

The pattern of handedness and schizotypal personality trait association among healthy Malays and healthy non-Malays in Malaysia

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Previous studies have shown that the non-clinical population also has differences in terms of the pattern of handedness. However, the universality of the result finding is still a gap in the literature since most of the studies were done in Western, Australian, and some Asian countries, but there is a scarcity of studies that explored the Malaysian population. This study aims to identify the universality of the result finding from previous studies. A total of 162 participants were recruited to answer an online survey about their schizotypy trait measured by Schizotypal Personality Questionnaires (SPQ), and their pattern of handedness measured by Edinburgh Handedness Inventory (EHI) by calculating the Laterality Quotient (LQ) score. Pearson correlation of the overall SPQ and LQ score will be analysed. Pearson correlation between all the domains of the SPQ is also being analysed with the LQ score. An Independent sample t-test between Malay and to non-Malay participants is done to see the differences among groups in handedness pattern, overall schizotypy, domains and subdomains of schizotypy. The result shows that there is an overall correlation between the SPQ score and the LQ score. There is also a correlation for all domains of the SPQ score with the LQ score except for the Disorganised domain. Malay participants show significantly higher Cognitive Perceptual domain scores, and Magical thinking subdomain scores of the SPQ compared to the non-Malay population. There is a significant correlation between the pattern of handedness and schizotypy. Malay participants show significantly higher scores in the certain trait of the schizotypy compared to the non-Malay population.

Keywords: brain lateralisation; ethnicity; handedness; Malay; schizotypal

Behavioural differences have been observed among people with schizotypy compared to normal population. For example, some of the behaviours differences between schizotypy with normal population are eye movement (Jessica et al., 2016); footedness, eye domain, and chewing side during eating (Lee et al., 2017). Another behaviour that has been studied in the literature is the pattern of handedness which shown that people with schizotypy tend to have significantly different pattern of handedness compared to normal population (Asai & Tanno, 2009; Chen et al., 2011; Claridge et al., 1998; Dragovic & Hammond, 2005; Dragovic, et al., 2005; Erlenmeyer-Kimling et al., 2005; Hirnstein & Hugdahl, 2014; Ortuño et al., 2005; Preti et al., 2007; Stefanis et al., 2006; Tsuang et al., 2016). One of the possible causes of the significant difference in term of handedness pattern is due to brain lateralisation process (Deep-Soboslay et al., 2010; Hamilton et al., 2007; Kitamura et al., 2017) which shown morphologically or anatomically difference brain structure among people with schizotypy as compared to non-schizotypy population (ibid) besides genetics (Walter et al., 2016) or environment (Asai & Tanno, 2009; Chen et al., 2011; Gregory et al., 2003; Singh & Bryden, 1994). Moreover, the pattern of handedness was also reported to be different not only in clinically diagnosed schizotypy, the similar pattern also has been found in non-clinical population (Chen & Su, 2006; Chen et al., 2011; Preti et al., 2007; Schürhoff, Laguerre, Roy, Beaumont, & Leboyer, 2008). It is still a vague topic that is not frequently being studied for the last decade (Hirnstein & Hugdahl, 2014; Tsuang et al., 2016).

There is mixed finding in the literature in term of the pattern of handedness association with schizotypy relationship. Some research found that handedness is negatively correlated with schizotypy (Asai & Tanno, 2009; de Kovel, et al., 2019; Dragovic & Hammond, 2005; Hirnstein & Hugdahl, 2014; Lee et al., 2017; Schürhoff et al., 2008; Somers et al., 2009), some research found mixed handedness is strongly correlated with schizotypy (Dragovic & Hammond, 2005; Dragovic et al., 2005; Hirnstein & Hugdahl, 2014; Lee et al., 2017; Ortuño et al., 2005; Preti et al., 2007; Stefanis et al., 2006; Tsuang et al., 2016), and also some research does not find any significant difference among different group when handedness score is treated as continuous (Chen et al., 2011). The mixed findings might be due to usage of different assessment tools to measure the pattern of handedness such as Annett Handedness Questionnaires (AHQ) (Claridge et al., 1998; Tsuang et al., 2016), Edinburgh Handedness Inventory (EHI) (Deep-Soboslay et al., 2010; Kelley, 2014; Schürhoff et al., 2008) for instance; and also to measure the schizotypal personality trait of the population such as Schizotypal Personality Questionnaires (SPQ) (Annett & Moran, 2006; Kim et al., 1992; Tsuang et al., 2016), Diagnostic Interview for Genetic Studies (DIGS) which consist of Structured Interview for Schizotypy (SIS) (Chen et al., 2011), and Peter et al. Delusion Inventory (PDI) (Preti et al., 2007). Research that used Annett Handedness Inventory (AHI) tend to get left handedness result, while research that used EHI tend to get mixed-handedness outcome (Williams, 1991). The grouping classification on the handedness differences of the previous studies was also vary. Some studies differentiate by right-left, some studies differ by right or non-right, and some studies differ group by mixed-handedness or lateralised (Dragovic & Hammond, 2005). Differences in assessment tools (Kuha et al., 2018), and also group classification might possibly lead to different outcomes in the relationship between the pattern of handedness with schizotypy.

Besides different assessment tools and group classification, clinical population of schizotypy people tend to not produce a consistent outcome result due to misjudge or answered the questionnaires inconsistently in judgment (Langdon et al., 2014; Strauss et al., 2011). This is the main reason why many previous researches try to understand the correlation of handedness with schizotypy among non-clinical population because non-clinical population shows higher consistency and reliability of data (Chen & Su, 2006; Chen et al., 2011; Erlenmeyer-Kimling et al., 2005; Preti et al., 2007; Schürhoff et al., 2008). The pattern of correlation could be seen more clearly which is the higher the schizotypy score of a person, the more that the person will be left-handed (Schürhoff et al., 2008). Other than inconsistency in reporting schizotypy trait among clinical population, the universality of the literature finding is still not fully understandable and still has a big gap. Many of the findings are based on Western culture, some researchers find different outcome in different region such as Asian countries like Japan (Asai & Tanno, 2009; Gregory et al., 2003) and Taiwan (Chen & Su, 2006; Chen et al., 2011). Only two research to see the correlation between pattern of handedness with schizotypy in Japan (Asai & Tanno, 2009; Gregory et al., 2003), and only one study has been done in Taiwan (Chen & Su, 2006; Chen et al., 2011) which lead to a total of only four studies has been done in Asian region.

Different outcome on the association between the pattern of handedness and schizotypy for different countries might be due to different cultural norms and beliefs. Different cultures have different perspective

on the usage of hand in doing certain activities. For example, Japanese people were forced to use right hand in writing as the Japanese perceived writing using left hand is not good (Asai & Tanno, 2009). Other than Japan, in Taiwan people tend to force or reward more toward the right handedness when doing activities, and research found that no correlation when handedness score is treated as continuous (Chen et al., 2011). However, a study has been done in India that found the same outcome as the northern American samples in term of the pattern of handedness in the population (Singh & Bryden, 1994) and same goes to the pattern of handedness among Italian people (Preti et al., 2007). The environmental effect of a person during childhood also affect the handedness pattern (de Kovel et al., 2019). The inconsistency and universality of the finding is still a gap in the literature. It is expected that the association between pattern of handedness and schizotypal personality trait might be different when looking into Malaysian population due to the multicultural background with different beliefs or norms among people in Malaysia. For instance, the Malays – which is the highest population in Malaysia – forced or taught to eat with their right hand and those who eat with left hand is perceived as being impolite (Abdul Raji et al., 2017). The Malay cultural norm of forced to use right hand in some of activity due to politeness might affect the association between pattern of handedness with schizotypal personality trait when being measured.

None of the previous research has ever explored the relationship on the pattern of handedness with schizotypy in south east Asia countries and Malaysia. This research was being done to fill in the gap in the literature about handedness pattern in Malaysia and also to observe whether the outcome will be same as what has been found in the western countries. It is hypothesised that, due to the different ethnicity and multicultural background of the participants, the correlation between pattern of handedness and schizotypal personality trait will be different, but still weakly correlated with one another. Finding in this research will closer the gap on understanding of the universality of the finding on the pattern of handedness correlation with schizotypy in different cultures. Thus, the main purpose of this study is to see the correlation between the pattern of handedness and schizotypal personality trait association among non-clinical (healthy) Malaysian population.

METHOD

Participant

162 total participants were recruited, but only 117 ($M_{Age} = 24.28$, $SD_{Age} = 6.67$) fulfil all the inclusion, and does not meet any of the exclusion criteria. Excluded participants are due to psychological issues (12 people), failed screening test which participants failed to read questions when answering (20 people), and incomplete all the questionnaires (13 people) which make a total of 45 people being excluded from 162 total participants. 86 (73%) of the participants are female, 93 (79.5%) are Malay, 19 (16.2%) are Chinese, followed by 3 (2.6%) Indian, 1 Dusun (0.9%) and 1 Kadazan (0.9%).

Data was collected via online survey. Participants were recruited using convenient sampling and advertisement in social media groups. This research study has been approved by University Sains Malaysia ethical committee (USM/JPeM/19050320). Inclusion criteria of the participants are (1) Not diagnosed with any psychological illness by mental health professional, (2) Answer all three of the screening questions correctly in the survey questionnaires, (3) Never receive any psychological treatment by any mental health professional and (4) Above 18 years old. The inclusion criteria are to prevent other confound variables that might affect the result such as neurodevelopmental problems (autism spectrum disorder) among the recruited participants with during data analysis. The exclusion criteria are (1) Physically handicap and (2) lost or not complete body limb(s). Participants with physical difficulty not being included in the research because this research will require to measure the pattern of handedness. Physical difficulty might affect the validity, and accuracy on the pattern of handedness. Participants were given token of acknowledgment after completing the research questionnaires.

Measures

Schizotypal personality. Schizotypal Personality Questionnaires (SPQ) has been used to measure the schizotypal personality trait for each individual participant. SPQ is being used because it measures the schizotypal trait symptoms according to DSM criteria (Raine, 1991). SPQ has been used in many other research in order to measure the schizotypal personality of a participant (Dragovic & Hammond, 2005;

Dragovic et al., 2005; Hirnstein & Hugdahl, 2014; Schürhoff et al., 2008; Van Rijn et al., 2015) besides SPQ has a good psychometric properties found in research from different ethnicities (Barron et al., 2018; Barron, et al., 2015; Fonseca-Pedroet al., 2009; Raine, 1991; Van Rijn et al., 2015). Four domains of the SPQ will be used for this research has found by previous psychometric tests among multiracial population (Barron et al., 2018, 2015; Davidson et al., 2016; Lahmar et al., 2014; Raine, 1991; Van Rijn et al., 2015). The four domains of the SPQ as suggested by Barron et al. (2018) which supported 4-factor model fit the best will be used as the main reference because it was being done in Malaysia. The four domains of the SPQ are Cognitive Perceptual Domain, Negative Domain, Paranoid Domain, and Disorganised Domain.

Handedness pattern. Edinburgh handedness inventory (EHI) has been used to measure the pattern of handedness of the participants by calculating the Laterality Quotient (LQ). The range of score is between +100 to -100. Oldfield (1971) states that score between +100 until +51 is defined as right-handedness, +50 until -50 is defined as mixed-handedness, and -51 until -100 is defined as left-handedness. EHI has been used instead of Annett Handedness Inventory (AHI) due to EHI's better in psychometric properties (Williams, 1991), besides EHI has excellent psychometric properties that has been supported by many previous research (Büsch et al., 2010; Dragovic, 2004; Espírito-Santo et al., 2017; Moritz et al., 1999; Ransil & Schachter, 2011; Veale, 2014; Williams, 1991). The computerized program to calculate the pattern of handedness is also available online at <http://zhanglab.wikidot.com/handedness> with complete LQ score and interpretation of handedness pattern. The formula for LQ is listed below (Oldfield, 1971):

$$\frac{(\text{Total Right Score} - \text{Total Left Score})}{(\text{Total Right Score} + \text{Total Left Score})} \times 100$$

Data analysis. IBM SPSS Version 25 will be used for all data analysis in this research. This study will analyse three different measurements. Firstly, the Pearson correlation will be done to find out the overall correlation score of the pattern of handedness (by measuring the LQ Score) with total SPQ score. The second analysis will be looking at each individual domain of the SPQ correlation with overall LQ score, then will follow up with multiple linear regression to find out the best predictor model of the SPQ on pattern of handedness. Lastly, independent sample t-test will be done to find out whether there is or are any significant differences between Malay, and non-Malay (Chinese, Indian, Dusun, and Kadazan) for the pattern of handedness by observing at the LQ total score, SPQ total score, domains of the SPQ, and subdomains of the SPQ. Chinese, Indian, Dusun, and Kadazan were categorized into non-Malay group due to small sample population of these ethnicities compared to Malay participants.

RESULT

Correlation between SPQ total score and LQ total score. Pearson correlation was being used to observe the overall correlation between total score of the SPQ and the LQ score. Based on the Pearson correlation, the total SPQ total score of the participants ($M = 33.64$, $SD = 15.01$) is significantly ($p < 0.05$) weak positively correlated ($r = 0.20$) with the LQ total score ($M = 61.32$, $SD = 58.47$). Table below shows the correlation matrix between SPQ total score and LQ total score.

Table 1
 Pearson correlation table matrix between SPQ total score and LQ total score

		SPQ total score	LQ total score
SPQ total score	r	1	0.20
	p		0.03

Correlation between domains of the SPQ score with LQ total score. Pearson correlation between LQ score with SPQ total score, cognitive perceptual domain, paranoid domain, negative domain, and disorganized domain has been done. Interpretation of the Pearson correlation strength is taken from the literature as a reference guidance (Dahniani et al., 2019). The Pearson correlation between LQ ($M = 61.32$, $SD = 58.47$) is weakly positive correlated, and statistically significant with the SPQ ($M = 33.64$, $SD = 15.01$) overall total score ($r = 0.20$, $p < 0.05$). Pearson correlation between LQ ($M = 61.32$, $SD = 58.47$) is also statistically significant and weakly correlated ($r = 0.20$, $p < 0.05$) with cognitive perceptual domain ($M = 5.22$, $SD = 3.50$). Moreover, LQ ($M = 61.32$, $SD = 58.47$) is also weakly correlated and statistically significant ($r = 0.30$, $p < 0.01$)

with paranoid domain ($M = 13.72, SD = 5.67$) and statistically significant and weakly correlated ($r = 0.22, p < 0.05$) with negative domain ($M = 17.06, SD = 7.37$). However, LQ ($M = 61.32, SD = 58.47$) is not statistically significant and poorly correlated ($r = 0.04, p > 0.05$) with disorganised domain ($M = 6.68, SD = 4.37$).

Table 2
 Pearson Correlation (r) matrix table of LQ Score with the domains of the SPQ

LQ	Cognitive Perceptual	Paranoid	Negative	Disorganised
	0.20	0.30	0.22	0.04
	0.03	0.001	0.02	0.67

Multiple linear regression of the domains of the SPQ on LQ total score has been done. Disorganized domain has been excluded from multiple linear regression because disorganized domain does not have a significant correlation with LQ total score which does not fit the process of multiple linear regression process (*Linear Regression And Correlation*, n.d.). The result of the multilinear regression model is a weak predictor ($R^2 = 0.12$) which consisted of only disorganized domain, and paranoid domain. The scatterplot of the multiple linear regression is also showing pattern which indicates that it is not a good model to be observed. Hence, multiple linear regression model cannot be done among domains of SPQ on LQ score due to poor statistical properties.

Independent Sample T-test between Malay vs non-Malay

Overall LQ score and SPQ score. Lastly is the independent sample t-test between Malay and non-Malay (consists of Chinese, Indian, Dusun, and Kadazan) on LQ score, SPQ total score, domains of the SPQ, and the subdomains of the SPQ. Malay LQ score ($M = 57.20, SD = 62.35$) is significantly lower ($p < 0.01$) than non-Malay LQ total score ($M = 77.28, SD = 36.87$). There is no significant different ($p > 0.05$) between Malay ($M = 34.01, SD = 15.26$) and non-Malay ($M = 32.21, SD = 14.23$) in total SPQ score.

Domains of the SPQ. Each individual domain of the SPQ was being analysed by using t-score between Malay and non-Malay population. None of the SPQ domains are significantly ($p > 0.05$) different between Malay and non-Malay participants. Only almost significant difference ($p = 0.08$) between Malay ($M = 5.50, SD = 3.54$) and non-Malay ($M = 4.17, SD = 3.21$) in cognitive perceptual domain score. Table below shows the t-test table output between Malay and non-Malay in SPQ domains (Cognitive Perceptual, Negative, Paranoid, and Disorganised).

Table 3
 SPQ domain score independent sample t-test between Malay and Non-Malay

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		<i>F</i>	<i>p</i>	<i>t</i>	<i>df</i>	Sig. (2-tailed)
Cognitive Perceptual Domain	Equal variances assumed	3.05	0.08	1.67	115.00	0.10
	Equal variances not assumed			1.77	38.70	0.09
Paranoid Domain	Equal variances assumed	0.43	0.51	0.78	115.00	0.44
	Equal variances not assumed			0.84	39.55	0.41
Negative Domain	Equal variances assumed	0.12	0.73	-0.05	115.00	0.96
	Equal variances not assumed			-0.05	38.71	0.96
Disorganised Domain	Equal variances assumed	0.07	0.79	-0.14	115.00	0.89
	Equal variances not assumed			-0.13	35.09	0.90

Subdomains of the SPQ. Subdomains of the SPQ was also being analysed by using t-test between Malay and non-Malay population to see the difference among groups. For subdomains of the SPQ, there is only one which is significantly different score among Malay and non-Malay participants. Malay magical thinking subdomain score ($M = 2.30, SD = 1.77$) is statistically significantly higher ($p < 0.05$) than non-Malay magical thinking subdomain score ($M = 1.83, SD = 1.55$). None of the other subdomains of the SPQ is significantly different between Malay and non-Malay participants. The table below shows the independent sample *t*-test among Malay and non-Malay participants for each subdomain of SPQ.

Table 4
 Subdomains of SPQ independent sample t-test among Malay and Non-Malay participants

SPQ Domains	SPQ Subdomains		Levene's Test for Equality of Variances		t-test for Equality of Means			
			F	p	t	df	Sig. (2-tailed)	
Cognitive Perceptual	Magical thinking	Equal variances assumed	5.29	0.02	1.18	115.00	0.24	
		Equal variances not assumed			1.28	40.01	0.21	
	Unusual perception	Equal variances assumed	0.68	0.41	1.78	115.00	0.08	
		Equal variances not assumed			1.86	37.78	0.07	
		Suspiciousness	Equal variances assumed	0.01	0.93	0.43	115.00	0.67
			Equal variances not assumed			0.45	38.35	0.66
Paranoid	Social anxiety	Equal variances assumed	0.01	0.93	0.23	115.00	0.82	
		Equal variances not assumed			0.23	36.15	0.82	
	Ideas of reference	Equal variances assumed	0.07	0.80	1.16	115.00	0.25	
		Equal variances not assumed			1.15	35.58	0.26	
Negative	No close friend	Equal variances assumed	0.02	0.89	-0.71	115.00	0.48	
		Equal variances not assumed			-0.71	35.98	0.48	
	Constricted affect	Equal variances assumed	0.03	0.86	0.03	115.00	0.98	
		Equal variances not assumed			0.03	34.48	0.98	
Disorganised	Odd Belief	Equal variances assumed	0.02	0.89	0.00	115.00	1.00	
		Equal variances not assumed			0.00	35.90	1.00	
	Odd Speech	Equal variances assumed	1.62	0.21	-0.22	115.00	0.83	
		Equal variances not assumed			-0.20	32.89	0.84	

DISCUSSION

According to the result in the previous section, it shows that there is a significant weak positive correlation between the overall SPQ score and the pattern of handedness by measuring the LQ score from EHI. This finding is not being found in some other literature (Chen & Su, 2006). This research found significant weak positive correlation might be due to the cultural differences, and due to lack of participants especially those who are in the middle range of the handedness spectrum and left-handed spectrum. As shown in the literature, Malay population tend to use right hand for many of their daily activities due to religious belief and culture norms (Barron et al., 2018, 2015; Abdul et al., 2017).

Further Pearson correlation analysis done to each domain of the SPQ according to Barron et al. (2018) which consist of Cognitive Perceptual domain, Disorganized domain, Paranoid domain, and Negative domain, shows that only Disorganized domain is not significantly correlated with the pattern of handedness score. Cognitive Perceptual domain, Negative domain, and Paranoid domain are all weakly positively correlated with the pattern of handedness measured by the LQ score from the EHI. This finding is the opposite then what has been discovered in previous research which Disorganized domain is the strongest correlation with the pattern of handedness (Davidson et al., 2016). Cultural norms and differences might affect the finding of this research. Paranoid domain however is consistent with previous finding on the literature which shows

that it has the strongest correlation with the pattern of handedness (Zalewski et al., 1998). The universality of the finding is still questionable because some of the findings are not consistent with the western countries.

Multilinear regression model was being observed for all the SPQ domains except for Disorganized domain because Disorganized domain in this research indicate no significant correlation with the pattern of handedness. The multilinear regression failed to be produced, none of the domains can be combined together to get the best outcome shown by the poor statistical characteristics.

The other finding was Malay population scored significantly different in term of pattern of handedness compared to non-Malay population from this research. The finding of ethnicity differences on the pattern of handedness is consistent with previous research done in Japan (Gregory et al., 2003). However, the Japan population research has been repeated and changed the handedness questionnaires by Asai and Tanno (2009), they found the similar finding as the western countries which the SPQ score tend to be higher if the participants are more toward the left-handed spectrum of the handedness questionnaires. The result of this research shows that Malay ethnicity participants is significantly higher score in the pattern of handedness which indicates that Malay population tend to be right-handed. This finding support the literature finding of different pattern of handedness among different ethnicity as some ethnicities were being forced to use certain hand for certain activities such as use right hand to eat for Malay population (Abdul et al., 2017) and also use right hand for writing in Taiwan (Chen & Su, 2006; Chen et al., 2011; Tsuang et al., 2016) and Japanese population (Asai & Tanno, 2009; Gregory et al., 2003).

This research is the only research has been done to analyse each individual subdomain of the SPQ differences between Malay and non-Malay Ethnicity. The strongest correlation among all the four domains of the SPQ was Cognitive Perceptual domain, which consist of Magical Thinking subdomain, and unusual perception subdomain (Barron et al., 2018, 2015; Dragovic, 2004; Raine, 1991). Only Magical thinking subdomain of the SPQ is significantly higher in Malay participants compared to non-Malay participants. None of the other subdomains were significantly different between Malay participants with non-Malay participants. As found by Barron et al. (2018), which done SPQ psychometric study among Malaysian population, it indicates that Malay population tend to score higher in cognitive perceptual domain. It also found that Malay female tend to score higher in Cognitive Perceptual domain which indicates that female Malay tend to have higher risk for schizotypy (Barron et al., 2018). The finding of this research supports the finding by Barron et al. (2018) on the schizotypy research among Malaysian population.

CONCLUSION

Even though no study has been carried out to analyse the handedness pattern correlation with schizotypy in Malaysian population, there are some weakness of this research which need to be changes if future research wants to be done on the same population. As compared to the literature, the number of participants is one of the weakness of this research. The other research on average tend to be ranged from 400 participants until 3,000 (Davidson et al., 2016; de Kovel et al., 2019; Gregory et al., 2003; Veale, 2014). This research has limited number of populations is due to funding issue, and time period which data collection was being done only for 3 months. More time and funding needed in order to increase the number of participants of this study. It will be better if a greater number of participants were increased for the other ethnicities such as Chinese and Indian so that clearer differences among ethnicities can be analysed. Chinese and Indian ethnicities are recommended to be collected more because the majority of the Malaysian ethnicities are Malays, Chinese, and Indians (<https://www.dosm.gov.my/v1/>). Future research might also want to look at the language proportion since the literature found that schizotypy people tend to have significantly different in language issue compared to normal population (Schürhoff et al., 2008; Stefanis et al., 2006). This study has found out lower score of English language comprehension tend to score higher in SPQ. Last but not least, universality of the finding is still questionable and gap in the literature. More studies need to be done in South East Asian countries such as Thailand, Singapore, Indonesian due to their multi-ethnicity countries.

In conclusion, there is a significant correlation between the schizotypy and the pattern of handedness. All the domains of the schizotypy (Cognitive Perceptual, Paranoid, and Negative domains) are correlated with the pattern of handedness except for Disorganized domain of schizotypy which is not correlated with the

pattern of handedness. Multilinear regression failed to be developed for different domains of the schizotypy. For ethnicity difference between Malay and non-Malay (Chinese, Indian, and other) participants, Cognitive Perceptual domains of schizotypy showed significant higher score among Malay participants compared to non-Malay. Malay participants also show significant higher score in Magical thinking subdomain, which is under Cognitive Perceptual Domain, compared to non-Malay participants. Hypotheses are accepted.

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