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GENDER DIFFERENCES IN GENERAL KNOWLEDGE: FOUR CROATIAN STUDIES

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Abstract

Gender differences in general knowledge are reported for four studies of school students aged 15 and 18 years in Croatia (total *n* =4430) and the results compared with those obtained on college students in the United States and in Northern Ireland. The results are generally consistent across the three countries in finding that males had more knowledge of the domains of discovery and exploration, finance, geography, history, politics, science and sport. Females had more knowledge in the domains of cookery and medicine. The results extend knowledge in this area by showing the cross-cultural consistency of gender differences in different domains of knowledge, and in showing that these differences are present in mid-adolescence. It is noted that the domains of which males have more general knowledge are concerned with competition between males in sport, current affairs, history and politics. The domains of which females have more general knowledge are concerned with nuturance, expressed in interest in the domains of medicine and nutrition. These gender differences in interests are interpreted in terms of evolutionary psychology.

Keywords: gender differences, general knowledge

Running head: gender differences in general knowledge

1. Introduction

General knowledge can be considered as a unitary construct and can also be broken down into a number of domains, such as knowledge of history, sport, literature, science and so on. In this regard general knowledge is analogous to general intelligence, which has likewise been broken down into components such as verbal, spatial, numerical, reasoning, etc. abilities in hierarchical factor models such as that of Carroll (1993). Research applying a hierarchical factor model to general knowledge has identified some twenty domains (Lynn, Irwing & Cammock, 2002; Rolfhus & Ackerman, 1999). These have been condensed into six higher order factors identified as Current Affairs, Family, Physical Health and Recreation, Fashion, Arts and Sciences (Lynn, Irwing & Cammock, 2002).

It has been well established that there are gender differences in the components of general intelligence, such that on average males have higher spatial and mechanical abilities, while females have higher word fluency and location memory (Kimura, 1999; Halpern, 2000). Analogous gender differences have been reported in the domains of general knowledge in studies in the United States and Northern Ireland. These studies have found that men typically have more general knowledge than women in the domains of sport, science, finance, politics and history, while women have more general knowledge than men in the domains of fashion, nutrition and medicine. These differences have been reported in the United States by Ackerman, Bowen, Beier & Kanfer (2001) and Rolfhus & Ackerman (1999), and in Northern Ireland by Irwing, Cammock & Lynn (2001) and Lynn, Irving & Cammock (2002).

A further parallel between intelligence and general knowledge is that there has been interest in the causes of the gender differences. In the case of intelligence, the gender differences have been explained as a result of differential socialisation in childhood or,

alternatively, by hormonal and biological factors (Kimura, 1999). The same alternative explanations can be advanced for the gender differences in different kinds of general knowledge. There is, however, a difference in the gender differences in intelligence and general knowledge in that the gender differences in the sub-factors of intelligence have been established in numerous studies for at least half a century. It is sixty years since Hobson (1947) reported that (among 15 year olds) males have higher average spatial abilities while females have higher word fluency ability and these differences have been confirmed in numerous subsequent studies. In contrast, it is only within the last decade that gender differences have been reported in the sub-factors of general knowledge. For this reason, it would be desirable to strengthen the empirical base of gender differences in the sub-factors of general knowledge.

This is the primary objective of the present paper. We present the results of four studies of gender differences in the sub-factors in general knowledge among senior school students in Croatia and compare these with results obtained in the United States by Ackerman, Bowen, Beier & Kanfer (2001) and in Northern Ireland by Lynn, Irwing & Cammock (2002). The hypothesis to be tested is that gender differences in the sub-factors in general knowledge in Croatia will be similar to those reported in the United States and Northern Ireland.

2. Method

There have been four studies in south-east European country Croatia of gender differences in general knowledge that have been reported in Croatian and that are summarized here. These are (1) Stanuga (1987) on a sample of 606 8th grade school students aged approximately 15 years in Zagreb (335 girls); (2) Novačić (1989) on a sample of 1376 (720 girls) 8th grade school students aged approximately 15 years in Zagreb (capital of Croatia),

three big cities, few smaller towns and villages in Croatia; (3) Zarevski & Gačnik-Del Negro (1998) on a sample of 1174 (574 girls) 8th grade school students sampled from four geographical areas as in Novačić (1989) and (4) on a further sample of 1174 (601 females) high school graduates aged approximately 18 years. All these samples were drawn from socially representative schools attended by both boys and girls and are considered to be representative of high school students in Croatia. Examples of items are given in the Appendix.

In each of these studies somewhat different tests (items) were used to assess familiarity and knowledge of specific domains. All these tests had the same response format: five possible answers were given and participants had to choose the correct answer among these five. Participants were told they will not be given negative points for incorrect answers. The number of items used in each of these studies is specified in Table 1. Examples of items are given in the Appendix. The internal consistency reliabilities for each of these tests (and not for each domain) were calculated for female and male sample separately. These values are also shown in Table 1.

3. Results

The results of the four Croatian studies are given in Table 1 together with, for comparative purposes, the results of the United States study of college students by Ackerman, Bowen, Beier & Kanfer (2001) and the Northern Ireland college students by Lynn, Irving & Cammock (2002). Gender differences are expressed as *d*s (the differences between the means of males and females divided by the pooled standard deviation). Positive *d*s denote higher means obtained by males, while negative *d*s denote higher means obtained by females.

Effect size is a useful measure of the magnitude of difference obtained by statistical testing. It presents the difference between two means divided by the pooled standard deviation of both samples. In other words, it indicates the level of overlap between two distributions (the magnitude of the independent variable's effect). In our case, such measure is almost inevitable since the data on the statistical significance by itself does not necessarily represent realistic indicator of the magnitude of this difference. Namely, our samples are relatively large which results in the smallest difference being statistically significant, although this difference does not have any practical implications; e.g. concluding that men scored statistically higher compared to women, based on the result that 45% of men and 44% of women answered correctly on a certain item, does not make much practical sense. Such difference of only 1% can be statistically significant even on the 1% risk-level, but in absolute sense and for the purposes of interpretation, this difference is very small. Hence, there are certain conventions about the magnitude of the difference expressed in terms of various effect size measures (in this case, Cohen's *d*) in order to consider it small (0.20), medium (0.50) or large (0.80) (see Cohen, 1988; Kolesarić, 2006). Further, comparison of results obtained in several similar studies (which is the case in this article; analogously to the meta-analysis studies) this measure is inevitable in order to conclude about general pattern of the findings obtained in specific research area. Therefore, the differences presented in certain domains of general knowledge between men and women are in this article expressed in terms of the effect size (*d*).

(insert Table 1 here)

4. Discussion

There are seven points of interest in the results. First, the hypothesis that there would be consistencies in the gender differences in the different domains of general knowledge in Croatia, the United States and Northern Ireland has been generally confirmed. The principal of these consistencies are that in all three countries males showed more knowledge than females in the domains of discovery (includes exploration), finance, geography, history, politics, science, sport and technology. Females consistently showed more knowledge than males in the domains of nutrition (cookery) and medicine in the Croatian and the Northern Ireland studies, but these domains were not measured in the United States.

Second, all four of the Croatian studies found that females had more knowledge of entertainment. This includes knowledge of dances and showbiz personalities. All four of the Croatian studies found that males had more knowledge of technology. This includes knowledge of the properties of materials, types and characteristics of automobiles and industrial products. Males also had much greater knowledge of this domain in the United States. This domain was not included in the Northern Ireland study.

Third, there are some inconsistencies in the gender differences in the different studies. The principal of these are (1) in art, where females showed more knowledge than males in two of the Croatian studies, while there were no differences in the other two studies, and there were no differences in the United States and in Northern Ireland; (2) in biology, where females showed more knowledge than males in two of the Croatian studies, while there were no differences in the other two studies; and males showed more knowledge than females in the American and Northern Ireland studies; (3) in classical music, where females showed more knowledge than males in the three Croatian studies in which this was tested, while there was a small advantage for males in the American study and no difference in the Northern Ireland study; (4) in fashion, the two Croatian studies that had items in this domain produced inconsistent results, while there was no gender difference in the sample from Northern

Ireland; (5) in literature, the gender differences were inconsistent in the four Croatian studies, no differences in the American study, while males scored considerably higher in the Northern Ireland study. Probably the main reason for these inconsistencies lies in the criteria of categorizing certain items into domains. For example, the question about the assassination of a well-known fashion designer could fall into the category of fashion or current affairs. Despite these inconsistencies across the studies, they are only present in 7 out of 23 domains (see last column in Table 1).

Fourth, the gender differences in the USA and Northern Ireland are based on studies of college students, while those in Croatia are based on 15 year olds in three of the studies, and on 18 year olds in the fourth. The general consistency across the studies shows that the gender differences in different domains of knowledge are present among younger age groups than has hitherto been reported. This is contrary to the suggestion of Ackerman (1996, p. 245) that "salient differentiation in intellectual knowledge structures is most likely to be observed as individuals enter early adulthood – with diverse demands from occupational or academic specializations". The Croatian results show that the gender differences are well established in mid-adolescence.

Fifth, there are differences between the results in the USA, Northern Ireland and Croatia in the total level of general knowledge possessed by males and females. In the USA and Northern Ireland males had more total general knowledge than females, obtained by summing the differences in all the domains. In Croatia no significant differences in total general knowledge were found (see last row in Table 1). There are two possible reasons for this. First, the gender differences depend on the nature of the questions and this will determine the total score. Second, the Croatian samples were high school students aged 15 years in three of the samples and 18 years in the fourth, while the American and Northern Ireland studies were based on college students. It may be that there are maturational differences such that

girls mature earlier in adolescence than boys, while among young adult college students this difference has levelled out.

Six, we consider some possible explanations for the gender differences in the different domains of general knowledge. Here we follow Ackerman's (1996) PPIK theory that interests are a major determinant on the acquisition of knowledge of different domains. Thus, for instance, he demonstrates that people who have "realistic" interests have good knowledge of engineering and physics, while people who have "artistic" interests have good knowledge of music and poetry. More recently, Evans, Schweingruber & Stevenson (2002) have confirmed that interests in different domains are positively correlated with knowledge of the same domains. Extending this theory, we suggest that gender differences in interests are largely responsible for the differences in different domains of knowledge. Here we follow Lubinski & Benbow (1992, p. 63) who have observed that gender differences in abilities and interests are "related to one of the most celebrated dimensions of individual differences, "people versus things" (females tend to gravitate to the former; males, to the latter)".

Seven, these different interests of males and females may arise from differential socialisation in childhood. Alternatively, they may be explained in terms of evolutionary psychology, according to which males have an evolved propensity for competition with other males as individuals and between groups. This predisposes males to be interested in domains concerned with competition between males, such as sport, current affairs, history and politics. Females have an evolved propensity for nuturance and this predisposes them to be interested in the domains of nutrition and medicine (see, Geary, 1998; Kaufman & McClean, 1998). This theory is supported by studies showing that interests have a heritability of about 50% (Lykken, Bouchard, McGue & Tellegren, 1993). Plomin (2001) has also concluded that there are genetic dispositions that make individuals more or less prone to the acquisition of different domains of knowledge.

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Table 1
Gender differences in general knowledge obtained in 4 Croatian studies, 1 USA study and 1 Northern Ireland study. The upper part of table contains general data on sample sizes, participants' age and tests' characteristics. Domain-specific gender differences (differences in the average result) are expressed by the effect size (*d*) in the lower part of table. Positive *d*s denote higher means obtained by males, while negative *d*s denote higher means obtained by females. The last row, as well as the last two columns contain sumative results.

	Croatia	Croatia	Croatia	Croatia	USA	N. Ireland
	Stanuga 1987	Novačić 1989	Zarevski & Gačnik-Del Negro 1998	Zarevski & Gačnik-Del Negro 1998	Ackerman et al. 2001	Lynn et al. 2002
N	606 (335 f)	1376 (720 f)	1174 (574 f)	1174 (601 f)	320	636
Age	15	15	15	18	19	20
Sample	School students	School students	School students	High school graduates	College students	College students
N of items in test	45	137	100	120		
Cronbach α	m .82 f .81	m .84 f .83	m .85 f .86	m .88 f .86		

Domains	Gender differences in general knowledge (effect size *d)*						*M*ds of domains	Consistency of findings in the domains **
Art	-	-0.29*	0.23*	-0.24*	0.10	0.07	-0.03	0
Biology	0.00	0.06	-0.40*	-0.49*	0.25*	0.42*	-0.03	0
Cookery	-	-0.15	-	-	-	-0.48*	-0.32	f
Classical music	-0.39*	-	-0.23*	-0.21*	0.21*	0.08	-0.11	0
Current affairs	-	-	-	0.35*	0.28*	-	0.32	m
Discovery	0.27*	0.24*		0.34*	-	0.69*	0.39	m
Entertainment	-0.20*	-0.25*	-0.31*	-0.60*	-	-	-0.34	f
Fashion	-	-0.24*	0.00	0.19*	-	-0.05	-0.03	0
Film	-	-0.09	-0.43*	0.08	-	0.13	-0.08	0
Finance	-	0.21*	-	-	-	0.69*	0.45	m
Games	-	-	-	-	-	0.54*	0.54	m
Geography	0.19*	0.22*	0.08	0.30*	0.65*	0.41*	0.31	m
Jazz & blues	-	-	-	-	-	0.46*	0.46	m
History	0.23*	0.21*	0.16	0.08	0.55*	0.72*	0.33	m
Literature	-0.01	0.10	-0.29*	-0.12	0.10	0.49*	0.05	0
Medicine	-0.23*	-0.23*	-	-	-	-0.32*	-0.26	f
Politics	0.20*	0.20*	0.24*	0.30*	-	0.82*	0.35	m
Popular music	0.24*	0.07	-0.25*	-0.21*	0.21*	-0.15	-0.02	0
Psychology	-	-	-	-0.33*	-0.01	-	-0.17	f
Science	0.15	0.14	0.27	-	0.51*	0.63*	0.34	m
Science history	-	-	-	-	-	0.33*	0.33	m
Sport	0.49*	0.33*	0.21	0.28*	-	0.84*	0.43	m
Technology	0.26*	0.37*	0.31*	0.48*	1.06*	-	0.50	m
*M*ds of study	0.09	0.05	-0.03	0.01	0.36	0.33	M_{tot} 0.14	

*denotes $p<.05$ or less;
** *f*- females consistently better across studies; *m*-males consistently better across studies; *0* – no consistency across studies

Appendix

Examples of domain-specific items used in Croatian studies (with correct answers)

Domains	*Example of items*
Arts	Salvador Dali was? (painter)
Biology	World's fastest mammal is? (cheetah)
Cookery	Which of the following words does not refer to a food? (onyx)
Classical music	Which musical form is not characteristic for F. Chopin? (fugue)
Current affairs	The first president of Croatian Academy of Science and Arts was? (I.Supek)
Discovery	Who invented dynamite? (A.Nobel)
Entertainment	The name of the famous dance is? (merengue)
Fashion	One of the world's famous fashion designers is? (K.Lagerfeld)
Film	Julia Roberts is? (actress)
Finance	Japanese currency is? (yen)
Geography	South America's largest state is? (Brazil)
History	The name of the Old-Greek prophetess is? (Pythia)
Literature	Hamlet is? (Danish prince)
Medicine	Which of the following diseases is not contagious? (haemophilia)
Politics	Anarchy is? (state of lawlessness)
Popular music	The most famous French female chanson singer is? (E.Piaf)
Psychology	Anxiety is? (fearful reaction to stress)
Science	One of the great contemporary scientists was? (S.Hawking)
Sport	Which of the following sports is not characteristic for USA? (soccer)
Technology	Awacs is? (spy aircraft)