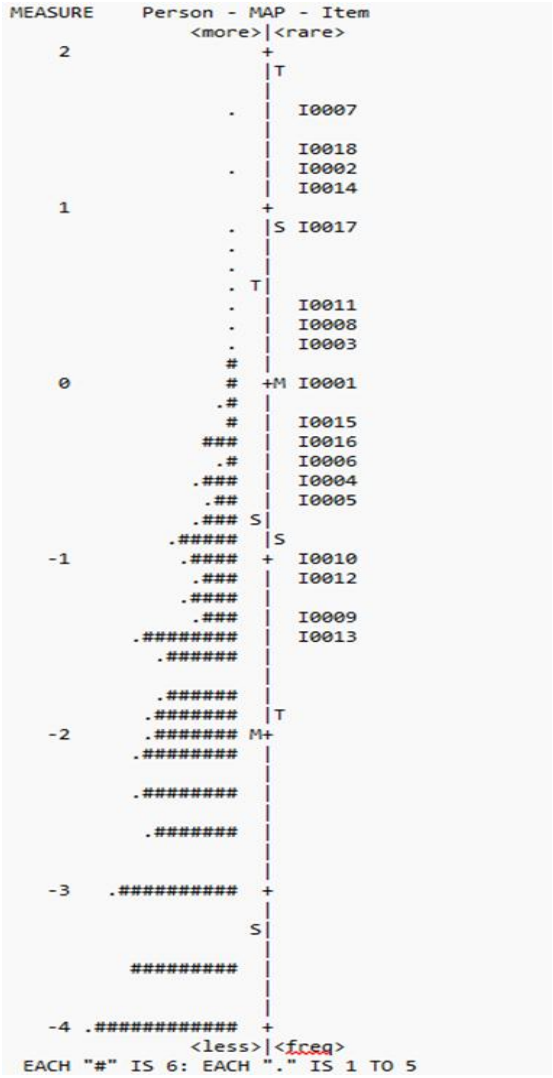

Figure 1. Variable Maps (812 Person and 18 Items)

In other words, the distribution of item difficulties aligns well with the distribution of respondents' abilities, indicating that the scale is sensitive enough to detect variations in self-harm tendencies among individuals. Items are spread across a continuum that covers both lower and higher levels of self-harm risk, allowing the instrument to differentiate between respondents with mild tendencies and those with more severe or critical levels. This balance ensures that no group of respondents is left unmeasured, as the items are able to "reach" both individuals with lower propensities for self-harm and those who are at greater risk. Such alignment between item difficulty and respondent ability supports the scale's measurement precision and reinforces its utility in identifying patterns of self-harm across diverse demographic groups.

The figure is a person-item map (Wright Map) depicting the distribution of respondents' ability levels (left) and the difficulty levels of Self-Harm Scale items (right) along a logit continuum. It can be seen that most respondents fall within the ability range of -2 to 0 logit, indicating that the majority have a relatively low to moderate tendency towards self-harm. Meanwhile, the items are spread from the most difficult/"rare" (e.g., I0007, I0018, I0002, I0014 above +1 logit) to the easiest/"common" (e.g., I0013, I0009, I0012 below -1 logit). This pattern indicates that the instrument has a fairly good range of items to measure variations in self-harm tendencies, ranging from infrequent to more common behaviors. However, the distribution of respondents that is crowded at the bottom of the map indicates that many individuals are at a low risk level, so that the more "difficult" or extreme items are only answered by a small proportion of respondents. This demonstrates the fit between the item distribution and the respondents, while also confirming the validity of the scale in reaching a spectrum of different self-harm tendencies.

Test Information Function

The test information function describes how well the Self-Harm Scale performs in measuring individuals across different levels of self-harm tendency. It shows the range where the scale provides the most reliable and accurate information.

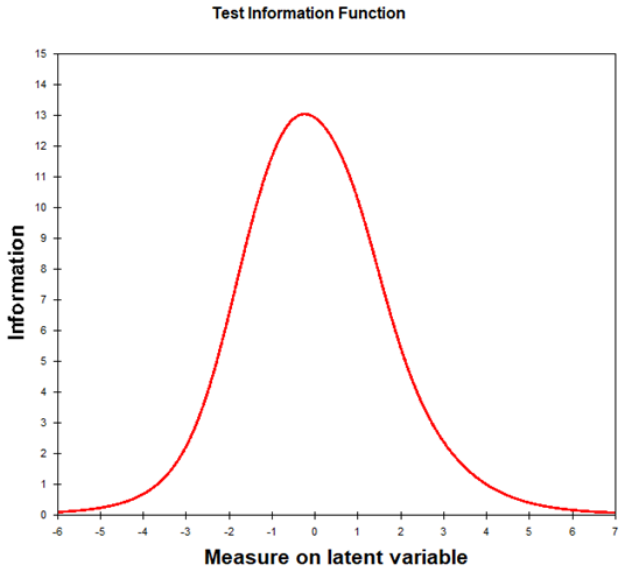

Figure 2. Test Information Function (TIF) of the Self-Harm Scale

The figure shows the Test Information Function (TIF) of the Self-Harm Scale. The curve is bell-shaped, with a peak information level of around 13 in the logit range of -1 to 0, then decreases sharply towards the left and right extremes. This indicates that the scale provides the highest (most accurate) information for measuring respondents with high to low levels of self-harm tendencies. Conversely, at very low levels (<-4) and very high levels (>+4), the information provided by the instrument decreases drastically, resulting in relatively weaker accuracy for these extreme groups. Overall, this graph indicates that the scale has good measurement quality, is able to distinguish variations in respondents, especially in the central range of the distribution, and is reliable enough to detect differences in levels of self-harm tendencies in the majority of individuals.

Differences in Self-Harm

Furthermore, a detailed analysis of self-harm based on gender, cultural background, and age is presented in Table 2 below. This table provides a clearer quantitative overview that supports the qualitative insights discussed above.

Table 3. Differences in Self-Harm in Based on Gender, Ethnic, Age in Indonesia (n = 812)

Differentiated Aspects	Distinct Item	n (%)	Mean Measure	Median	SD	Reliability Person	Mean Squares	F	Sig.
Gender	Male	161 (19.8)	-2.25	-2.00	1.01	.61	7.16	4.65	.009
	Female	651 (80.2)	-1.92	-1.85	1.03	.71			
Ethnic	Aceh	23 (2.8)	-2.27	-2.16	1.03	.60	3.30	2.15	.023
	Sunda	65 (8)	-1.55	-1.50	1.15	.79			
	Java	259 (31.9)	-1.94	-1.85	1.09	.71			
	Minangkabau	38 (4.7)	-1.73	-1.73	.90	.75			
	Betawi	62 (7.6)	-1.99	-2.00	.89	.68			
	Bugis	8 (9.8)	-1.25	-.73	.86	.83			
	Batak	266 (32.8)	-2.12	-2.00	.99	.65			
	Papua	15 (1.8)	-2.35	-2.00	.64	.51			
	Flores	7 (0.8)	-1.89	-1.61	.89	.60			
	Didn't choose	69 (8.5)	-2.11	-2.00	1.01	.65			
Age	11 – 14 Years	41 (5)	-2.41	-2.36	1.12	.61	9.88	6.53	.000
	15 – 17 Years	26 (3.2)	-1.81	-1.50	1.08	.76			
	18 – 20 Years	471 (58)	-1.92	-1.85	.98	.70			
	21 – 40 Years	258 (31.8)	-1.97	-1.85	1.09	.70			
	41 – 60 Years	16 (1.9)	-3.34	-2.95	.19	.18			
Gender * Ethnic							2.86	1.88	.013
Gender * Age							5.18	3.43	.000
Ethnic * Age							2.82	1.89	.000
Gender * Ethnic * Age							2.44	1.66	.001

Table 3 outlines the differences in self-harm behaviour in Indonesia based on gender, ethnicity, and age with 812 respondents. In terms of gender, the results show that female (80.2%) have a much higher prevalence of self-harm compared to male (19.8%). The average self-harm score for male is -2.25, while for female it is slightly lower at -1.92, with significant results (F = 4.65, p = .009). This indicates that female have a higher vulnerability to self-harm. In terms of ethnicity, the Bugis group stands out with the highest average score (-1.25), indicating a higher risk of self-harm behaviour compared to other ethnicities, such as Javanese (-1.94) and Batak (-2.12), even though they have a larger number of respondents. This difference is significant (F = 2.15, p = .023), indicating that ethnic factors also affect the level of self-harm.

In addition, in terms of age, it was found that the 11-14 age group had the highest risk with an average value of -2.41, which then decreased with age, with the 41-60 age group having an average value of -3.34. This difference was also significant (F = 6.53, p = .000), indicating that early adolescents are more vulnerable to self-harm. The interaction between gender, ethnicity, and age also showed a significant effect (F = 2.44, p = .001), meaning that the combination of these three factors plays an important role in increasing or decreasing the risk of self-harm. This analysis indicates that interventions for self-harm behaviour should take into account gender, ethnicity, and age variables simultaneously to provide more appropriate and effective support. For more details, please see the image below regarding the differences in self-harm in terms of gender, culture in Indonesia and age.

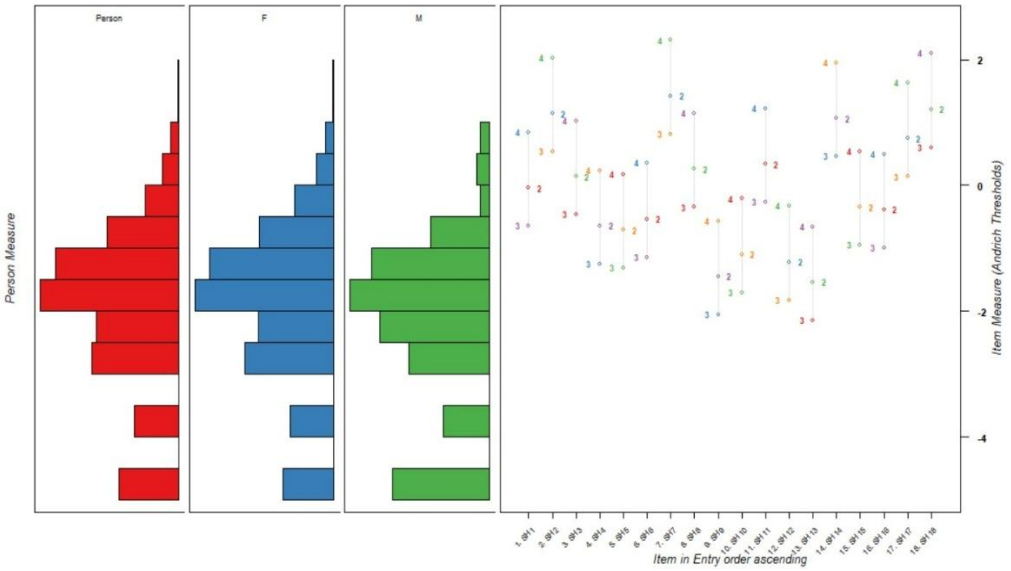

Figure 3. Self-Harm (The Gender)
Gender = M (Male) and F (Female)

Figure 3 shows that there are two lines, male is marked with a red line, and female are blue which show the difference in self-harm scores. This condition shows that there is a difference in self-harm scores between male and female, it is seen that female have higher self-harm scores compared to male. In line with the research of (Schrijvers et al., 2012) female have a greater incidence of self-harm, compared to male. Bresin & Schoenleber (2015) also strengthen the results of the study which revealed that there is a significant difference in self-harm between male and female, female, female have higher scores compared to male. Female show a higher prevalence of internalizing diseases, such as depression and anxiety, which are associated with suicidal thoughts and unsuccessful suicide attempts (Gámez-Guadix et al., 2022). This finding is also supported by previous research highlighting gender differences in self-harm behavior,

where females tend to report higher levels of self-harm compared to males (Syahputra, Evitarini, et al., 2024).

Among suicidal male, externalizing problems associated with more violent and impulsive behaviour are very prominent and may partly explain the higher fatal consequences of their suicidal behaviour (Schrijvers et al., 2012). According to population-based research, approximately 10% of young people have a documented history of self-harm (Hawton et al., 2012). A lifetime history of self-harm was reported by 13.4% of female adolescents and 4.3% of young male in a multi-centre study conducted in Europe (Hawton et al., 2012). The advent of suicidal behaviour is typically observed in the late adolescent or early twenties (Quarshie et al., 2023; Turgumbayev et al., 2023). These findings indicate that gender differences in self-harm are not only quantitative but also qualitative in nature. Females tend to engage more frequently in self-harming behaviors such as cutting or overdosing, often as a coping mechanism to relieve emotional pain, express distress, or regain a sense of control (Demuth & Demuthova, 2022). These findings are further supported by research demonstrating that negative social experiences, such as body shaming, significantly affect adolescents' mental health. Body shaming has been found to contribute 34% to variations in adolescents' psychological well-being, indicating that social pressure and negative self-perception may increase emotional distress (Hapsari et al., 2026). Such distress can act as a contributing factor to maladaptive coping strategies, including self-harm behaviors.

Males, on the other hand, may underreport self-harming behaviors due to stigma or social norms that discourage emotional vulnerability, leading to the use of more aggressive and potentially fatal methods when they do occur (Diggins et al., 2024). This gender-based divergence in the manifestation and motivation behind self-harm underscores the importance of developing gender-sensitive prevention and intervention strategies. Understanding these differences allows practitioners to tailor support systems and therapeutic approaches that align with the unique psychological and emotional needs of each gender.

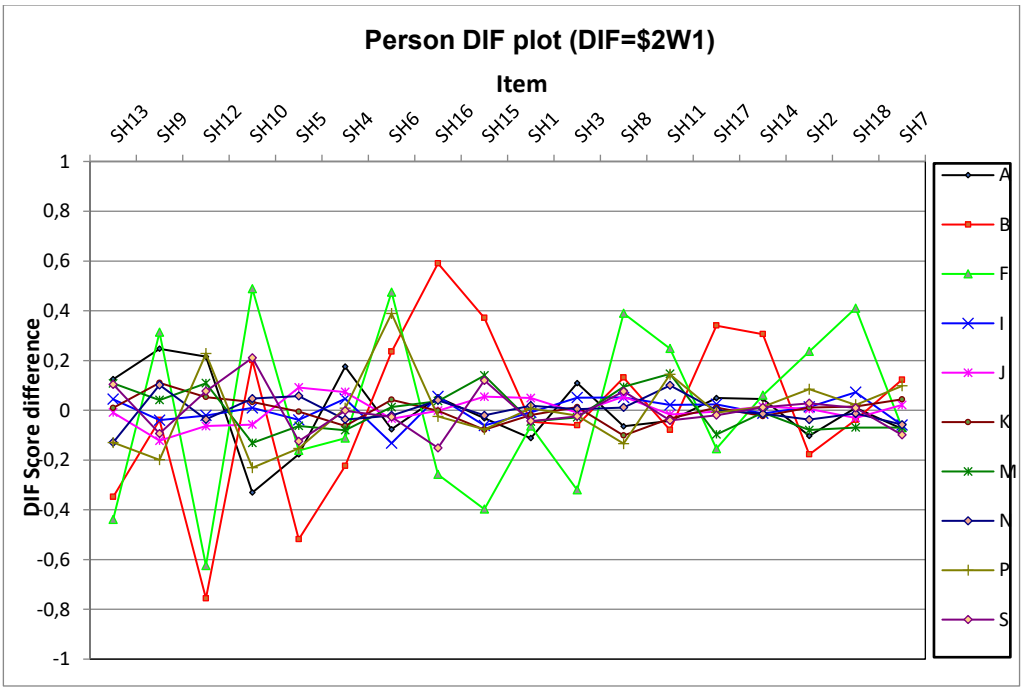

Figure 4. Self-Harm (The Culture in Indonesia)
Culture in Indonesia: Aceh = A; Sunda = S; Java = J; Minangkabau = M; Betawi = I; Bugis = B; Batak = K; Papua = P; Flores = F; and No choice = N

Figure 4 shows the Person DIF plot graph depicting the differences in DIF (Differential Item Functioning) scores for several items related to self-harm in various cultural groups in Indonesia, namely Aceh (A), Sunda (S), Java (J), Minangkabau (M), Betawi (I), Bugis (B), Batak (K), Papua (P), Flores (F), and a group without a cultural choice (N). The horizontal axis shows the various items (SH1–SH18), while the vertical axis shows the DIF difference scores with a range of -1 to 1. Each colored line represents a certain cultural group, where the difference in scores for each item is indicated by the fluctuation of the line. It can be seen that the Bugis (B) and Flores (F) cultures have more significant differences in some items compared to other cultural groups, which is indicated by more extreme variations in scores. In the Bugis and Flores cultures, there are certain traditional norms and values that influence how individuals cope with emotional distress (Hasni et al., 2019). For example, Bugis culture has a very strong concept of "siri' na pacce" (Rahayu et al., 2018) (self-esteem and empathy), where feelings of shame or loss of self-esteem can trigger extreme behavior, including self-harm, as a form of venting or self-punishment (Junker et al., 2019). The high tendency of self-harm in the Flores culture may be caused by several factors. First, strong cultural expectations in Flores, especially in terms of social and religious traditions, may conflict with modern influences such as social media, which can cause stress and mental health problems in adolescents. Second, the geographical isolation of Flores (Eldridge et al., 2018), as a relatively remote area, may exacerbate feelings of loneliness or helplessness, which then increases the risk of self-harm as a coping mechanism. Third, limited access to mental health services in the area can worsen the situation (Aeratag et al., 2013; Sastraatmadja et al., 2023), as issues such as anxiety, depression, and self-harm go undiagnosed or untreated. This shows the existence of cultural variation in responses to self-harm items in Indonesia.

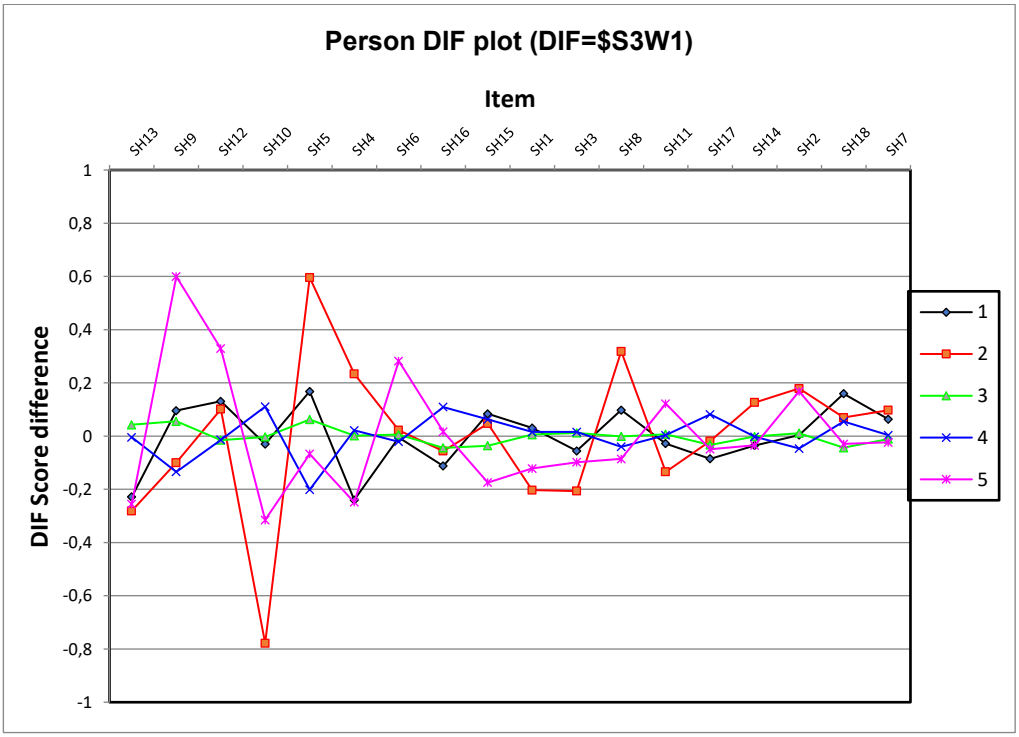

Figure 5. Self-Harm (The Ages)
11 - 14 Years = 1; 15 - 17 Years = 2; 18 - 20 Years = 3; 21 - 40 Years = 4; 41 - 60 Years = 5

Figure 5 shows the differences in DIF scores related to self-harm based on age groups, namely 11-14 years (1), 15-17 years (2), 18-20 years (3), 21-40 years (4), and 41-60 years (5). In general, the age of 15-17 years showed higher fluctuations in self-harm scores compared to other age groups. In contrast, the 18-20 and 21-40 age groups were relatively stable with smaller fluctuations approaching zero, indicating that they tend to have a lower risk of self-harm. The 11-14 age group showed some small fluctuations, but remained more stable compared to the 15-17 and 41-60 age groups. Overall, late adolescence (15-17 years) appeared to be more vulnerable to self-harm in several items, compared to other ages that were more stable. This finding may be explained by increased exposure to social and digital pressures during adolescence. Social anxiety and fear of missing out (FoMO) have been shown to contribute to psychological distress among adolescents (Erwinda et al., 2024), which may increase vulnerability to maladaptive coping strategies, including self-harm behaviors.

In line with several studies explaining that the level of self-harm behavior progressively decreases after the age of 18 years, with a peak between the ages of 14 and 16 years, and an increase until the age of 12 years (Gandhi et al., 2018). Lira's research, the 18-20 year old age group in the late adolescent development stage filled out more self-harm instruments than other age groups (Erwinda & Kurnaedi, 2024). The prevalence of self-harm among Norwegian adolescents increased by fourfold over a 15-year period, according to a study (Tørmoen et al., 2020). Participants with a prolonged duration and a lower age of self-harm onset were more likely to attempt suicide. This is consistent with recent research on adults (Muehlenkamp et al., 2019) that suggests the risk of suicide attempts increases as the age at which self-harm begins increases. Nevertheless, these studies are based on adult samples and are not easily comparable to a clinical sample of adolescents. Adolescents are at an elevated risk of suicidal behaviour due to mental disorders (Bjureberg et al., 2019). The age at which the highest probability of NSSI onset is observed is between 14 and 15 years, which implies that adolescence is the most critical period for this behavior (Gandhi et al., 2018). It is of great interest to ascertain whether the onset of self-harm at an early age is indicative of an increase in self-harm behavior. This finding is consistent with previous research that has shown that borderline symptoms are linked to a higher severity of self-harm (Aouidad et al., 2020; Reichl & Kaess, 2021). It implies that it would be crucial to evaluate borderline symptoms in adolescents who exhibit recurrent self-harm behaviour as part of the assessment and management of suicide risk (Aouidad et al., 2020; Witt et al., 2019).

The implications of this study emphasize the need to develop prevention and intervention programs that consider gender, ethnicity, and age differences in self-harm behaviours. Education for families and communities is important to reduce mental health stigma and build better support for individuals at risk of self-harm when they lose self-esteem. Loss of self-esteem can trigger extreme behaviours, including self-harm, as a form of self-expression or self-punishment (Junker et al., 2019). In the future, further research on borderline symptoms in adolescents who experience repeated self-harm is essential for the assessment and management of suicide risk. Borderline symptoms, such as extreme emotional instability, feelings of emptiness, and fear of rejection or abandonment, may increase vulnerability to self-harmful behaviours. Therefore, it is important to identify and evaluate these symptoms early, as part of a comprehensive assessment to reduce suicide risk.

Conclusions

This study demonstrates that self-harm behaviors vary significantly across gender, ethnicity, and age within the Indonesian context. Rather than merely reflecting behavioral differences, these variations may also indicate the presence of differential response patterns influenced by socio-cultural and demographic factors. Importantly, the use of Rasch-based Differential Item Functioning (DIF) analysis provides a more nuanced understanding by highlighting that

observed group differences may not always represent true behavioral disparities, but could also be affected by measurement bias. This finding contributes to the methodological advancement of self-harm research, particularly in ensuring the validity and fairness of psychological instruments across diverse populations.

From a theoretical perspective, the results support the notion that self-harm is a multidimensional phenomenon shaped by the interaction between individual characteristics and socio-cultural contexts. The findings reinforce the importance of considering cultural norms, gender roles, and developmental stages when interpreting self-harm behaviors. Practically, these results suggest that prevention and intervention strategies should not adopt a one-size-fits-all approach. Instead, mental health programs should be tailored by considering demographic differences, particularly gender-sensitive approaches, culturally informed interventions, and age-specific prevention strategies. Future research is encouraged to further investigate potential measurement bias in self-harm instruments and to incorporate additional variables, such as psychological traits and environmental stressors, to better understand the complexity of self-harm behaviors.

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Conflict of Interest

Declaration by the authors that they do not have any conflicts of interest to declare

Authors Contribution

YD contributed to conception, methodology, software, formal analysis, investigation, writing original draft preparation, writing-review and editing. AIE contributed to writing-review, editing, data processing and analysis. LE contributed to conception, investigation, writing original draft preparation, writing-review and editing. MNAR contributed to software, data processing and analysis. NF contributed to conception, methodology, investigation, writing-review and editing. MH contributed to conception, methodology, investigation, writing-review and editing. SS contributed to conception, methodology, and investigation. MM contributed to conception, methodology, and investigation. All authors have read and agreed to the published version of the manuscript.

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