Review of Psychology,
2014, Vol. 21, No. 2, 131-135 ORIGINAL SCIENTIFIC PAPER UDC 159.9

Gender differences in general knowledge: Do residential status and the type of school matter?

PREDRAG ZAREVSKI, MARIJANA KOVAČ and KRUNOSLAV MATEŠIĆ, Jr.

The goal of this study was to examine gender differences in general knowledge related to residential status and type of school. The study included 817 subjects aged 17 to 19 (455 female) of the third and fourth year of grammar ($N = 422$) and vocational schools ($N = 395$) in the Republic of Croatia, from the capital (Zagreb, $N = 440$) or from the smaller cities (less than 50.000 inhabitants, $N = 377$). The new 110 item version of the General Information Test (GIT-2012) was used ($\alpha_{males} = .89$, $\alpha_{females} = .85$). In accordance with previous studies, the results of this study showed better performance and greater variance of male participants in total score on the GIT-2012 compared to female participants. Hierarchical regression analysis showed that the strongest determinant of general knowledge was type of school, then residential status, and the weakest predictor was gender. This result supports *gender similarities hypothesis* (Hyde, 2005) and has important implications for tertiary education in Croatia, suggesting that all students, regardless of gender, and grammar school students, regardless of residential status, have practically the same potential for further education.

Key words: gender differences, general knowledge, general information, high school students, residential status

The use of general information (GI; some authors prefer the term knowledge) tests has a long history. *General knowledge* is an important construct in Cattell-Horn's (Cattell, 1971), Carroll's (1993), and McGrew's (2005) theories of the structure of intelligence. Although it is primarily a measure of knowledge, it is also a measure of cognitive aptitude and has an important relation to Ackerman's (1996) theory of interests for cognition. General knowledge can be considered 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. Six GI tests were published in Croatia from 1988 to 2013 (Zarevski, 1988, 1991, 1993, 1995; Zarevski, Matešić, & Matešić, 2013). They are valuable to psychological practice as they are economical and provide a good approximation of crystallized intelligence (for further reading, see Zarevski, 2012).

Three questions are often asked regarding the GI construct: (a) how general is the GI construct, (b) are there gender differences in GI, and (c) are these differences domain specific? Regarding the first question in Croatia, Zarevski, Ivanec, and Zarevski (2005) conducted two analyses to determine the position of the General Information Test (GIT) in relation to other verbal competency measures. The first analysis questioned the latent structure of four tests having the same format and questioning the knowledge of international terms (classical vocabulary test), general culture, knowledge of most recent events, and GI. The second analysis added a g-factor intelligence test to determine how the described structure changes when this classic intelligence test is introduced. In both analyses, GIT had the highest projection on the only significant latent dimension of cognitive space measures. So it can be concluded that GI knowledge is in the centre of the vector space of these cognitive variables.

Regarding the second question, most recent studies have reported that males on average obtain higher scores than females on tests of general knowledge. This has been found in school and college student samples in the USA by Ackerman, Bowen, Beier, and Kanfer (2001) and Rolfhus and Ackerman (1999), in Northern Ireland by Lynn, Irwing, and Cammock (2002) and Lynn and Irwing (2002), in Estonia by Allik, Must, and Lynn (1999), and in Germany by Lynn, Wilberg, and Margaf-Stiksrud (2004). The gender difference in these studies has been approximately $d = 0.5$ and is one of the higher gender differences.

Regarding the third question, on the Croatian samples of male and female university graduates, highly comparable by age, education, and motivation Lynn, Ivanec, and Zarevski

Predrag Zarevski, Department of Psychology, Faculty of Humanities and Social Sciences, University of Zagreb, Ivana Lučića 3, Zagreb, Croatia. E-mail: pzarevsk@ffzg.hr (the address for correspondence);

Marijana Kovač, Department of Psychology, University of Zagreb, Croatia;

Krunoslav Matešić, Jr., Croatian Catholic University, Zagreb, Croatia.

(2009) found that men obtained higher average scores on the g-factor intelligence test, on the general knowledge of natural and social sciences, world religion. and customs, and knowledge of current affairs. There were no significant gender differences in vocabulary, foreign language test, and general knowledge of culture. An analysis of covariance, with an intelligence test as a covariate, showed that sex differences in general knowledge were still present when intelligence was controlled. Also, Zarevski, Ivanec, Zarevski, and Lynn (2007) reported gender differences in general knowledge for four studies of high school students in Croatia and compared these results with those obtained in the United States and Northern Ireland. The results were 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. 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 nurturance. In the Croatian sample, the composite measure of GI domains revealed smaller gender differences than in the USA and Northern Ireland samples.

Considering GIT as a measure of cognitive achievement, it is important to keep in mind that Johnson and Bouchard (2007, p. 24) wrote: "... data suggest that men and women achieve similar levels of overall intellectual processing power using different neuroanatomic and brain structural pathways, which in turn contribute to differences in more specialized abilities". The contemporary consensus favours the *gender similarities hypothesis* (Hyde, 2005) which supposes that males and females are more similar than different in terms of cognitive and personality variables than the lay person or scientist presumes. However, there is widespread consensus that males and females have different cognitive profiles (Neisser et al., 1996), or, where general knowledge is concerned, we can draw a parallel with differences in the profiles of GI domains.

Taking into account that there is a trend of cognitive gender differences becoming smaller in more recent research (see Zarevski, Matešić, & Matešić, 2010), the goal of this research was to investigate gender differences in a sample of high school students in GIT and to take into account the potential differences caused by differences in type of school and residential status defined via city economic power and number of inhabitants. Despite the fact that numerous studies exist on gender differences in general knowledge, as well as the influence of the type of school and residential status on different intelligence and knowledge matters, data are lacking in the Republic of Croatia on the interaction of these three significant variables in their influence on general knowledge.

METHODS

The study included 817 subjects aged 17 to 19 (455 female) of the third and fourth year of grammar (N = 422) and vocational schools (N = 395) in the Republic of Croatia. They were from the capital (Zagreb, N = 440) or the smaller cities (with less than 50.000 inhabitants: Pula, Poreč, Pakrac, Bjelovar, N = 377). The new 110 item version of the GIT, the GIT-2012 (Zarevski et al, 2013, was used. Cronbach alpha for male participants was .89, and .85 for females. Research applying a hierarchical factor model to general knowledge has identified twenty domains (Lynn et al., 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 et al., 2002). This test was composed to cover the main domains of general knowledge and items referring to new IT technology terms connected with web and popular culture were also included. Group test administration of the paper and pencil version of GIT-2012 took place in school classes (20-30 students) with no time limitation and took less than 45 minutes. Participants were not anonymous. Although they were told that taking the test is not obligatory, nobody declined to do so.

RESULTS

Table 1 presents the basic statistical data for the total scores obtained on the GIT-2012 with respect to gender as well as the results of testing for differences in scores and distribution of scores by gender. A difference of approximately half a standard deviation in favour of males was observed (d = 0.53), which is typical for a composite test of general knowledge.

It has frequently been reported that there is greater male variability in cognitive measures and that males are overrepresented at both extremes (e.g., Hedges & Nowell, 1995; Deary, Irwing, Der, & Bates, 2007). Levene's test indicated that high school male students had greater variability in general knowledge. This is in accordance with all previous Croatian studies of gender differences in general knowledge.

Analysis conducted according to general knowledge domains has shown the existence of statistically significant differences in favour of male participants in the major-

Table 1.
Gender differences in the General Information Test (GIT-2012)

Variable	Gender	*N*	*M*	*SD*	*F*(1, 815)[a]	*t* (815)	*d*
GIT-2012	Male	362	53.26	13.94	16.64**	7.63**	0.53
	Female	455	46.49	11.41			

[a]Levene's test of variance equality.
** $p < .01$.

ity of domains. These observed differences are in accordance with those obtained in other research throughout the world (see, for example, Zarevski et al., 2007). They are determined by the differences in interests of males and females. Lippa (1998) proposed a *people-things dimension* of interests such that women are typically more interested in people, and hence in literature and culture, while men are typically more interested in things, and hence in science and technology. In a review of the evidence, he concluded that "women are more interested in social and artistic occupations and men are more interested than women in investigative occupations" (Lippa, 2002). In this study, male students have shown better achievement in geography and chemistry, science and technology, sport, history, philosophy and art, politics and social sciences, and, surprisingly, in fashion, film, entertainment, and music. Female students have shown better results in culinary and the arts. The fields of medicine, botany, and zoology have not shown statistically significant gender differences. These findings can also be interpreted within the framework of Ackerman's theory of adult intellectual development (Ackerman, 1996, 2002; Ackerman, Bowen, Beier, & Kanfer, 2001). Plomin (2001) has concluded that there are genetic dispositions that make individuals prone to the acquisition of different domains of knowledge. From the evolutionary standpoint, Wittmann's (2005) claim needs to be taken into account, which points out that diversity within and between groups helps populations survive.

Table 2 presents descriptive data for the GIT-2012 dependent on residential status and type of school. Analysis of variance has shown the existence of a significant main effect of town size, $F(1, 813) = 14.62$, $p = .001$: students from the capital achieved better overall results on the GIT-2012 than students from the remaining cities. The main effect of the type of school is also significant, $F(1, 813) = 128.17$, $p = .001$. Students attending grammar schools were better than those in vocational schools. Along with these main effects, the interaction of city and type of school is also significant, $F(1, 813) = 13.03$, $p = .001$. Namely, there were no differences between grammar school students in the capital and the remaining cities, while vocational school students in the capital showed significantly better results than those of other cities.

In order to determine how gender differences are linked to the two factors significant for general knowledge, a hierarchical regression analysis was conducted. The first step included predictors city size and type of school, while gender was introduced as a predictor in the second step. The results of this analysis are presented in Table 3. The condition for regression analysis referring to multicolinearity was met for all predictors (VIF < 10 and tolerance > .1).

Table 3.
Results of regression analysis with total result on the General Information Test (GIT-2012) as criteria and residential status and type of school as predictors in the first step and gender in the second step

		β	
Variable		Step 1	Step 2
Residential status		-.228*	-.129*
Type of school		-.342*	-.406*
Gender			-.236*
	R	.509	.555
	adjusted R	.257	.306
	F	142.31*	120.80*
	ΔR^2		0.049*
	$F\,\Delta$	142.31*	57.89*

* $p < .001$.

Table 3 shows that, even when controlling the type of school and residential status, gender differences exist in the total result on the GIT-2012. Gender accounts for 5% of the criteria and is statistically significant, although having a rather small effect. The size of the β ponders shows that the strongest determinate of general knowledge is the type of school, followed by residential status, while the weakest is gender. All three predictor variables explain 30.6% of the total variance.

DISCUSSION

The results of this study are important, since general knowledge measures are a good approximation of crystallized intelligence (g_c). From the standpoint of equal opportunity for further education and professional careers in Croatia, it is relevant that gender differences in general knowledge (or g_c) are not large, supporting the gender similarities hypothesis (Hyde, 2005). However, the difference is greater with regard to type of school and residential status, leading to two significant conclusions. Firstly, despite

Table 2.
Descriptive data for the General Information Test (GIT-2012) dependent on type of school and residential status

Residential status	Grammar school		Vocational school		Total	
	n	M (SD)	n	M (SD)	n	M (SD)
Capital	336	55.50 (11.39)	104	48.26 (11.04)	440	53.79 (11.71)
Smaller cities	86	55.30 (14.99)	291	41.28 (9.92)	377	44.48 (12.71)
Total	422	55.46 (12.19)	395	43.12 (10.67)	817	49.49 (13.03)

the fact that all have the same right to education, the selection of school plays an important role and those who opt for vocational schools lag behind their grammar school counterparts in general knowledge. From the viewpoint of potential tertiary education candidates, it is important that grammar school students show no differences with regard to residential status. Secondly, despite the fact that general knowledge is in the public domain, i.e., readily available and not dependent on formal education, vocational students from the capital city still achieve better results than those from smaller cities.

Because of the parallel between intelligence and general knowledge, explanations for the causes of gender differences are similar. In the case of intelligence, the gender differences have been explained as a result of differential socialization in childhood or, alternatively, by hormonal and biological factors (Kimura, 1999). The same alternative explanations can be advanced for gender differences in domains of general knowledge.

This study also shows a strong relationship between general knowledge with type of school and residential status. It is, of course, a reciprocal causality where abilities and knowledge affect the choice of school, while the type of school probably influences the acquisition of some general knowledge domains. It is more difficult to explain the finding that residential status has a stronger relationship than gender to general knowledge. It is difficult to speculate on the degree to which this is a result of varying quality of schools, particularly where vocational schools are concerned, or of differences in passive socio-economic status between the capital city and the smaller towns.

The overall findings of this study have important implications for tertiary education in Croatia, where students, regardless of gender, and grammar school students, regardless of residential status, have practically the same potential for further education. The most vulnerable group for enrollment and success in further education are vocational school students from small towns.

INSTEAD OF A CONCLUSION

Cognitive gender differences are under the microscope of scientists and the general population. In overall IQ, most studies show very small and inconsistent sex differences (summarized, for example, in Colom, Quiroga, & Juan-Espinosa, 1999). There is a trend of their reduction (e.g., Halpern, 2000; Hyde, 2005), in developed countries at least. In view of the fact that the content of GI tests necessarily changes with important societal and cultural changes and technological and informational development of societies in particular, it will be very interesting to follow the course of events concerning gender differences in these tests. Information technology is more readily available in schools and families and its influence on the level of general knowledge will probably strengthen and it can be expected that the influence of type of school and residential status on general knowledge will diminish.

REFERENCES

Ackerman, P. L. (1996). A theory of adult intellectual development: Process, personality, interests, and knowledge. *Intelligence, 22*, 227-257.

Ackerman, P. L. (2002). Gender differences in intelligence and knowledge: How should we look at achievement score differences? *Issues in Education, 8*, 21-31.

Ackerman, P. L., Bowen, K. R., Beier, M. E., & Kanfer, R. (2001). Determinants of individual differences and gender differences in knowledge. *Journal of Educational Psychology*, *93*, 797-825.

Allik, J., Must, O., & Lynn, R. (1999). Sex differences in general intelligence among high school graduates: Some results from Estonia. *Personality and Individual Differences, 26*, 1137-1141.

Carroll, J. B. (1993). *Human cognitive abilities: A survey of factor-analytic studies.* New York: Cambridge University Press.

Cattell, R. B. (1971). *Abilities: Their Structure, Growth and Action.* Boston: Houghton Mifflin.

Colom, R., Quiroga, M. A., & Juan-Espinosa, M. (1999). Are cognitive differences disappearing? Evidence form Spanish populations. *Personality and Individual Differences, 27*, 1189-1195.

Deary, I. J., Irwing, P., Der, G., & Bates, T. C. (2007). Brother-sister differences in the *g* factor in intelligence: Analysis of full, opposite-sex siblings from the NLSY 1979. *Intelligence, 35*, 5, 451-456.

Halpern, D. F. (2000). *Sex differences in cognitive abilities* (3rd ed.). Mehwah, NY: Lawrence Erlbaum.

Hedges, L. V., & Nowell, A. (1995). Sex differences in mental test scores, variability, and high scoring individuals. *Science, 269*, 41-45.

Hyde, J. S. (2005). The gender similarities hypothesis. *American Psychologist, 60*, 581-592.

Johnson, W., & Bouchard, T. J., Jr. (2007). Sex differences in mental abilities: *g* masks the dimension on which they lie. *Intelligence*, *35*, 23-39.

Kimura, D. (1999). *Sex and cognition.* Cambridge, MA: MIT Press.

Lippa, R. A. (1998). Gender-related individual differences and the structure of vocational interests: The importance of the people-things dimension. *Journal of Personality and Social Psychology, 74*, 996-1009.

Lippa, R. A. (2002). *Gender, nature and nurture*. Mahwah, NJ: Lawrence Erlbaum.

Lynn, R., & Irwing, P. (2002). Sex differences in general knowledge, semantic memory and reasoning ability. *British Journal of Psychology, 93*, 545-556.

Lynn, R., Irwing, P., & Cammock T. (2002). Sex Differences in General Knowledge. *Intelligence, 30*, 27-40.

Lynn, R., Ivanec, D., & Zarevski, P. (2009). Sex differences in general knowledge domains. *Collegium Antropologicum, 33*(2), 515-520.

Lynn, R., Wilberg, S., & Margaf-Stiksrud, J. (2004). Sex differences in general knowledge in German high school students. *Personality and Individual Differences, 37*, 1643-1651.

McGrew, K. S. (2005). The Cattell-Horn-Carroll (CHC) Theory of Cognitive Abilities: Past, Present and Future. In D. P. Flanagan & P. L. Harrison (Eds.), *Contemporary intellectual assessment: Theories, tests, and issues* (pp. 136-181). New York: The Guilford Press.

Neisser, U., Boodoo, G., Bouchard, T. J., Boykin, A. W., Brody, N., Ceci, S. J.,...Urbina, S. (1996). Intelligence: Knowns and Unknowns. *American Psychologist, 5*, 77-101.

Plomin, R. (2001). Genetics and behaviour. *Psychologist, 14*, 134-139.

Rolfhus, E. L., & Ackerman, P. L. (1999). Assessing individual differences in knowledge: Knowledge structures and traits. *Journal of Educational Psychology*, *91*, 511-526.

Wittmann, W. W. (2005). Group differences in intelligence and related measures. In O. Wilhelm & R.W. Engle (Eds.), *Handbook of understanding and measuring intelligence* (pp. 223-239). London: Sage Publications.

Zarevski, P. (1988). *Test opće informiranosti, Priručnik* [General Knowledge Test, Manual]. Zagreb, Croatia: Savez samoupravnih interesnih zajednica za zapošljavanje Hrvatske.

Zarevski, P. (1991). *Test opće informiranosti za učenike četvrtih razreda srednjih škola (TOIM), Priručnik* [General Knowledge Test for Year 12 High School Students, Manual]. Zagreb, Croatia: Zavod za zapošljavanje.

Zarevski, P. (1993). *Test opće informiranosti (A i B forma), Priručnik i standardizacija za Test opće informiranosti (revidirano izdanje)* [General Knowledge Test (Forms A & B), Manual and Standardization of the Revised General Information Test]. Zagreb, Croatia: Ministarstvo rada, socijalne skrbi i obitelji, Zavod za zapošljavanje - Središnja služba Zagreb.

Zarevski, P. (1995). *Test opće obaviještenosti*, *Priručnik* [General Information Test, Manual]. Jastrebarsko: Naklada Slap.

Zarevski, P. (2012). *Struktura i priroda inteligencije* [Structure and Nature of Intelligence] (2nd ed.). Jastrebarsko: Naklada Slap.

Zarevski, P., Ivanec, D., & Zarevski, Z. (2005). How general is general information construct. *Psihološka obzorja/ Horizons of Psychology, 14*, 9-15.

Zarevski, P., Ivanec, D., Zarevski, Z., & Lynn, R. (2007). Gender differences in general knowledge: Four Croatian studies. *Suvremena psihologija, 10*, 213-221.

Zarevski, P., Matešić, K., & Matešić, K., Jr. (2010). Kognitivne spolne razlike: Jučer, danas, sutra [Cognitive Gender Differences: Yesterday, Today, Tomorrow]. *Društvena istraživanja, 19*(4/5), 797-819.

Zarevski, P., Matešić, K., & Matešić, K., Jr. (2013). *Test opće informiranosti, TOI–2012* [General Information Test, GIT-2012]. Jastrebarsko: Naklada Slap.