

Measuring Cognitive Differences among Three Cultural Groups: An Exploratory Study

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The purpose of the study was to explore two new macrocognitive measures that assessed complex cognitive differences in natural settings among three national groups: Malay, Indonesian and Arab students. The first, the Cognition in Context scale, measured differences in six cultural dimensions and the relationships among these dimensions. The second, the Dynamic Cognition test, measured decision making performance based on two unfolding scenarios. We predicted some shared cognitive processes among the groups due to their common religious denominator but also expected cultural differences because of their different histories. Results of the one-way ANOVA showed significant differences for all subscales of the Cognition in Context scale. Post-Hoc tests showed significant differences in the three groups on the various subscales. The results of the Dynamic Cognition test, however, were less clear. While these findings showed that Malays, Indonesians and Arabs are culturally different in terms of problem solving and decision making skills, due to the different sample sizes, the overall findings cannot be treated as clearly conclusive. Nevertheless, with respect to the two measures, the Cognition in Context scale appears to be more promising than Dynamic Cognition in understanding cultural differences involving complex cognitive tasks.

Keywords: cognition, culture, problem solving, decision making, national differences

Today, there is a greater need towards multinational operations, as a pragmatic response to changing work patterns of businesses, and catastrophes caused by natural disasters and/or human-induced disasters (Khalid, 2007; Khalid, Helander, & Hood, 2013). Therefore, professionals in various scientific, business, military and humanitarian domains have to work together to identify problems, make sense out of complex and confusing information, weigh options, and coordinate with others in order to make decisions and take action (Klein & McHugh, 2005). In more dynamic and complex contexts, there is a tendency for different national groups to construct different realities, use alternative coordination schemes, and make different decisions. As such, productivity, safety, and quality of work may be compromised due to cultural differences in cognition. Cultural differences can also inhibit the ability to take the perspective of others and predict their choices, particularly when people attempt to anticipate the decisions without understanding the context (Klein, 2005).

Culture is important because it provides a functional blueprint for group member's behavior and social roles as well as in providing cognitive tools to make sense of the world. Because culture is rooted in the changing physical and social ecology of the group, shared experiences of the setting shape a common vision and evolve over time. Because cultures are composed of integrated components rather than a haphazard collection of interchangeable parts, it is difficult to separate cognition from the behavioral and social roles. The integrated nature of cultural components means that some cultural elements regularly occur together.

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These clusters characterize types of cultures. This definition of culture is consistent with Berry's EcoCultural framework (Berry, 1986; Berry et al., 1997; Segall, Dasen, Berry, & Poortinga, 1990).

However, it is unclear how cultures of industrially developing countries (IDCs) parallel those of more advanced nations, even in the same geographical region. Moreover, events such as September 11 (Moten & Noor, 2007) have created a deeper gap in cultural understanding, thereby demanding greater effort towards bridging the gap. Because culture is complex, the measures used to assess culture remain problematic. While existing measures cannot provide a comprehensive view of a group's or a person's culture, they nevertheless have been able to show that there are differences in the way people from different cultures identify problem, gather and use information, explain, and make decisions. For example, research has shown that East Asians favor holistic thinking while Westerners favor analytic thinking (Choi, Koo, & Choi, 2007; Nisbett, Peng, Choi, & Norenzayan, 2001). As such, East Asians would be more likely than Westerners to retain and include more information (both dispositional and situation) as well as to be more accepting of contradictory information. Understanding these differences would enable more effective multinational interactions.

The Present Study

The study reported here is part of the ROSETTA II project (for the full report see Klein et al., 2008) which aimed at uncovering cultural differences in cognition across several national groups, besides the usual US and East Asian samples.

Two new macrocognitive measures, Cognition in Context and Dynamic Cognition, were developed specifically for ROSETTA II. These measures involved studying how people attend to the dynamic ongoing actions, identify changes and irregularities, and sometimes integrate contradictory information to make decisions in unfamiliar contexts. In this research, we examined the extent to which these two complex cognitive measures differed in three different cultural groups. The three cultural groups—Malays, Indonesians and Arabs, shared a common religion. They are predominantly Muslim, and as such, it would be expected that they shared some cognitive processes among them but at the same time also expected cultural differences in cognition to exist due to their different socialization processes, traditions, and social-political histories. Furthermore, it is expected that Malays and Indonesians would share more cognitive commonality than Arabs due to their geographic proximity, ethnic and social traditions.

Method

Participants

Participants were recruited from the International Islamic University Malaysia (IIUM) which has a unique student population of more than 90 countries, totaling 19,432 (both undergraduate and postgraduate) the majority being Muslims. They were selected via purposive sampling; i.e., participants volunteered following calls for participation that were advertised on bulletin boards, class announcements, and email dissemination. The only

criteria of selection were that they represented the cultural groups, and they had taken Introductory Psychology.

Besides the local Malay students, Indonesian and Arab students studying in IIUM were used as exploratory groups to provide initial measures of cognition in their respective languages, to provide initial comparisons of cognition in these two groups to the Malay group, and to provide an initial description of the commonality shared by these groups (all three groups are Muslims). The number of participants in the Malaysian sample was much bigger than the other two exploratory groups because the number of Indonesian and Arab students had taken Introductory Psychology was limited. This difference in the sample size of the Malay sample and the latter two samples preclude a definitive comparison between the groups. But, the results may still provide some insight into understanding the cognitive processes in these three Muslim groups.

Malay sample: In multiethnic Malaysia, Malays make up 54.2% of the population (Ninth Malaysia Plan, 2006-2010). A Malay is defined as one who speaks the Malay language, adheres to Malay customs, and follows the Islamic faith (Article 160 [Clause 2] of the Constitution of Malaysia). One hundred and eighty three (183) Malay students, comprising 165 female (92.2%) and 18 males (9.8%), age ranged from 19-24 years with a mean age of 21.86 years ($SD = 1.38$ years), provided completed data for the study. They answered the research material in Malay.

Indonesian sample: Indonesia is the most populous Muslim-majority country (86% are Muslims) with 300 distinct native ethnicities, 742 different languages and dialects, and six officially recognized religions (Islam, Protestantism, Roman Catholicism, Hinduism, Buddhism, and Confucianism). In this sample, an Indonesian is one who originates from Indonesia, speaks Bahasa Indonesia and professes Islam as his/her faith. Thirty (30) Indonesian students, aged between 17 to 24 years, mean age of 20.79 years ($SD = 1.76$ years) participated in the study. There were 18 females (60.0%) and 12 males (40.0%). They completed the research material in the Bahasa Indonesia.

Arab sample: In this sample, an Arab is defined as one who originates from the Middle East and Northern Africa, speaks the Arabic language, and identifies with this ethnic group. They comprised 30 Middle Eastern students, 2 females (6.7%) and 28 males (93.3%), and their age ranged from 17-49 years with a mean age of 22.86 years ($SD = 5.70$). They completed the research material in Arabic.

Measures

Cognition in context. The scale measures differences in six cultural dimensions as well as the relationships among these dimensions, borrowed from past cultural research (Choi & Nisbett, 1998; Hofstede, 1980; Markus & Kitayama, 1991; Nisbett et al., 2001; Peng & Nisbett, 1999). It includes the cognitive dimensions of Analytic-Holistic thinking (AH), Hypothetical-Concrete reasoning (HC), Differentiation Dialectical Thinking (DD), Attributional Dispositional (ATTDIS), Attributional Situation (ATTSIT) as well as the values dimensions of Power Distance (PD) and Tolerance for Uncertainty (TU).

To tap differences in these six cultural cognitive and values dimensions among groups, a vignette about opening a factory in the participant's country of origin was presented

to participants. Each of the cultural dimensions was represented by 8 items, 4 supporting each end of the dimension, with a total of 48 items. Two items were used as practice items, making a final total of 50 items. Participants rated each item on a scale ranging from 1 (Not Important) to 6 (Very Important). Each dimension was scored separately, and high scorers were predicted to possess the skills and abilities to make clear judgments based on available decision choices.

An example of each item for each dimension is as follows: “Analysis can overcome unexpected complications” (AH); “Change plans based on imagined outcomes” (HC); “Tell friends and relatives about your problems” (DD); “Workers expect to be told what to do” (PD); “Settle on one option” (TU); “The competence of the Financial Advisor” (ATTDIS); and “The political impact of a recent election” (ATTSIT).

Cronbach alpha values of these dimensions in the present sample were .65 for AH, .53 for TU, .65 for HC, .57 for PD, .90 for DD, .91 for ATTDIS and .93 for ATTSIT.

Dynamic cognition. This measure used two unfolding scenarios to assess complex cognition including sense making and information use as well as decision choices and their justification. The first scenario assessed the importance of information type for sense making during a potentially dangerous situation. It described a fire emergency in a school, with limited information provided to create uncertainty. As the scenario unfolded, more information was provided and participants’ responses were sought. The second scenario assessed the perceived usefulness of information based on its source presented during an important business meeting. It conveyed decision making under time pressure and high stakes and included queries regarding the value given to personal vs. institutional information (personal information referred to information obtained from informal sources like friends and family while institutional was information from formal sources like published reports) and to dispositional vs. situational information (dispositional information was information about the company while situational information was about the external environment of the company such as the industry and the economic climate where the company was located).

Both scenarios requested participants to choose among options and explain their choices. It tapped differences in decision choices and the underlying reasons for those choices. Both used close-ended and open-ended questions. For the first scenario, two questions measured the initial decision after a scenario was presented, and changes in decision making, after some information were added to the scenario. The follow-up questions measured the decision making process and the problem solving techniques used by participants. The second scenario on the business meeting included questions regarding the value given to personal vs. institutional information, and to dispositional vs. situation information.

For both the scenarios, scores were computed for changes in decision, usefulness of information and approaches, and resolution of conflicting choices.

Translation and back translation of measures

The measures, as well as the instructions and supporting materials (cover letter, consent form), were in the English language (referred to as “original language”), but for the purposes of this research, they were first translated into Bahasa Malaysia, Bahasa Indonesia and Arabic (referred to as “target languages”) of the cultural groups, Malays, Indonesians, and Arabs, respectively. From the target languages, the measures were back-translated into

the original language, English. Comparisons were made of the target and original language for each type of measure. Discrepancies were rectified through consultation with language experts.

Procedure

The testing complied with the general instructions provided for the research. These were translated into the target language. Prior to the testing session, each participant was asked to sign the consent form. The testing was conducted in groups of about 25-30 students per group. At the start of the session, participants were briefed on the study, and they could ask questions at this point.

Data analysis

The data were analyzed using SPSS (Statistical Package for Social Sciences). Means, standard deviations, and ANOVA (Analysis of Variance) were performed on the data.

Results

Cognition in Context

The Cognition in Context scales measured performance on Analytic-Holistic thinking (AH), Tolerance of Uncertainty (TU), Hypothetical-Concrete thinking (HC), Power Distance (PD), Differentiation Dialectical thinking (DD), and Attributional Dispositional (ATTDIS) and Attributional Situation (ATTSIT).

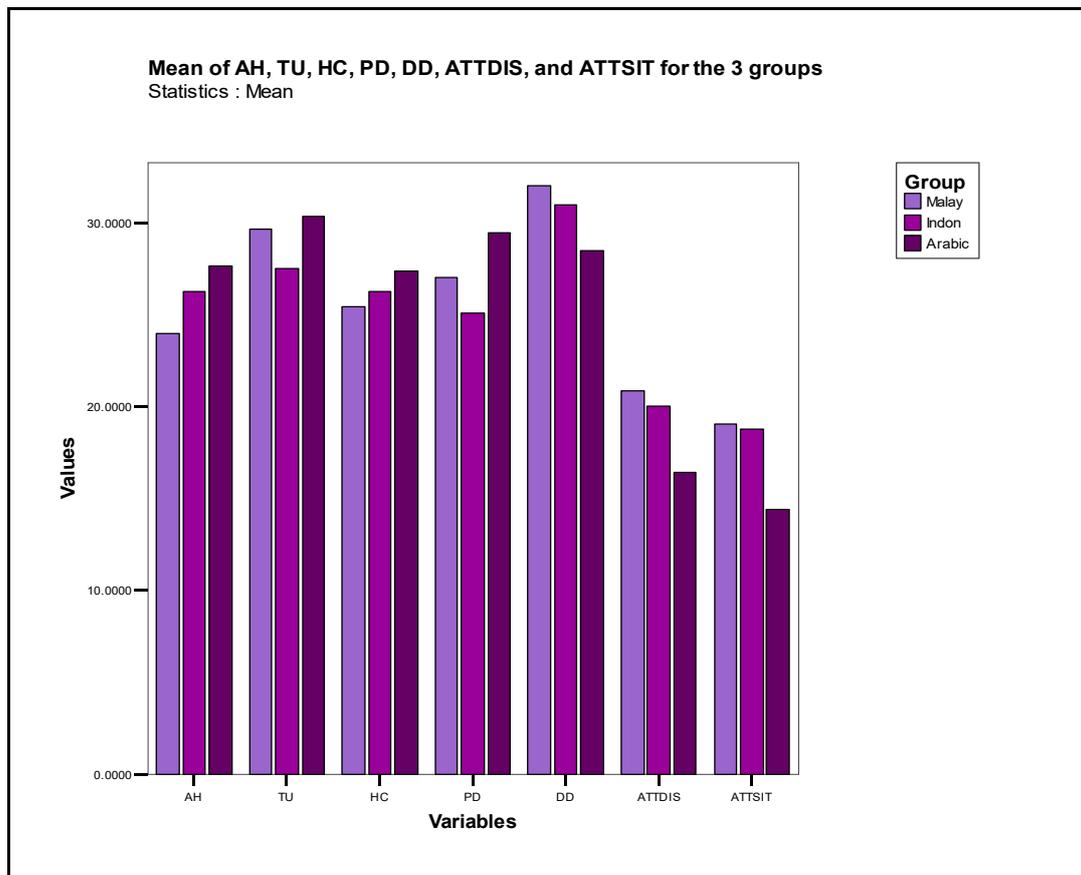


Figure 1. Mean of AH, TU, HC, PD, DD, ATTDIS, ATTSIT for the Three Groups

The results of the one-way ANOVA (see Table 1) showed that there were significant differences for all the subscales.

Post Hoc tests (Table 2) showed significant differences were found in all combination of the three groups for PD, with the biggest difference between Indonesians and Arabs; between the Malays and Indonesians on AH and TU, between the Malays and Arabs on AH, HC, DD, ATTDIS, and ATTSIT. The Indonesians and Arabs also differed in performance on TU, ATTDIS, and ATTSIT. Figure 1 summarizes the results.

Table 1

One-Way Analysis of Variance for the Cognition in Context Subscales

Source	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>p</i>
Analytic-Holistic Thinking, AH					
Between groups	2	447.59	223.79	28.13	.0001
Within groups	257	2044.43	7.96		
Total	259	2492.02			
Tolerance of Uncertainty, TU					
Between groups	2	141.14	70.57	7.60	.001
Within groups	255	2369.33	9.29		
Total	257	2510.47			
Hypothetical-Concrete Thinking, HC					
Between groups	2	105.88	52.94	8.31	.0001
Within groups	256	1631.80	6.37		
Total	258	1737.68			
Power Distance, PD					
Between groups	2	289.09	144.55	9.70	.0001
Within groups	256	3815.04	14.90		
Total	258	4104.13			
Differentiation Dialectical Thinking, DD					
Between groups	2	327.68	163.84	5.77	.004
Within groups	254	7208.49	28.38		
Total	256	7536.17			
Attributional Disposition, ATTDIS					
Between groups	2	516.97	258.49	24.59	.0001
Within groups	257	2701.24	10.51		
Total	259	3218.21			
Attributional Situational, ATTSIT					
Between groups	2	560.05	280.02	31.26	.0001
Within groups	257	2302.49	8.96		
Total	259	2862.54			

Table 2

Post-Hoc Multiple Comparisons for Cognition in Context

Scales	(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
Analytic- Holistic Thinking, AH	Malay	Indon	-2.29*	.552	-3.59	-.99
		Arabic	-3.72*	.552	-5.02	-2.42
	Indon	Malay	2.29*	.552	.99	3.59
		Arabic	-1.43	.728	-3.15	.28
Tolerance of Uncertainty, TU	Malay	Indon	2.16*	.609	.73	3.59
		Arabic	-.65	.597	-2.06	.75
	Indon	Malay	-2.16*	.606	-3.59	-.73
		Arabic	-2.82*	.794	-4.69	-.94
Hypothetical- Concrete Thinking, HC	Malay	Indon	-.83	.494	-2.00	.34
		Arabic	-1.93*	.494	-3.10	-.76
	Indon	Malay	.83	.494	-.33	2.00
		Arabic	-1.10	.652	-2.64	.44
Power Distance	Malay	Indon	1.93*	.756	.14	3.71
		Arabic	-2.44*	.756	-4.22	-.66
	Indon	Malay	-1.93*	.756	-3.71	-.14
		Arabic	-4.37*	.997	-6.72	-2.02
Attributional Disposition, ATTDIS	Malay	Indon	.88	.635	-.62	2.37
		Arabic	4.44*	.635	2.95	5.94
	Indon	Malay	-.88	.635	-2.37	.62
		Arabic	3.57*	.837	1.59	5.54
Attributional Situational, ATTSIT	Malay	Indon	.25	.586	-1.13	1.63
		Arabic	4.62*	.586	3.24	6.00
	Indon	Malay	-.25	.586	-1.63	1.13
		Arabic	4.37*	.773	2.54	6.19
Diff. Dialectical Thinking, DD	Malay	Indon	1.01	1.059	-1.49	3.50
		Arabic	3.51*	1.044	1.04	5.97
	Indon	Malay	-1.01	1.059	-3.50	1.49
		Arabic	2.50	1.387	-.77	5.77

Note: *p < .05.

Dynamic Cognition

This test measured decision making performance based on two scenarios. In the first scenario, the fire emergency, participants after reading the scenario had to decide either to stay or leave. They then reviewed additional information and decided the likelihood that they would change their decision based on the information presented. Change scores were used for the analysis. The ANOVA results did not show the three groups to differ in terms of whether new information would influence their decision to stay or to leave.

In the second scenario, participants were presented with a business meeting that involved high stake decisions that had to be made under time-pressure and risk. Participants were then asked to judge the value given four types of information: personal-dispositional, personal-situational, institutional-situational, and institutional-dispositional. The results, presented in Table 3, showed that the groups significantly differed only on the Institutional-Dispositional items. Tukey's post-hoc analysis revealed a significant difference only between the Malay and Arab groups, with Malays placing this source of information as high in value in decision making compared to Arabs (see Table 4).

The business meeting scenario also asked participants to indicate their preference for outcome that was relatively certain vs. those that balanced risk with advantage. No significant difference was found between the groups, implying that the groups place similar values on these two types of approaches.

Table 3

One-Way Analysis of Variance for the Business Meeting Scenario

Source	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>p</i>
Personal-Dispositional Information	2	19.47	9.74	1.55	.215
	257	1619.39	6.30		
	259	1638.86			
Personal-Situational Information	2	22.99	11.50	1.45	.237
	257	2038.56	7.93		
	259	2061.55			
Institutional-Dispositional Information	2	104.62	52.31	8.83	.0001
	256	1516.34	5.92		
	258	1620.96			
Institutional-Situational Information	2	13.58	6.79	.83	.438
	257	2104.96	8.19		
	259	2118.54			

Discussion

The present study investigated cultural differences in complex cognition tasks (via two new macrocognitive measures) among Malay, Indonesian and Arab groups to understand

how the groups make decisions in situations that are uncertain, under time pressure and risky.

As predicted, we observed similarities and differences between the groups in their responses to the two measures. Though the three groups may vary with respect to their traditions and social-political histories, all three are Muslim groups and they are often seen as more collective than Western cultures, with a greater emphasis on group orientation and relationship. As a consequence, interdependence, belongingness, pursuing common goals with others, and maintaining harmonious relationships are highly desired values (Hofstede, 1980; Markus & Kitayama, 1991; Oyserman, Koon, & Kimmelmeier, 2002; Triandis, 1995). In the Dynamic Cognition task, there was very little difference in the responses of the three groups in making sense of new information, decisions and planning. Because this is a new scale, there is also the possibility that it was not sensitive enough to tease out subtle differences in cognition among the three groups, or that the small sample sizes in the two exploratory groups could have exacerbated variance attributable to individual difference variables.

Table 4

Post-Hoc Multiple Comparisons for the Business Meeting Scenario

Scales	(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
Personal- Dispositional Information	Malay	Indon	-.80	.491	-1.96	.36
		Arabic	-.43	.491	-1.59	.73
	Indon	Malay	.80	.491	-.36	1.96
		Arabic	.37	.648	-1.16	1.89
Personal- Situational Information	Malay	Indon	-.56	.551	-1.85	.74
		Arabic	.68	.551	-.62	1.98
	Indon	Malay	.56	.551	-.74	1.85
		Arabic	1.23	.727	-.48	2.95
Institutional- Dispositional Information	Malay	Indon	1.04	.477	-.09	2.16
		Arabic	1.84*	.477	.71	2.96
	Indon	Malay	-1.04	.477	-2.16	.09
		Arabic	.80	.628	-.68	2.28
Institutional- Situational Information	Malay	Indon	-.68	.560	-2.00	.64
		Arabic	.16	.560	-1.17	1.48
	Indon	Malay	.68	.560	-.64	2.00
		Arabic	.83	.739	-.91	2.58

The Cognition in Context task, however, was able to show differences (and also similarities) in decision making. In complex decision making, Arabs are seen to be the most

holistic (AH), showed more tolerance for uncertainty (TU), reported higher power distance (PD), and used more concrete reasoning (HC) than the other two groups.

In terms of reasoning, the Arabs were found to rely more on concrete reasoning as they tend to base planning and decision making on past experience compared to the other two groups. They tend to reason with more precision and seemed to borrow from similar past cases and are reluctant to reinvent the wheel, while the Malays and Indonesians are more flexible. For Arabs, hypothetical reasoning is neither expected nor rewarded (Klein et al., 2008). They also accept inequality between subordinates and superiors where those in power make decisions with intermediaries facilitating and implementing. According to them, high power distance speeds the decision making and saves face if a request or idea is rejected (Klein & Kuperman, 2008). As predicted, the Malay and Indonesian groups are much more similar to one another.

To what extent are the two measures internally reliable? Given that the Dynamic Cognition subscales were made up of two items only, the reliability test was performed on the Cognition in Context measures only. Cronbach alphas were .65 for AH, .53 for TU, .65 for HC, .57 for PD, .90 for DD, .91 for ATTDIS and .93 for ATTSIT. Using a cut-off criterion of .90, it may be concluded that only three sub-scales—ATTDIS, ATTSIT and DD—are reliably consistent. Thus, this has implications on the design of the items and their translations into the target languages.

Conclusion

These two cognition measures have provided an initial look at the effect of culture on dynamic complex cognition. The Dynamic Cognition measure documented how the three cultural groups make decisions based on changes in available information. Our findings however, did not show much difference in the three groups.

The Cognition in Context scale assessed six cognitive and related dimensions in the context of naturalistic situations. The three groups differed on all these dimensions. The Malay and Indonesian groups tend to show more similarities than differences on these dimensions. The Malay and Arab groups, however, were the most different in terms of how they use information to make decisions.

As mentioned earlier, the sample size of the exploratory groups (Indonesians and Arabs) was small which may prevent us from making a definitive comparison. Differences in the gender distribution in the three groups may also have driven the differences observed in the results. Therefore, the findings must be interpreted with caution. Despite this limitation, the data seemed to suggest that the two measures used are promising in understanding cultural differences in complex cognitive tasks.

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