

ADAPTATION OF THE WISC-111 IN SUDAN AND JAPAN : A CROSS-CULTURAL STUDY

OMAR KHALEEFA (PHD)* Psychology – Khartoum, SUDAN

okhaleefa@hotmail.com

Abstract: A number of cross-cultural studies have been carried out particularly comparing the processes of translation and adaptation of Wechsler Intelligence Scale for Children-Third Edition (WISC-111) in many cultures and countries in Europe and Asia. No cross-cultural studies were carried out comparing adaptation of tests in Japan with African and Arab countries. The aim of the present study is to fill this gap by comparing the adaptation process of the WISC-111 in Sudan, as a poor African country, and Japan as a rich Asian country as well as to compare the performance of Sudanese and Japanese children in subtests. In Sudan, the WISC-111 (6-16 years) was translated from English to Arabic and back translated from Arabic to English and in Japan the test was translated from English to Japanese and back translated from Japanese to English. The study showed that performance tests are identical in all countries except in Sudan and Japan. Psychologists in the two countries were highly sensitive to their environment and the results showed that the WISC-111 has generally enjoyed adequate structural equivalent in Sudan as well as Japan. The adapted test was applied to a group of 330 and 1125 children in Sudan and Japan, respectively. The most remarkable finding is that the WISC-111 has high level of reliability and validity in the two countries. In Japan, the time limit for some subtests was shortened from 120 to 90 seconds, By contrast, in Sudan was increased from 120 to 150 seconds. Additionally, the study showed that Japanese children performed better in visio-spatial tests while Sudanese performed better in verbal tests

Introduction

Many conceptual and theoretical cross-cultural issues regarding cognitive processes have been investigated (Georgas, 2003). Principles of translation, adaptation and standardization of intelligence tests to other cultures have been outlined as well (Van de Vijver, 2003). The past and present assessment of children intelligence by Wechsler scales has been investigated too (Saklofske., Weiss., Beal., & Coalson, 2003). Not only methodology of combining the WISC-111 data sets has been established (Van de Vijver, Mylonas, Pavlopoulos, & Georgas, 2003) but also results and comparative analysis of the WISC-111 across many cultures have been presented in details (Georgas, Van de Vijver, Weiss, & Saklofske, 2003).

Several issues regarding cultural similarities and differences with reference to cognitive processes or intelligence have been discussed by cross-cultural psychologists. For example, variations in languages; items specific to cultures; level of motivation and performance speed (Jensen, 1980; Hambleton, 1994; Khaleefa, Taha & Ashria, 1995; Van de Vijver & Tanzer, 1997) and discrepancies between verbal and performance tests (Lynn, 1977, 1982; Lynn & Hampson, 1985, 1986; Nagoshi & Johnson, 1987, Ueda, 1978; Vernon, 1982) are cases in point. According to Georgas et al certain subtests of the WISC-111 did not require much revision. This was the case mostly with the performance subtests, but also with some verbal tests such as Comprehension and Similarities. The test constructor should either attempt to keep the number of adapted items as small as possible, or risk the possibility of changing the construct, or not being able to demonstrate its equivalence (Georgas, Van de Vijver, Weiss & Saklofske, 2003).

A number of cross-cultural studies have been carried out particularly comparing the processes of translation, adaptation and standardization of the WISC-111 (Wechsler, 1991) in eleven

countries, including Japan (Ueno & Nakatani, 2003), South Korea (Kwak, 2003), Taiwan (Chen, Chen & Zhu, 2003), USA, (Weiss, 2003), Canada (Saklofske, 2003), United Kingdom (McKeown, 2003), France and French speaking Belgium (Gregoire, 2003), Netherlands and Flemish –speaking Belgium (Schittekatte, Fort, Resing, Vermeir, & Verhaeghe, 2003), Germany (Tewes, 2003), Austria and Switzerland (Rossmann & Schallberger, 2003), Sweden (Sonnander & Ramund, 2003), Lithuania (Gintiliene & Girdzijauskienė, 2003), Slovenia (Boben & Bucik, 2003), and Greece (Georgas et al, 2003). One observation is that this rich and outstanding cross-cultural study did not include sample from other cultural zones such as South America, South and West Asia, Africa, or the Middle East.

Additionally, a number of cross-cultural studies have been carried out comparing and contrasting cognitive processes or intelligence of Japanese and many groups in the West as well as in Asia, e.g., Japanese and Ainu (Hilger, Klett & Watson, 1976), Japanese and Mongoloid (Lynn, 1980), Japanese and Chinese (Stevenson, 1983; Stevenson et al, 1985), Japanese and Taiwanese (Stigler et al, 1982), Japanese and Caucasian in Hawaii (Nagoshi & Johnson, 1987), and Japanese and the British (e.g., Lynn & Hampson, 1986b, Stevenson et al, 1982). Moreover, hundreds of studies were carried out comparing abilities of Japanese and North Americans (e.g., Flynn, 1988; Holloway, 1988; Lynn, 1982, 1983; Lynn & Hampson, 1986b; Misawa, Motegi, Fujita & Hattori, 1984; Stevenson & Azuma, 1983; Vining, 1983).

Two observations can be noted from the previous cross-cultural studies. On the one side, that many studies were conducted comparing Japanese and people from Western and Asian countries in their cognitive processes or intelligence and competences. On the other side, all attempts of translation and adaptation of WISC-111 were carried out in the North of the globe, neglecting countries in the South of the globe. For example, no many studies, to my knowledge, were carried out comparing and contrasting the performance of Japanese with Africans, Arabs or particularly Sudanese children. The aim of the

present study is to fill this gap by comparing the adaptation process of the WISC-111 (Wechsler, 1991) in Sudan as a poor African country and Japan as a rich Asian country as well as to compare the performance of Sudanese and Japanese children in intelligence tests.

History of intelligence research in Sudan and Japan

In Sudan, Scott (1950), carried out the first study of Sudanese intelligence while Badri (1964) published the first book on intelligence about the "Psychology of children drawings" (Khaleefa, 2003). Later on, the Wechsler Adults Intelligence Scale has been introduced to the Sudan in 1987 (Khaleefa, Taha and Ashria, 1995), while Hussain (1988) introduced the revised Wechsler Intelligence Scale- Revised for Children (WISC-R). Besides, Al-Sadig (1992, 2003) adapted the revised as well as the fourth edition of Stanford – Binet Scale in the country. Additionally, Khatib and Motwakkil (2001) introduced the Standard Progressive Matrices to Sudan. Recently, Hussain (2005) adapted the Third Edition of the Wechsler Intelligence Scale in the country (Wechsler, 1991). However, all attempts of research for translation and adaptation of intelligence tests in Sudan were dissertations for MA and PhD thesis in psychology. They were not standardized for professional use in the country but for research purposes.

In Japan, there were many attempts. Firstly, Matsumoto published the first book of more than 1100 pages on the "Psychology of intelligence". Secondly, Miyake introduced Binet-Simon Test to Japan in 1908. Thirdly, Kubo worked hard to construct the Japanese version of Binet-Simon Test in 1918. Fourthly, Tanaka completed the revised version of the Stanford-Binet Scale in 1941. Fifthly, Minami and others completed the standardization of Wechsler-Bellevue Intelligence Scale in 1950. Sixthly, Kodama and Shinagawa standardized the Wechsler Intelligence Scale for Children (WISC) in 1954 and Wechsler Adults Intelligence Scale (WAIS) in 1958 (Sato, Namik, Ando & Hatano, 2003). Interestingly, apart from cross-cultural studies few indigenous studies were conducted about description of an intelligent person in Japan (e.g., Azuma & Kashiwagi, 1987); Japanese conception of and research on human intelligence (Sato, Namiki, Ando & Hatano, 2004); intelligence tests in Japan (Osaka, 1961), and Tanaka Scale for Children-Revised (Kodama, Shinagawa & Moteki, 1978). Importantly, the Third Edition of Wechsler Intelligence Scale for Children (Wechsler, 1991) has been standardized in Japan by the Institute of Psychological Aptitude in 1998 (Ueno & Nakatani 2003).

This brief history of intelligence research in Sudan and Japan suggested that there is a rich experience of translation and adaptation of intelligence tests for 55 years in Sudan since the development of the first test of intelligence by Scott (1950) comparing with 97 years in Japan with the introduction of the Binet-Simon Test by Miyake (1908).

Method

Sample of the WISC-111 in Sudan and Japan
Japanese psychologists, in their standardization sample were careful to avoid sampling bias regarding geographical location. For that reason, they divided Japan into eight geographical regions; selected a representative sample from each one as well as considering age and gender in the stratification. In Japan, the population of children were divided to 12 age groups starting from age 5 to age 16 . The total sample of the Japanese study was 1200 children divided to 12 age groups with 100 children for each one and 50% of both genders. The number of children in the final sample was 1125 representing about 94% of the target sample (Table, 2).

In Japan, testers who had completed training at the WISC-R Skill seminars held by the Japanese Institute of Psychological Aptitude were asked to administer the WISC-111 for the standardization phase. The

children were selected randomly from class –rooms to avoid selection bias (Ueno & Nakatani, 1989).

TABLE (2)
The standardization sample of WISC-111
(Japan)

Age	N	East Japan	West Japan
5	96	58.3	41.7
6	93	61.3	38.7
7	94	69.1	30.9
8	88	59.1	40.9
9	102	67.6	32.4
10	82	67.1	32.9
11	114	62.3	37.7
12	87	59.8	40.2
13	82	63.4	36.6
14	81	58.0	42.0
15	106	69.8	30.2
16	100	53.0	47.0
Total	1125	62.5	37.5
Japan Population		60.9	39.1

Table from Ueno & Nakatani (1998)

In the Sudan, because the country is very heterogeneous, with greater range of economic, urbanization, modernization, education, socioeconomic levels all the sample were selected from Greater Khartoum as a metropolis representing most subcultures in the country. It represents 13% of the total number of children in Sudan. The percentage of females was 50.87% while for males 49.13% (Sudan Statistics, 2004). Greater Khartoum was divided to three areas, Khartoum, Omdurman and Bahari.

In Sudan, a different strategy was used for the sampling selection that is to take a representative sample from suburban areas in the metropolis because they represent both the urban sector of the society as well as rural ones. The target sample of the study was 330 children including children from 11 age groups starting from age 6 to 16 years. The sample was taken randomly from each area. The representative sample of age groups, level of education and gender were considered in the standardization process (Table 3). One observation regarding the sampling process is that the number of Japanese age groups are 12 compared to 11 for the Sudan. The former starts with age group 5 while the later with 6.

TABLE (3)
Standerdization sample of WISC-111 (Sudan)

City	Primary education	Secondary education	Females	Males
Khartoum	87	25	55	55
Omdurmn	86	23	55	55
Bahari	86	23	55	55
Total	259	71	165	165
Percentae	78%	22%	50%	50%

Hussain (2005) Adaptation of WISC-111 in Khartoum State.

Procedures for adaptation of the WISC-111

Due to variations between countries in languages and items specific to cultures many items of intelligence tests may be biased to

specific environment or cultural milieu (e.g., Jensen, 1988; Hambleton, 1994). Intelligence tests need to ensure adequate applicability in the local environment. For this reason, rigorous translation and adaptation of IQ items is needed. In the Sudan, the WISC-111 (Wechsler, 1991) was translated from English to Arabic and back translated from Arabic to English following guidelines outlined by Hambleton (1994). In Japan, the test was also translated from English to Japanese and back translated from Japanese to English for the search of equivalence of meaning or what is called functional and structural equivalent (Portinga, 1989, Van de Vijver, 2003, Van de Vijver & Leung, 1997).

The translated test was applied in Sudan to a group of 110 children from 6-16 years old (Hussain, 2005), while in Japan the tryout test was based on 160 children (Ueno & Nakatani, 2003). In the adapted Sudanese version of WISC-111, for example, among verbal tests, 65% of the Vocabulary items were replaced by items from Arabic that are more suitable to Sudanese children compared to the original items. Among performance tests, 42% of Picture Completion and 54% of Picture Arrangement were replaced by new items suitable to the Sudanese environment. While in Japan, among verbal tests, 93% of Vocabulary items were replaced by words from Japanese rather than direct translation of the original American items. Among performance tests, 40% of Picture Completion has been replaced by new items (Table 1).

Both Sudanese and Japanese psychologists have conducted higher level of changes for the Vocabulary Test. New items were selected from Arabic language as well as from Japanese one, which were not a result of a direct translation of the American original items. Psychologists in both countries considered the issue of the difficulty of the new items. This form of rigorous adaptation is more suitable to the local environment in Sudan and Japan. For the Information Test, both Sudanese and Japanese psychologists replaced almost half of the American items by local historical persons, famous indigenous individuals and local geographical places.

In the adaptation process, Japanese psychologists were highly sensitive to their environment with respect to the issue of disabled people. For this reason, items related to missing organs in the human body or parts of animals in the Picture Completion test were replaced with those on things. Perhaps, after World War II the issue of the handicapped became very sensitive in Japan. For that reason, for example, they do not like to show the picture of an animal with a missing leg to a Japanese handicapped child with one leg. Interestingly, in Sudan, psychologists have also been sensitive to the issue of peace as well as the disabled. For example, in the test of Picture Arrangement, one story is replaced by a handicapped individual showing that in the indigenous culture there is always some one to help. Regarding the issue of peace, careful scenarios were selected from different regions in the country responded to the issue of equality and justice after 20 years of destructive civil war,

TABLE (1)
Percentage of items changed in the
Sudanese and Japanese WISC-111

Subtest	Sudan	Japan
Pilot study	No= 110	No = 160
Information	51%	57 %
Vocabulary	65 %	93 %
Similarities	60 %	37 %
Picture Completion	42 %	40 %
Picture Arrangement	50 %	21 %
Total	54 %	50 %

Results

Reliability of WISC-111 in Sudan and Japan

Table (4) shows the split half reliability for 10 subtests as well as for verbal intelligence, performance intelligence and full IQ. There is no information regarding split half reliability for Coding, Mazes and Symbol Search in Sudan. For this reason, we did not compare the two countries with respect to these three subtests. The average reliability for verbal IQ is equal in both countries which is 0.93. As for higher reliability it is found for performance IQ in Japan (0.90) compared to Sudan (0.76) and the two countries show more or less similar level of Full IQ which is 0.94 for Sudan and 0.95 for Japan. In Sudan, the average reliability for the 10 subtests is ranged between $r = 0.67$ for Object Assembly to $r = 0.84$ for Comprehension, while for Japan the range is between $r = 0.64$ for Object Assembly to $r = 0.87$ for Digit Span. Both countries show lower level of reliability for Object Assembly. This is perhaps due to the influence of practice and improvement of performance in this practical test.

TABLE (4)
Split half reliability of WISC-111 in Sudan
and Japan

Test	Sudan	Japan
Information	0.79	0.81
Similarities	0.75	0.69
Arithmetic	0.68	0.80
Vocabulary	0.80	0.83
Comprehension	0.84	0.78
Digit Span	0.70	0.87
Picture Completion	0.79	0.80
Picture Arrangement	0.81	0.71
Block Design	0.77	0.85
Object assembly	0.67	0.64
Verbal IQ	0.93	0.93
Performance IQ	0.76	0.90
Full Scale IQ	0.94	0.95

Validity of the WISC-111 in Sudan and Japan

The study shows that in Sudan the validity of the test, with respect to the correlation coefficients between WISC-111 and WAIS-R for a group of 30 children (16 years), is $r = 0.77$, while for Japan the correlation between WISC-111 and Tanaka-Binet IQ scores for a group of 38 children is 0.74. The study suggested that WISC-111 has strong correlation with other intelligence tests in Sudan and Japan. The correlation coefficient is higher in the case of Sudan.

Furthermore, the validity of WISC-111 in Sudan and Japan was measured by the intercorrelation of subtests scaled scores. In Sudan, the highest intercorrelation among verbal tests is between Vocabulary and Similarities $r = 0.79$ and the lowest is between Arithmetic and Digit Span $r = 0.51$. As for Japan, the highest intercorrelation among verbal tests is between Vocabulary and Information as well as between Vocabulary and Comprehension which is $r = 0.62$ and the lowest is between Digit Span and Comprehension $r = 0.29$.

In Japan, the highest intercorrelation among performance tests is between Coding and Symbol Search $r = 0.55$ and the lowest is between Mazes and Picture Completion $r = 0.21$. In Sudan, the highest intercorrelation among performance tests is

between Picture Arrangement and Object assembly $r = 0.60$ and the lowest is between Block Design and Picture Completion $r = 0.45$. While for Japan, the highest intercorrelation coefficient between verbal and performance tests is between Block Design and Arithmetic $r = 0.49$ and the lowest is between Mazes and Vocabulary as well as between Mazes and Comprehension $r = 0.17$. For the Sudan, the highest intercorrelation is between Picture Arrangement and Vocabulary $r = 0.67$ and the lowest is between Picture Completion and Arithmetic $r = 0.32$.

The study shows that in both countries, the verbal tests had higher intercorrelation with other verbal tests compared to performance tests. Additionally, in the two countries vocabulary had the highest intercorrelation whereas Digit Span has the lowest one. Interestingly, in both of them, Vocabulary Test has the highest level of items changed which is in Japan and Sudan 93%, 65%, respectively. This might reflect the fact that the new Japanese and Arab vocabularies enjoyed adequate applicability in the local environment. However, in Japan, performance tests had higher intercorrelations with other performance ones than with the verbal tests, while for Sudan, performance tests had higher intercorrelation with other verbal tests than with performance tests.

Cross-cultural issues of WISC-111 in Sudan and Japan

The most remarkable finding of the present study is that the WISC-111 enjoyed high level of reliability and validity in Sudan and Japan. This result reflects that there are many similarities in cognitive processes between children from a poor African country such as Sudan and children in a rich Asian country such as Japan. Additionally, there are other important cross-cultural issues can be discussed with reference to the adaptation of WISC-111 in Sudan and Japan.

Firstly, in Japan, it is generally acknowledged that there are no cultural differences in different localities (Ueno & Nakatani, 1998). In other words, Japanese environment and culture is more homogeneous. However, in Sudan, it is generally acknowledged that there are great variations between regions; in term of climate, plant cover, economic activity, tribes, dialects, level of education, socioeconomic measures, urbanization, as well as the degree of modernization (Khaleefa, 1999; Khaleefa, Taha & Ashria, 1995). In brief, Sudanese environment and culture is more heterogeneous. For this reason, it is so difficult in the situation of Sudan to have a good representative sample of all cultural, social, economic and urbanization levels. This might be a source of bias in sampling.

Secondly, Psychologists in Sudan and Japan have high level of adapted items of the WISC-111 subtests compared to other countries (Khaleefa, 2005; Van de Vijver et al, 2004). For example, in Information, Vocabularies, Similarities, Picture Completion and Picture Arrangement the percentage of adapted items in the Sudan and Japan is 54% and 50%, respectively. Vijver et al (2004) argues that "whereas Korea and Taiwan are close to each other, with relatively low numbers of adapted items, Japan had the highest proportion of all countries. The reason behind the deviant position of Japan is not clear" (p. 266). According to Vijver et al, performance tests appear to travel well across country, cultural and languages border. These tests are identical in all countries except Japan (Vijver, et al, 2004) and Sudan (Hussain, 2005, Khaleefa, 2005; Khaleefa, Taha and Ashria, 1995). Psychologists in Sudan and Japan did their best to construct indigenous scenarios for Picture Arrangement as well as Picture Completion that enjoyed adequate applicability in the local environment with high level of reliability, validity and sensitivity.

Thirdly, It is known that Japanese children show high test

performance on speed tests, including Coding, Symbol Search, Picture Arrangement, Block design, and Mazes (Ueno & Nakatani, 2004). Additionally, Lynn (1977, 1982, 1988) found that Japanese children performed higher on visio-spatial tests in all age groups between 6-16 years on McCarthy test of intelligence. The differences between verbal and performance tests were significant. By contrast, Sudanese children's performance is higher on verbal intelligence compared to performance intelligence (Khaleefa, 2005, Khaleefa Taha and Ashria, 1995) and the differences between verbal and performance tests on the WISC-111 were quite significant. Japanese culture may be characterized by putting more emphasis on figurative, visual, spatial, and practical aspects, while Sudanese culture puts more emphasis on verbal, oral and auditory aspects (Khaleefa, 2005). One might ask whether the high level of scores in performance tests in Japan reflects higher level of effort and motivation or not? By contrast, is the low level of scores of performance tests in Sudan reflects lower level of effort and motivation?

These results raise many questions regarding the educational, cultural, social, environmental and perhaps neurological aspects for the differences between VIQ and PIQ. Some studies analyzed the differences between verbal and performance tests to lateralization or hemispheric specialization. It has been well known that the verbal abilities are represented in the left hemisphere and the visio-spatial in the right one (Kaufman, 1994; Lynn, 1987). According to this form of analysis, perhaps, the left hemisphere of Sudanese children may be more active or efficient while the right hemisphere of the Japanese children may be more active or efficient. Perhaps, environmental factors may also play crucial role in cross-cultural differences in manifestation of intelligence. Specifically, the environmental richness might be reflected in higher scores of Japanese children in performance or visio-spatial aspects of intelligence is due to their rich technological advancement. Similarly, the Sudanese children's higher scores in the verbal and auditory aspects of intelligence may be attributed to their rich oral culture and environment.

Interestingly, Japanese when they compare people in terms of intelligence they do not verbalize their judgments. Instead, they often discuss who is diligent, works hard and so forth, on academic and occupational tasks. The dimension which is considered critical for describing people's task performance may vary from culture to another (Sato, Namiki, Ando & Hatano, 2004). However, in Sudan, people verbalize their judgments by telling who is intelligent more than who is working hard. The culture puts more emphasis on intelligence rather than effort. Effort, task commitment and motivation are important for achieving high level of talent or giftedness. Generally, high level of achievement is attributed to mental abilities rather than effort. On the other hand, Japanese attributed higher level of performance to effort rather than to abilities. According to this understanding, everyone can achieve a very high level of performance in any domain if he or she engages in exercise or deliberate practice for an extended period of time (Sato, Namiki, Ando & Hatano, 2004). This view attributes achievement to effort not to innate ability. Intelligence in Japan can be a result of experience and education (Shimahara, 1986).

Fourthly, the higher level of performance of Japanese children on the speed subtests of the WISC-111 raises a further question with respect to cross-cultural differences in the level of effort or motivation. The time limit for some subtests and some items was shortened (e.g., Coding and Symbol Search) which were originally 120 seconds, shortened to 90 seconds, and more

difficult items were added to some subtests (e.g., Block Design). By contrast, the Sudanese children performed less in speed subtests. For that reason a suggestion was made for increasing the time for speed subtests by 30 seconds. This is in contrast to Japanese who decreases the time by 30 seconds. Here, it seems a rich cross-cultural comparison between Japanese children who need 90 seconds to complete some performance tests (Ueno & Nakatani, 2003); American children who need 120 seconds (Wechsler, 1991) and Sudanese children who need 150 seconds (Khaleefa, 2005).

Japanese may be characterized by what Hanato and Holloway (1988) called "belief-in-effort" as a determinant factor of achievement. In the Sudan, since Scott has developed the first test of intelligence in the country, he suggested that Sudanese children need high level of motivation in order to complete the test of intelligence (Scott, 1950). In Sudan, there is a popular saying that "speed is from the devil". Sudanese children in general find difficult in working under time pressure. More cross-cultural discussion with respect to the level of speed, commitment, effort and motivation for performing IQ tests is needed.

Conclusion

Results showed that the WISC-111 has generally enjoyed adequate structural equivalent in Sudan and Japan. Some cross-cultural psychologists suggested that some Western psychological scales showed stability across cultures (e.g., Van de Vijver, 1997, 2003). Our finding provides evidence for the universality of cognitive process across Sudan and Japan. Other researcher reach similar conclusion that the same cognitive process can be manifested in different ways in different cultures (Berry, Portinga, Segall & Dasen, 2002, Van de Vijver, 1997). The question here: can our results obtained in the present study be generalized to other poor African and Arab country with similar social, cultural, environmental, educational, urbanizational and technological development?

References

- . Azuma, H., & Kashiwagi, K. (1987). Descriptors for an intelligent person: A Japanese study. *Japanese Psychological Research*, 29, 17-26.
- . Badri, M. (1964). *The psychology of children drawings* (In Arabic). Beirut: Dar Al-Fath.
- . Boben, D., & Bucik, V. (2003). Slovenia. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) *Culture and children's intelligence: Cross-cultural analysis of the WISC-111* (pp. 181-197). Tokyo: Academic Press.
- . Chen, H., & Chen, Y. (2003). Taiwan. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) *Culture and children's intelligence: Cross-cultural analysis of the WISC-111* (pp. 241-252). Tokyo: Academic Press.
- . Georgas, J. (2003). Cross-cultural psychology, intelligence, and cognitive processes. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) *Culture and children's intelligence: Cross-cultural analysis of the WISC-111* (pp. 23-37). Tokyo: Academic Press.
- . Georgas, J., Paraskevopoulos, I., Besevegis, E., Giannitsas, N. (2003). Greece. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) *Culture and children's intelligence: Cross-cultural analysis of the WISC-111* (pp. 199-213). Tokyo: Academic Press.
- . Georgas, J., Van de Vijver, F., Weiss, L., Saklofske, D. (2003). A cross-cultural analysis of the WISC-111. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) *Culture and children's intelligence: Cross-cultural analysis of the WISC-111* (pp. 277-312). Tokyo: Academic Press.
- . Gintiliene, G., & Girdzijauskienė, S. (2003). Lithuania. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) *Culture and children's intelligence: Cross-cultural analysis of the WISC-111* (pp. 165-179). Tokyo: Academic Press.
- . Gregoire, J. (2003). France and French-speaking Belgium. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) *Culture and children's intelligence: Cross-cultural analysis of the WISC-111* (pp. 89-108). Tokyo: Academic Press.
- . Flynn, J. (1988). Japanese intelligence simply fades away. *The Psychologist: Bulletin of the British Psychological Society*, 9, 348-350.
- . Hambleton, R. (1994). Guidelines for adapting educational and psychological tests. A progress report. *European Journal of Psychological Assessment*, 10, 229-244.
- . Hatano, G. (1982). Should parents be teachers too? A Japanese view. *Dokyo University Bulletin of Liberal Arts*, 17, 54-72.
- . Hilger, S., Klett, W., & Watson, C. (1976). Performance of Ainu and Japanese six-year-olds on the Goodenough-Harris Drawing Test. *Perceptual and Motor Skills*, 42, 435-438.
- . Holloway, S. (1988). Concept of ability and effort in Japan and the United States. *Review of Educational Research*, 58, 327-354.
- . Hussain, A. (2005). Adaptation of WISC-111 in Khartoum State, Sudan. Unpublished MA thesis, university of Al-Nileen, Khartoum, Sudan.
- . Jensen, R. (1980). *Bias in mental testing*. New York: Free Press.
- . Kaufman, A. (1994). *Intelligent testing with the WISC-111*. New York: Wiley.
- . Khaleefa, O. (2005). Environmental sensitivity of Sudanese and Japanese psychologist in adapting intelligence tests. Unpublished manuscript, Graduate School of Human and Environmental Studies, Kyoto University, Japan.
- . Khaleefa, O. (1999). Research on creativity, intelligence and giftedness: The case of the Arab world. *Gifted and Talented International*, 14, 21-29.
- . Khaleefa, O., Erdos, G., & Ashria, I. (1996). Creativity, culture and education. *High Ability Studies*, 7, 157-167.
- . Khaleefa, O., Erdos, G., & Ashria, I. (1996). Creativity testing in an indigenous Afro-Arab Islamic culture. *The Journal of Creative Behavior*, 30, 282-286.
- . Khaleefa, O., Taha, Z., & Ashria, I. (1995). Adaptation of intelligence scales in an Arab culture: The Sudanese experience. *The Arab Journal of Education*, 15, 106-131.
- . Kodama, H., Shinagawa, F., & Moteki, M. (1978). *Wechsler Intelligence Scale for Children-Revised*. Tokyo: Nihon Bunka Kagakusha.

- . Kwak, K. (2003). South Korea. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) Culture and children's intelligence: Cross-cultural analysis of the WISC-111 (pp. 215-240). Tokyo: Academic Press.
- . Lynn, R. (1977). The intelligence of the Japanese. *Bulletin of the British Psychological Society*, 30, 69-72.
- . Lynn, R. (1980). On the intelligence of the Japanese and other Mongoloid peoples. *Personality and Individual Differences*, 1, 95-96.
- . Lynn, R. (1982). IQ in Japan and the United States shows a growing disparity. *Nature*, 297, 222-223.
- . Lynn, R. (1983). Lynn replies. *Nature*, 306, 292.
- . Lynn, R. (1988). Educational achievement in Japan: Lessons for the West. London: Macmillan.
- . Lynn, R., & Hampson, S. (1986a). Intellectual abilities of Japanese children: McCarthy Scales of Children's Abilities. *Intelligence*, 10, 41-58.
- . Lynn, R., & Hampson, S. (1986b). The rise of national intelligence: Evidence from Britain, Japan and the USA. *Personality and Individual Differences*, 7, 23-32.
- . Mckeowin, P. (2003). United kingdom. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) Culture and children's intelligence: Cross-cultural analysis of the WISC-111 (pp. 77-88). Tokyo: Academic Press.
- . Misawa, G., Motegi, M., Fujita, K., & Hattori, K. (1984). A comparative study of intellectual abilities of Japanese and American children on the Columbia Mental Maturity Scale. *Personality and Individual Differences*, 5, 173-181.
- . Nagoshi, C., & Johnson, R. (1987). Cognitive ability profiles of Caucasian vs. Japanese subjects in the Hawaii family study of cognition. *Personality and Individual Differences*, 8, 581-584.
- . Osaka, R. (1961). Intelligence test in Japan. *Psychologia*, 4, 218-234.
- . Oyama, T., Sato, T., & Suzuki, Y. (2001). Shaping of scientific psychology in Japan. *International Journal of Psychology*, 36, 396-406.
- . Rossmann, P., Schallberger, U. (2003). Austria and Switzerland. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) Culture and children's intelligence: Cross-cultural analysis of the WISC-111 (pp. 137-148). Tokyo: Academic Press.
- . Saklofske, D. (2003). Canada. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) Culture and children's intelligence: Cross-cultural analysis of the WISC-111 (pp. 61-75). Tokyo: Academic Press.
- . Saklofske, D., Weiss, L., Beal, A., Coalson, D. (2003). The Wechsler scales for assessing children's intelligence: Past to present. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) Culture and children's intelligence: Cross-cultural analysis of the WISC-111 (pp. 3-21). Tokyo: Academic Press.
- . Sato, T., Namiki, H., Ando, J., & Hatano, G. (2004). Japanese conception of and research on human intelligence. In R. Sternberg (Ed.). *International handbook of intelligence* (pp. 302-324). Cambridge: Cambridge University Press.
- . Schittekatte, M., Kort, W., Resing, W., Vermeir, G. (2003). The Netherlands and Flemish-speaking Belgium. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) Culture and children's intelligence: Cross-cultural analysis of the WISC-111 (pp. 109-119). Tokyo: Academic Press.
- . Shimahara, N. (1986). The cultural basis of student achievement in Japan. *Comparative education*, 22, 19-26.
- . Sonnander, K., & Ramund, B. (2003). Sweden. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) Culture and children's intelligence: Cross-cultural analysis of the WISC-111 (pp. 149-163). Tokyo: Academic Press.
- . Stevenson, H., & Azuma, H. (1983). IQ in Japan and the United States: Methodological problems in Lynn's analysis. *Nature*, 306, 291-292.
- . Stevenson, H., Stigler, J., Lee, S., Lucker, W. (1985). Cognitive performance and academic achievement of Japanese, Chinese and American children. *Child Development*, 56, 718-734.
- . Tewes, U. (2003). Germany. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) Culture and children's intelligence: Cross-cultural analysis of the WISC-111 (pp. 121-135). Tokyo: Academic Press.
- . Ueda, R. (1978). Standardization of the Denver developmental Screening Test on Tokyo children. *Developmental medicine and child Neurology*, 20, 647-656.
- . Ueno, K., & Nakatani, I. (2003). Japan. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) Culture and children's intelligence: Cross-cultural analysis of the WISC-111 (pp. 215-225). Tokyo: Academic Press.
- . Vernon, P. (1982). The abilities and achievements of Orientals in North America. New York: Academic.
- . Wechsler, D. (1974). Wechsler Intelligence Scale for Children-Revised. New York: Psychological Corporation.
- . Weiss, L. (2003). United States. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) Culture and children's intelligence: Cross-cultural analysis of the WISC-111 (pp. 41-59). Tokyo: Academic Press.
- . Van de Vijver, F., Mylonas, K., Pavlopoulos, V., Georgas, J. (2003). Methodology of combining the WISC-111 data sets. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) Culture and children's intelligence: Cross-cultural analysis of the WISC-111 (pp. 265-276). Tokyo: Academic Press.
- . Van de Vijver, F. (2003). Principles of adaptation of intelligence tests to other cultures. In J. Georgas, L., Weiss., F. Van de Vijver., & D. Saklofske (Eds.) Culture and children's intelligence: Cross-cultural analysis of the WISC-111 (pp. 255-263). Tokyo: Academic Press.
- . Van de Vijver, F., & Tanzer, N. (1979). Bias and equivalence in cross-cultural assessment: An overview. *European review of Applied Psychology*, 41, 263-279.
- . Vining, D. (1983). Mean IQ differences in Japan and the United States. *Nature*, 301, 738.

* Institute of Economic and Social Studies, Sudan