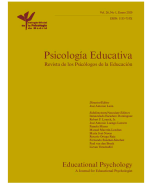




Psicología Educativa

<https://journals.copmadrid.org/psed>



World Perception and High Intellectual Ability: A Comparative Study

M^a Luz Urraca-Martínez, Sylvia Sastre-Riba, Lourdes Viana-Sáenz

Universidad de la Rioja, Logroño, Spain

ARTICLE INFO

Article history:

Received 28 October 2019
Accepted 10 May 2020
Available online 30 September 2020

Keywords:

High intellectual ability
Gifted students
Talented students
Typical students
Moral development
World perception
Cognitive processes
Ethics of education

Palabras clave:

Alta capacidad intelectual
Estudiantes superdotados
Estudiantes dotados
Estudiantes típicos
Desarrollo moral
Percepción del mundo
Procesos cognitivos
Ética de la educación

ABSTRACT

From a neuroconstructivist point of view and a developmental model of high intellectual abilities (HIA), the aim of this study is to understand the world perception of high intellectual children, which results from their cognitive complexity and other traits such as their high context sensitivity. An intentional sample of $N = 80$ boys and girls, of which a group of $n = 40$ children with HIA ($n = 40$), aged 7, 9, and 11 years old has been studied and compared with a paired control group of $n = 40$ students with typical intelligence. BADyG and TCTT tests were administered to determine their intellectual profiles multidimensionally. They were also given the Autobiography Questionnaire Form U in order to capture their world perception. The multivariate analysis of variance (GLM) shows an earlier and more advanced world perception among HIA participants, with higher fluency and abstraction in perceiving problems and solutions compared to subjects with typical intelligence. The coefficient of generalizability is high (.822). The conclusions suggest the relevance to design educational programs for an ethical guide of moral sensitivity differentially wide and early in HIA students.

Percepción del mundo y alta capacidad intelectual: un estudio comparativo

RESUMEN

Desde un modelo neuroconstructivista de desarrollo de la alta capacidad intelectual (ACI) estudia la percepción del mundo de escolares con HIA, resultante de su complejidad cognitiva y gran sensibilidad hacia el entorno. La muestra intencional es de $N = 80$, un grupo de niños y niñas con HIA ($n = 40$) de 7, 9 y 11 años y otro grupo control apareado con inteligencia típica ($n = 40$). Extraídos los perfiles intelectuales multidimensionales mediante los tests BADyG y TTCT, se mide la conciencia del mundo mediante el Cuestionario Autobiográfico Forma U. Se valida el instrumento, se categorizan respuestas y se controla la calidad de los datos. El análisis de varianza multivariado (GLM) presenta diferencias estadísticamente significativas intragrupo e intergrupo, mostrando una avanzada conciencia social entre escolares con HIA con mayor fluidez y abstracción en percibir problemas y soluciones que los sujetos con inteligencia típica. El coeficiente de generalizabilidad es alto (.822). Se concluye que es importante diseñar programas educativos que guíen éticamente la temprana y diferencial sensibilidad moral de los aprendices con HIA.

Studies on high intellectual ability (HIA) have traditionally focused on the intellectual abilities that configure it and its functioning, identification, and relation to educational or professional success (Sastre-Riba, 2008). With old conceptual hypotheses now being rejected, HIA and its manifestations of giftedness and talent are approached through a multidimensional vision of competences. These include convergent and divergent cognitive abilities and the structural correlates underlying them, in co-variation with intra- and inter-personal moderating variables, such as motivation or emotional and environmental aspects (Castelló-Tarrida et al., 2019; Dai, 2017).

Educational practice and politics influence the need to promote so-called “21st century skills” (Bellanca & Brandt, 2010), which

include cognitive and non-cognitive skills, focusing on excellence, ethics, commitment, the common good, and character development (Ambrose & Sternberg, 2016; Fischman & Gardner, 2009; Seligman, 1998). In this regard and considering that high intellectual potentiality is a social capital, Renzulli (2012) highlights the importance of people with HIA committing themselves to society in order to contribute new ideas and solutions to the challenges and difficulties of today's world. Personal characteristics associated with human commitment include “optimism”, i.e., hope and positive feelings about hard work, “courage”, psychological and intellectual independence and moral conviction, “passion” for a subject or discipline that absorbs and excites “sensitivity” to human issues related to “insight” and

Cite this article as: Urraca-Martínez, M. L., Sastre-Riba, S., & Viana-Sáenz, L. (2020). World perception and high intellectual ability: A comparative study. *Psicología Educativa*. Ahead of print. <https://doi.org/10.5093/psed2020a15>

Funding: This manuscript has been carried out thanks to the I+D+i Project of the Ministry of Economy, Industry, and Competitiveness of the Spanish Government (Excellence Project, EDU2016-78440P), and a contractual agreement with the Ministry of Education, Formation and Employment of the Government of La Rioja (20018-2019).

Correspondence: silvia.sastre@unirioja.es (S. Sastre-Riba).

ISSN: 1135-755X/© 2020 Colegio Oficial de la Psicología de Madrid. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

empathy, “physical and mental energy”, composed of charisma and curiosity, and a “sense of destiny”, which covers the sense of power to change things, the sense of direction, and the pursuit of objectives (Renzulli, 2002). All these features are interconnected and related to the manifestation of this social capital and are linked to each other in current research within the concept of ethics (Renzulli, 2012; Tirri, 2016), moral development or sensitivity (Lovecky, 1997; Roeper & Silverman, 2009), or social awareness.

In turn, Gibson et al. (2008) stress the importance of critical and global thinking, reflection, metacognition, and interpersonal intelligence as fundamental processes for improving learning, as well as for the analysis of and search for realistic solutions to our world's current and future problems.

The relationship between the complex cognitive configuration of people with HIA and moral development has not been well studied and many of the studies date back to the 1980s and 1990s. Part of this work indicates the differential characteristics of students with a high intellectual capacity in moral and social aspects. For Eggen and Kauchak (1994), a parallel relationship exists between intellectual capacity and the moral attributes of justice, honesty, and compassion. Other authors propose that feelings of responsibility regarding others' needs, misfortunes, or tragedies develop sooner in children with HIA (Piechowski, 2003; Roeper, 2008) than in their peers. It has also been suggested that there is a higher level of awareness and concern about current events and interpersonal and intrapersonal issues, accompanied by an increased sense of justice (Piechowski, 2009; Roeper & Silverman, 2009).

A lot of research shows that, although the relationship between HIA and moral development is complex, most schoolchildren with HIA are more sensitive to moral and ethical dilemmas than their peers. This sensitiveness derives from their superior ability to understand different types of problems and their implications (Ambrose & Cross, 2009), coupled with an increased sense of justice and an earlier development of concerns about the concepts of good and evil, and right and wrong (Roeper & Silverman, 2009; Terman, 1925).

Studies often describe people with HIA as people with high ideals who believe in human beings and the need to improve the world, with a responsible vision of their role in it. In other words, their vision of the reality of our planet and of humans seems to be conscious and optimistic. Also, in studies of adolescents with HIA, Hume (2000) and Tirri (2012) described their social involvement in various current affairs, such as death penalty, suicide, euthanasia, genetic manipulation, and politics, thus reflecting their concern for social issues and how they can be resolved. In turn, Silverman (1998) described how the cognitive and social awareness of children with high capacity shows that they perceive the world more globally and realistically than their peers, with creative proposals for resolution but, in contrast to what was stated previously, with elements of pessimism and concern for their future.

In general, current work brings these aspects and results together under the concept of moral sensitivity (Ambrose & Cross, 2009), to be understood as one of the components of moral judgement, which also includes awareness of the world and its dilemmas. It is worth observing that these studies warn that there is not always a correlation between moral sensitivity to dilemmas and perception of everyday life and moral behaviour of people with HIA (Tirri & Pehkonen, 2002). Consequently, experts such as Renzulli (2012), Sternberg (2012), and Tirri (2016) have highlighted the importance of directing the broad moral sensitivity of people with HIA towards ethics in order to combine this with excellence and progress. Hence, it is essential to include social and emotional aspects in the education provided to students in order to improve their personal, emotional, and social awareness. Along with cognitive improvement programmes, other programmes should be included that favour the development of emotional, personality, and creative characteristics, especially for students with gifts

and talent (Tirri, 2012). Our future leaders should increase awareness of the common good and the so-called social capital that will successfully address the problems that affect mankind.

Because of the reasons stated above and the lack of research on the perception of the world, its problems, and its solutions, both in schoolchildren with high capacity and in their peers, this study aims to: 1) comparatively determine the perception of problems in today's world and prospective solutions among students of high intellectual capacity and those of average intellectual capacity; 2) verify the kinds of problems and solutions provided by each study group; and 3) check transversely whether there are differences in the perception of the world at different stages of childhood.

Method

Sample

A sample of 80 participants was chosen by non-probabilistic intentional sampling according to age and type of development criteria by simple random sampling; 40 of them were children aged 7, 9, and 11 ($n = 13$, $n = 14$, and $n = 13$, respectively) with high intellectual capacity participating in the extracurricular enrichment programme of the University of La Rioja who had been previously diagnosed as having HIA in one of the profiles included (giftedness or talented) according to Castelló (2008). The paired control group consisted of 40 schoolchildren with typical development, of the same age, extracted from students from grade 1 to 5 (aged 6 to 11) in Primary Education in a state school.

Instrument

The following measuring instruments were employed:

In order to measure the intellectual profile, *Batería de Aptitudes Diferenciales y Generales* [Differential and General Skills Battery] (BADyG; Yuste et al., 1988) was used to assess convergent intellectual abilities (verbal, numeric, logical, and spatial reasoning) and Torrance Test of Creative Thinking (Torrance, 1974) to assess divergent intellectual ability.

To assess the perception of the world's problems and their solutions, *Cuestionario de Autobiografía - Forma U* [Autobiographical Questionnaire - Form U] (Beltrán & Pérez, 1993) item 8, was used: “What do you think are the most important problems for the human race? Do you think these can be solved? How?”.

Design

The administration of the questionnaire was carried out in groups of $n = 10$ children. The experimental group took the tests during the extracurricular enrichment programme and the control group during school hours. In both cases, the tests were supervised by a specialised researcher.

Participants were asked to answer all questions sincerely and were full guaranteed confidentiality. Written parental informed consent was provided in order for their child to participate in the study. Participants were informed of the confidentiality of their responses and of the voluntary nature of the study. No incentive was provided for their participation. The research was conducted according to the principles expressed in the Declaration of Helsinki.

Data Analysis

The steps followed when analysing data were:

Response coding and categorisation in a mixed system of field formats (Anguera et al. 2001) using between judge criteria (see Table 1).

Data quality control. Within and between-observer reliability coefficients and validity of field format categories were calculated using Cronbach et al.'s (1972) generalisability coefficient with a single measure plan of two facets.

Multivariate general linear analysis (GLM) to estimate the facets that explain the variability and the degree was used. The effect size between the type of development, age, and the categories of problems and solutions provided was calculated using a multifaceted linear design to determine intra and inter-group differences. The statistical program SPSS v.24.0 was used for this purpose.

Calculation of generalisability of results was carried out through SAGTV 1.0 programme (Ramos et al., 2012).

Results

The categorisation of the responses resulted in a mixed system of field formats configured by $n = 17$ categories, distributed as a) $n = 8$ on problem perception and b) $n = 8$ on solutions (See Table 1).

Table 1. World Problems and Solutions: Response Categories (HIA and Typical Development Participants)

Word problems		
Conflict	Demotivation	Economic crisis
Environment	Evil	Health
Inequality	No problems	-
Solutions		
Alternative means of transportation	Citizen action	Environmental measures
No solutions	Political measures	Prevention
Rational spending	Treatment	Solidarity

Table 2 shows the results of data quality control. The value of the inter-observer reliability coefficient is optimal ($CG = .935$). Therefore, most of the variance is explained. Likewise, the results of the instrument's validity have a high generalisability coefficient ($CG = .000$), so a highly significant goodness of fit is estimated for the categories.

Levene's test of homocedasticity indicates that there are no significant differences in the variance of the study variables ($F = 0.473$, $p = .625$; $F = 0.032$, $p = .858$). Mauchly's sphericity test is significant ($W = .639$, $p = .035$), so the Greenhouse-Geisser correction method has been used, since it has an epsilon less than .75 ($\epsilon = .716$).

Regarding the inter-group comparative differences (see Table 3), the results of the multifaceted analysis indicate differences between

both study groups in world consciousness for all three ages under study. This is the case both in the perception of problems ($F = 3.323$, $p = .041$) and in the contribution of solutions ($F = 3.949$, $p = .005$), explaining 48% of the variation in both study factors, with greater social awareness among participants with HIA.

Table 2. Inter-observer Reliability Coefficient and Validity of the Response Categories

FV	SS	VC	%	GC
O	0.017	-0.001	0.000	
C	22.683	0.366	87.724	.935
CO	1.483	0.051	12.276	
P	5.083	-0.242	0.000	
C	261.625	12.458	69.581	.000
PC	76.250	5.446	30.419	

Note. O = observers; C = category; P = participants; FV = facets of variability; SS = sum of squares; VC = variance components; GC = generalizability coefficient.

More specifically, there are statistically significant differences in the awareness of world problems according to the type of development ($F = 11.375$, $p = .001$) and solutions provided ($F = 3.216$, $p = .004$). The type of response category explains 65% of the variance for the perception of problems ($F = 5.387$, $p < .001$) and 60% for the contribution of solutions $F = 5.803$, $p < .001$).

Table 3. World Consciousness: Inter-group Differences and Age Studied

	Problems			Solutions		
	F	p	h ²	F	p	h ²
A	3.323*	.041	.487	3.949**	.005	.487
D	11.375**	.001	.132	3.216**	.004	.070
C	5.387**	.000	.653	5.803**	.000	.601
A x D	4.641**	.005	.607	4.326*	.017	.634
A x C	3.003**	.006	.250	2.736**	.001	.238
A x D x C	3.583*	.033	.886	3.596*	.032	.954

Note. A = age; D = development; C = category. * $p < .05$, ** $p < .01$.

According to the three sources of variation, 89% of the inter-group variability in the perception of problems is explained, and 95% in the contribution of solutions, with a large effect size in both factors ($h^2 = .954$) and ($h^2 = .886$) respectively. It is worth noting the decrease in the contribution of solutions in the HIA group as age progresses ($F = 4.326$, $p = .017$) for the intersection of age ' development.

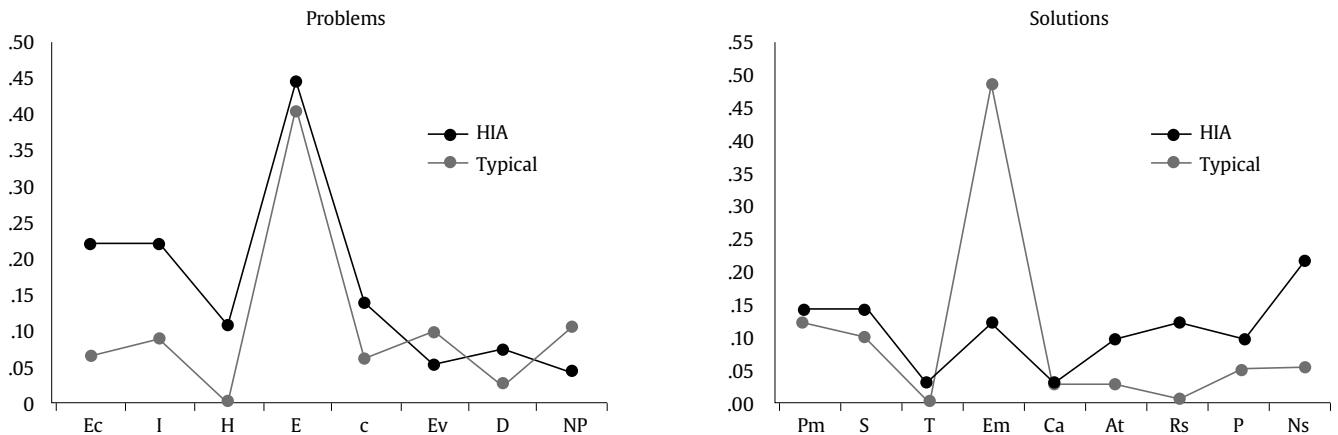


Figure 1. World Problem Types and Solutions: Intergroup Comparison.

Note. Ec = economic crisis; I = inequality; H = health; E = environment; C = conflict; Ev = evil; D = demotivation; NP = no problems; Pm = political measures; S = solidarity; T = treatment; Em = environmental measures; Ca = citizen action; At = alternative transport; Rs = rational spending; P = prevention; Ns = no solutions.

Figure 1 represents the kinds of problems perceived by each study group and the solutions provided. More specifically, the group with HIA shows greater fluency and abstraction in understanding the world's problems with greater moral sensitivity.

Likewise, it is also observed that the problem perceived most similarly by both groups is the one related to "environment", but the low frequency of the other categories of problems formulated by the experimental group stands out: economic crisis, inequality, health, conflict, evil, and lack of motivation, compared to the control group. The "no problems" response category is more frequent amongst the latter.

There are statistically significant differences in Tukey's tests regarding the particular variables of environmental measures ($F = 8.664, p = .004$) and no solutions ($F = 5.184, p = .026$), as well as marginally significant differences concerning the particular variables of economic crisis ($F = 2.871, p = .055$) and inequality ($F = 2.434, p = .059$). These differences are positive in relation to HIA group, except in environmental measures.

It also illustrates, comparatively, the type of solutions provided. Among participants of average intellectual capacity, the most frequent solution is that of environmental measures. By contrast, treatment and rational expenditure has a zero occurrence, and civic action, alternative means of transportation, and prevention a very low one. In contrast, participants with HIA provide a greater number of solutions, especially in the categories of rational expenditure and solidarity, but not in environmental measures, which were less prevalent than in the control group.

Figure 2 shows differences in the perception of world's problems and solutions in both groups according to age. Participants with HIA not only present greater fluidity, diversity, and abstraction in the perception of the problems they report, but they are also more aware of the world and contribute better indicators of problem perception at an earlier age than their peers in the average group.

It also shows that HIA participants are sensitive in perceiving world's problems at an earlier age (from 7 years) and, more broadly, at all ages studied, compared to their peer group with average intellectual capacity.

Regarding solutions, Figure 2 shows that at the age of 7 the group with HIA has more solutions. The two groups give an equal number of solutions at the age of 9, while at 11 the HIA group gives fewer solutions than the control group.

More specifically, with respect to the group with HIA, intra-group differences are statistically significant according to age, both in the perception of current world problems ($F = 2.519, p = .018, h_p^2 = .062$) and in solutions ($F = 3.248, p = .044, h_p^2 = .078$). That is, participants with HIA show differences in awareness of the world at different ages.

The differences are also significant in the interaction between categories * age, both in the number of types of problems ($F = 2.214, p$

$= .016, h_p^2 = .054$) and in the kinds of solutions proposed ($F = 3.011, p = .001, h_p^2 = .073$). Consequently, there is a greater difference according to age in the proposal of solutions than in the problems raised; however, the factor that best explains the variability is the number of response categories for both problems ($F = 9.675, p < .001, h_p^2 = .112$) and solutions ($F = 4.578, p < .001, h_p^2 = .056$) proposed.

Children with HIA have a greater diversity of response categories at all ages, and a decreasing number of proposed solutions from 7 years onwards. Typical children show a greater concern for environmental problems, giving more concrete solutions and presenting less fluency and a later emergence of some of the problems noted above. In turn, it is possible to compare how certain kinds of perceived problems appear at different ages, although they always appear earlier among participants with HIA.

Consequently, the results reveal that there is an early awareness of the world's problems and of solutions in the sample of HIA studied, with a diversity of responses, and with high fluidity and flexibility. Among participants of the control group, there is a later awareness of the world's problems and the provision of solutions is characterized by a smaller variety of responses, with a focus on environmental content.

The generalisability coefficient is high (.822). The Optimisation Plan, with two projections increasing the sample size to $n = 94$ and $n = 104$ participants, provides coefficients of (.834) and (.844), respectively, which indicate poor optimisation of the generalisability of the results obtained if the sample were extended.

Discussion

This study has focused on determining if children with HIA present a greater and earlier awareness of the world and its dilemmas than others. It has been designed under the assumption that social awareness and critical thinking are fundamental aspects in the search for realistic solutions to our world's problems (Gibson et al., 2008). It has also taken into account the importance of people with HIA committing to society in order to contribute new ideas and solutions to the challenges and difficulties of today's world as potential future leaders (Renzulli, 2012; Tirri, 2010).

The results obtained show that the type of intellectual development (HIA vs. typical intellectual capacity) and age influence the perception of world problems and their possible solutions, thus corroborating other studies (Ambrose & Cross, 2009; Sternberg, 2012) that suggest the existence of greater moral sensitivity towards these issues in children with HIA compared to those of average ability.

These inter-group differences are manifested both in fluency and especially in the flexibility and abstraction of the type of problems perceived in the world. This is possibly influenced by the

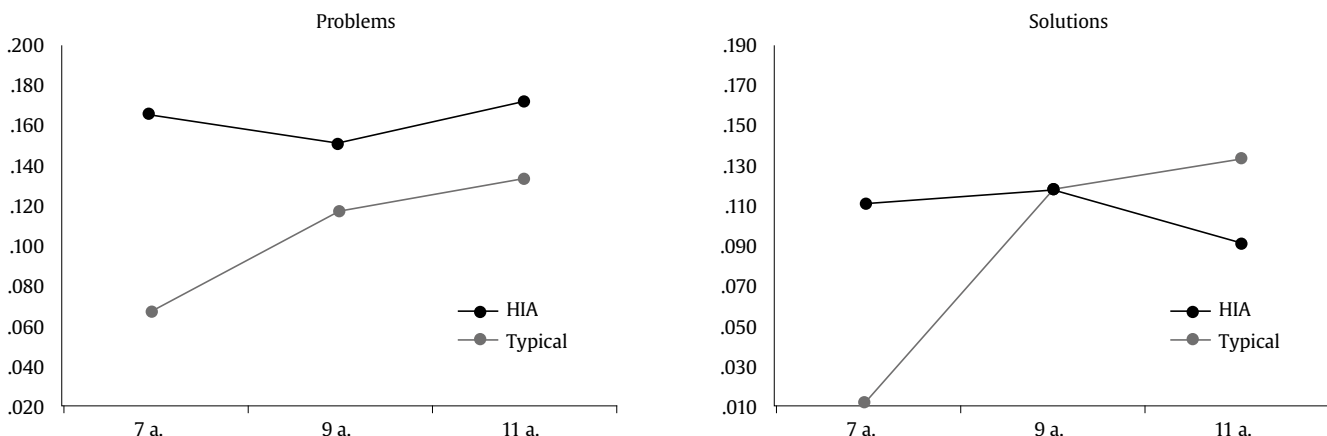


Figure 2. World Problems and Solutions: Intergroup Comparison according to Age.

greater capacity for cognitive processing and emotional sensitivity (Daniels & Piechowski, 2009), confirming greater diversity in the answers in all ages studied within the group with high intellectual capacity, compared to the children with average development.

On the other hand, at age 7 children in the group with typical intellectual capacity do not report any problems and offer only environmental solutions, compared to children with HIA, who provide up to four different categories of response, both in perceived problems and in solutions. This fact supports the evidence of greater moral sensitivity at earlier ages compared to those in the control group. The depth in the analysis and judgement of the reality of today's world is manifested in the type of problems that they point out: economic crisis, health, environment, or lack of motivation in society. They thus evince acute perception, abstraction in thought, and moral sensitivity. These results agree with other studies that show the relationship between intelligence and moral components at an earlier age among children with HIA compared to peers with typical intellectual capacity (Piechowski, 2009; Roeper & Silverman, 2009).

It should be noted that, despite their earlier awareness of the world's problems and conception of solutions, there is a decrease in these in HIA group across the ages studied. This is in accordance with what is proposed by other authors in relation to children with HIA's increased pessimism and concern for the future in perceiving the world in a more complex and realistic way (Silverman, 1998), compared to their peers.

This work provides evidence of the eventual relationship between complex cognitive configuration, understanding the world, and the moral sensitivity of people with HIA from childhood. It thus contributes to a better understanding of this differential manifestation of human intelligence, beyond classical proposals. In agreement with other authors (for example, Dai, 2017; Renzulli, 2012; Sternberg, 2012; Tirri, 2016), these proposals allow guiding the broad moral sensitivity of these people towards ethics, combined with excellence and progress, through programmes that strengthen and favour their consolidation.

It would be interesting to determine whether the differences found in this study are maintained throughout the development of individuals during their childhood, adolescence, and adulthood. This would allow us to ascertain whether the pessimism that authors such as Piechowski (2009) postulate for the beginning of adolescence is maintained at more advanced ages. Likewise, it would be interesting to contrast these results based on the intellectual profile of giftedness or talent within the HIA group, designing educational programmes for the development of moral sensitivity and real-world configuration with increased ethical components.

Conflict of Interest

The authors of this article declare no conflict of interest.

References

- Ambrose, D., & Cross, T. L. (Eds.). (2009). *Morality, ethics and gifted minds*. Springer. <https://doi.org/10.1007/978-0-387-89368-6>
- Ambrose, D., & Sternberg, R. J. (Eds.). (2016). *Giftedness and talent in the 21st century: Adapting to the turbulence of globalization* (Vol. 10). Springer. <https://doi.org/10.1007/978-94-6300-503-6>
- Anguera, M. T., Blanco-Villaseñor, A., & Losada, J. L. (2001). Observation design, a key issue in the process of observation methodology. *Methodology of Behaviour*, 3(2), 135-160.
- Bellanca, J., & Brandt, R. (Eds.). (2010). *21st century skills: Rethinking how students learn*. Solution Tree.
- Beltrán, J., & Pérez, L. (1993). Identificación. In L. Pérez (Coord.), *Diez palabras clave en superdotados* (pp. 137-168). Verbo Divino.
- Castelló, A. (2008). Bases intelectuales de la excepcionalidad: un esquema integrador. *Revista Española de Pedagogía*, 66(240), 203-220.
- Castelló-Tarrida, A., Cladellas-Pros, R., & Limonero-García, J. (2019). El papel de las estructuras del conocimiento en la excelencia adulta. Aproximación desde el funcionamiento experto. [The role of knowledge structures in adult excellence. An approach from expert functioning.] *Comunicar*, 60, 49-58. <https://doi.org/10.3916/C60-2019-05>
- Cronbach, L. J., Gleser, G. C., Nanda, H. & Rajaratnam, N. (1972). *The dependability of behavioral measurements: Theory of generalizability for scores and profiles*. Wiley. <https://doi.org/10.1126/science.178.4067.1275>
- Dai, D. Y. (2017). Envisioning a new foundation for gifted education: Evolving complexity theory of talent development. *Gifted Child Quarterly*, 6(3), 172-182. <https://doi.org/10.1177/0016986217701837>
- Daniels, S., & Piechowski, M. M. (2009). *Living with intensity: Understanding the sensitivity, excitability, and emotional development of gifted children, adolescents, and adults*. Great Potential Press. <https://doi.org/10.1037/e676842011-002>
- Edgerton, P., & Kauchak, D. (1994) *Educational psychology: Classroom connections*. Merrill-MacMillan Publishing Co.
- Fischman, W., & Gardner, H. (2009). Implementing GoodWork programs: Helping students to become ethical workers. *Knowledge Quest*, 37(3), 74-79.
- Gibson, K. L., Rimmington, G. M., & Landwehr-Brown, M. (2008). Developing global awareness and responsible world citizenship with global learning. *Roeper Review*, 30, 11-23. <https://doi.org/10.1080/02783190701836270>
- Hume, M. (2000). *Los alumnos intelectualmente bien dotados*. Edebé.
- Lovecky, D. V. (1997). Identity development in gifted children: Moral sensitivity. *Roeper Review*, 20(2), 90-94. <https://doi.org/10.1080/02783199709553862>
- Piechowski, M. M. (2003). Emotional and spiritual giftedness. In N. Colangelo & G. Davis (Eds.), *The handbook of gifted education* (3rd ed.) (pp. 404-416). Allyn & Bacon.
- Piechowski, M. M. (2009). The inner world of the young and bright. In D. Ambrose & T. L. Cross (Eds.), *Morality, ethics and gifted minds* (pp. 177-194). Springer. <https://doi.org/10.1007/978-0-387-89368-6>
- Ramos, F. J., Hernández-Mendo, A., Pastrana, J. L., & Blanco-Villaseñor, A. (2012). SAGT: software para la aplicación de la teoría de la generalizabilidad (Proyecto fin de carrera para la titulación de Ingeniería Técnica en Informática de Gestión de la Escuela Técnica Superior de Ingeniería Informática). Universidad de Málaga, España.
- Renzulli, J. S. (2002). Expanding the conception of giftedness to include co-cognitive traits and to promote social capital. *Phi Delta Kappan*, 84(1), 33-58. <https://doi.org/10.1177/003172170208400109>
- Renzulli, J. S. (2012). Reexamining the role of gifted education and talent development for the 21st century: A four-part theoretical approach. *Gifted Child Quarterly*, 56(3), 150-159. <https://doi.org/10.1177/0016986212444901>
- Roeper, A. (2008). Global awareness and gifted children: Its joy and history. *Roeper Review*, 30(1), 8-10. <https://doi.org/10.1080/02783190701836254>
- Roeper, A., & Silverman, L. K. (2009). Giftedness and moral promise. In D. Ambrose & T. Cross (Eds.), *Morality, ethics and gifted minds* (pp. 251-264). Springer. https://doi.org/10.1007/978-0-387-89368-6_19
- Sastre-Riba, S. (2008). Niños con altas capacidades y su funcionamiento cognitivo diferencial. *Revista de Neurología*, 46(s1), 11-16. <https://doi.org/10.33588/rn.46S01.2008008>
- Seligman, M. E. P. (1998). *Learned optimism*. Pocket Books.
- Silverman, L. K. (1998). Through the lens of giftedness. *Roeper Review*, 20(3), 204-210. <https://doi.org/10.1080/02783199809553892>
- Sternberg, R. J. (2012). Giftedness and ethics. *Gifted Education International*, 8(3), 241-251. <https://doi.org/10.1177/0261429411435050>
- Terman, L. M. (1925) *Genetic studies of genius*. Stanford University Press.
- Tirri, K. (2010). Combining excellence and ethics: Implications for the education of the gifted, *Roeper Review*, 33(1), 59-64. <https://doi.org/10.1080/02783193.2011.530207>
- Tirri, K. (2012). What kind of learning environment supports learning of gifted students in science? In A. Ziegler, Ch. Fischer, H. Stoeger, & M. Reutlinger (Eds.), *Gifted education as a life-long challenge: Essays in honour of Franz J. Mönk*s (pp. 13-24). Lit Verlag.
- Tirri, K. (2016). Holistic perspectives on gifted education for the 21st Century. In R. J. Sternberg & D. Ambrose (Eds.), *Giftedness and talent in the 21st century. Adapting to the turbulence of globalization*, (pp. 101-110). Sense Publishers. https://doi.org/10.1007/978-94-6300-503-6_6
- Tirri, K., & Pehkonen, L. (2002). The moral reasoning and scientific argumentation of gifted adolescents. *Journal of Secondary Gifted Education*, 13(3), 120-129. <https://doi.org/10.4219/jsgse-2002-374>
- Torrance, E. P. (1974). *The Torrance Test of Creative Thinking: Norms and technical manual*. Scholastic Testing Service.
- Yuste, C., Martínez, R., & Galve, J. L. (1988). *Batería de aptitudes diferenciales y generales*. CEPE.