


Children's Conceptions of Intelligence. What is the role of Executive Functions and Self- regulation?

Concepciones de niños y niñas sobre la inteligencia ¿Qué papel se otorga a las funciones ejecutivas y a la autorregulación?

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Summary

Intelligence is a construct of notable impact in our sociocultural context, related to a wide range of conceptual and operational definitions which originate positions that highlights cognitive and abstract elements and emotional and social skills, as well as perspectives that are focused on processes underlying the intelligent performance, such as in the case of executive functions (EFs), which are configured as cognitive processes that make it possible the self-regulation (Miyake & Friedman, 2012). Similarly, there are approaches that give intelligence a relevant and predictive role of school performance, an aspect strengthened by the psychometric perspective, where the concept of intelligence has been closely linked to learning. In this line, we also find the classical perspective of crystallized Intelligence of Cattell (1943), which refers to the knowledge acquired through educational and cultural processes. The aim of this study is to know the conceptualizations of intelligence of children aged 8-12, the features they give to them, and the assessment of their own intellectual capacities. The data analysis was carried out through the grounded theory and the results mainly show that participants attribute components referred to the management of school contents and quantitative performance to intelligence. Moreover, the answers show elements related to EFs and self-regulation not only when considering the meaning of the construct, but also while characterizing and evaluating the intelligence performance.

Keywords: Intelligence; Executive Functions (EFs); Self-Regulation; Children

Resumen

La inteligencia constituye un constructo de notable impacto en nuestro contexto sociocultural, evidenciado en un amplio desarrollo de definiciones conceptuales y operacionales, donde surgen aseveraciones que van desde privilegiar elementos de tipo cognitivo y abstracto, a elementos emocionales y sociales, hasta perspectivas que se enfocan en los procesos que subyacen al desempeño inteligente, como es el caso de las funciones ejecutivas (FE), las cuáles se configuran como procesos cognitivos que posibilitan la autorregulación (Miyake & Friedman, 2012). De igual modo, existen enfoques que otorgan a la inteligencia un rol relevante y predictivo del rendimiento escolar, aspecto fortalecido por la perspectiva psicométrica donde el concepto de inteligencia se ha vinculado estrechamente con el aprendizaje. En esta línea, también encontramos la perspectiva clásica de inteligencia cristalizada de Cattell (1943), la cual hace alusión al conocimiento adquirido a través de procesos educativos y culturales. El objetivo de este estudio fue conocer las concepciones que niñas y niños, de edades comprendidas entre 8 y 12 años, otorgan al concepto de inteligencia, las características que le atribuyen y la valoración que hacen de las propias capacidades intelectuales. El análisis de los datos se llevó a cabo mediante la teoría fundamentada y los resultados evidencian principalmente que los participantes atribuyen al constructo de inteligencia componentes referidos al manejo de contenidos escolares y al rendimiento cuantitativo; además de poner en manifiesto elementos relacionados con las FE y la autorregulación no sólo en la significación que hacen del constructo, sino también al caracterizar y valorar el desempeño inteligente.

Palabras Clave: Inteligencia; Funciones ejecutivas; Autorregulación; Niños.

Introduction

The conceptualization of the intelligence construct represents a demanding work and complexity. It is also a relevant aspect not only for science, but also for public policies, and is focused on educational, assistance and health guidelines (Marambio, Gil de Montes, Valencia & Zubieta, 2015). We also observe a variety of conceptual definitions of the term, definitions that throughout time, have experienced paradigmatic changes that enrich the speech and awaken disciplinary interests (Ardila, 2011; Cabas-Hoyos, González-Bracamonte & Hoyos-Regino, 2017; Rosas, Boetto & Jordán, 2005).

If the conceptualization of intelligence is relevant for many scholars and significant for the evolution of the guidelines that impact the life of the subjects, it is also important to questions ourselves about the conceptions of this construct that children manage of our educational contexts, how they characterize and interpret it, the meanings they give it and the attributions they give based on this concept. From the perspective of the Grounded Theory (GT), it is intended to know the theory of intelligence emerging from their opinions, the intelligence that they use in their daily school experiences and it is main part of the explicative models that they prepare not only of their own learning processes (Bravo, 2012), but also relevant affective, social and motivational aspects in the construction of their own identity (Toledo, 2012). Central elements where the school context acquires significance, since it occurs in physical and psychological space that is relevant and favorable for the development of their own affordances and generation of adaptive resources (Sánchez, 2008).

Intelligence and Paradigm Changes

Intelligence is conceived as a cognitive process of high complexity in which different skills intervene and its conceptualization has not been exempt from different theoretical and even contradictory approaches (Ardila, 2011; Cabas-Hoyo et al., 2017; Pacheco, 2003). In the literature, we can observe perspectives that are focused on the preparation of theoretical definitions that emphasize aspects related to abstract skills, with the capacity to solve problems, or with faculties related to comprehension and understanding (Isaza & Calle, 2016; Rosas et al., 2005). All perspectives that stand out cognitive and abstract elements that strongly characterize an intelligence conceptualization in our cultural context, influencing different areas, such as the school, political and social environment (Rosas et al., 2005).

There are differences and controversies in the approaches that address topics related to stability or modification of intellectual skills. Specifically, we refer to theoretical perspectives that propose as basis of the determination of the intelligence variables of hereditary genetic type and, in its counterpart, environmental and cultural variables (Rosas et al., 2005). According to these approaches, we could have two main perspectives when we refer to the intellectual skills of the people, the first one defends an hereditary conception where the intellectual limit is established by the transmitted genetic potential and the second one defends the roles of the environmental, cultural and socio-economic variables in the stimulation and development of the intelligence, especially in the first years of life (Ardila, 2011; Herrnstein & Murray, 1994; Rosas et al., 2005).

Another important aspect is the fact that the study of intelligence in psychology, from its origins, was related to the possibility of its measurement (Ardila, 2011; Rosas et al., 2005). In fact, the psychometry has put a lot of effort into finding a valid measurement of this construct, using in most cases samples in the schools and assessing though the contents considered in the curricula (Isaza & Calle, 2016; Rosas et al., 2005). From this perspective, it is not difficult to understand the approaches that link intelligence to learning and school performance, up to the point of generating confusions derived from the superposition of these concepts (Bravo, 2012; Heaven & Ciarrochi, 2012; Strobel, Behnke, Gärtner & Strobel, 2019); in addition to the perspectives that attribute a main role or predictive role of school performance to intelligence (Jensen, 1973; Bravo, Villalón & Orellana, 2004; Strobel, Behnke, Gärtner & Strobel, 2019).

On the other hand, the factor perspective arises in search of reaching conceptualizations that integrate elements that are part of the intelligence construct (Ferreira, Zanini & Seabra, 2015; Rosas et al., 2005). This perspective is focused on inquiring the same structure of the intelligence through demanding statistical methods. From this perspective, different factor approaches emerge, from those that postulate the presence of a main factor that would explain the structure of this construct to others that postulate multifactorial views of this concept (Arancibia, Herrera & Strasser, 2004).

The conception of crystallized intelligence (Gc) and fluid intelligence (Gf) is a relevant theoretical perspective in the conceptualization of the intelligence construct, where elements derived from the factor and psychometric perspective converge (Arán Filippetti, Krumm, & Raimondi, 2015; Pérez & Medrano, 2013). Crystallized intelligence (Gc) would reflect on the knowledge acquired through cultural and educational processes, which would be more related to the level of schooling and learning, while fluid intelligence would represent less acquired and more related aspects to the abstract ability to the resolution of problems (Arán Filippetti et al., 2015, Ardila, 2011; Cattell, 1943).

As a complement to the traditional vision of intelligence that primarily emphasizes the cognitive and abstract elements, we have witnessed, in the last decades, the emergence of new intelligence conceptions that highlight elements related to emotionality, social aspects, artistic elements and even intrapersonal qualities (Cobos-Sánchez, Fluja-Contreras & Gómez-Becerra, 2017; Goleman, 2000; Isaza & Calle, 2016). This change of paradigm responds to the need to broaden the intelligence construct to other dimensions closer to the daily life of people (Goleman, 2000; Mesa, 2018; Rosas et al., 2005).

We also find more contemporary study perspectives that are focused on the processes that can regulate not only the cognitive activity, but also behavioral, social and emotional activities. We specifically refer to executive functions (FE), called also high order cognitive skills that consider cognitive aspects (FE *cool*) as well as emotional and motivational aspects (FE *hot*) (Zelazo & Muller, 2002) underlying intelligent behavior. Although there is a difference between the constructs related to intelligence and to the FE, we can also retain that both are central components of cognition and are relevant not only in the cognitive adaptation, but also in the social, behavioral and affective one (García-Molina, Tirapu-Ustárrroz, Luna-Lario, Ibáñez & Duque, 2010). However, the studies that have analyzed the relationship between intelligence, assessed through psychometric tests and FEs have shown contradictory results. In fact, children and adolescents show from very low correlations (Arán Filippetti et al., 2015; Ardila, Pineda & Rosselli, 2000; Montoya-Arenas, Trujillo-Orrego and Pineda-Salazar, 2010; Welsh, Pennington & Groisser, 1991), to significant correlations between different FE and the crystallized (Brydges, Reid, Fox, & Anderson, 2012), fluid (Brydges et al., 2012; Duan, Wei, Wang & Shi, 2010) and general intelligence (Arffa, 2007). It has been concluded that these constructs overlap only in some aspects and that, although FEs and intelligence refer to the ability of the subject to adapt to his environment, they cannot use as exchangeable terms (García-Molina et al., 2010). In addition to indicating that the intelligence tests do not use in the operationalization of the construct, elements related to executive processes, significant and coherent aspect with the approach that postulates that the EFs would be a relevant sphere of cognition but relatively independent from the IQ (Arán Filippetti et al., 2015; Montoya-Arenas et al., 2010; Welsh et al., 1991).

Executive Functions (EF)

The EFs are a set of cognitive processes directly related to the ability of self-regulation, intentionality and decision making (Arán Filippetti & López, 2013; Goldberg, 2001; Miyake & Friedman, 2012). That is, they are a set of control processes that can regulate thinking and behavior of people when making decisions and during the development of their affordances (Miyake & Friedman, 2012).

There are evidences that indicate that the development of the EFs, although it is not only limited to the childhood, this stage is where they would show more intensity and the possibility to establish relevant meta-cognitive competencies for the development and integral adaptation of children (Arán Filippetti & López, 2013; Best, Miller & Naglieri, 2011; Flores, Castillo & Jiménez, 2014; Pennequin, Sorel & Fontaine, 2010; Stelzer, Cervigni & Martino, 2011). This development is closely related and subject to neurobiological and environmental elements (Gaitán & Rey, 2013). In fact, the neurological substrate of the EFs is found in the pre-frontal cortex and the cingulate cortex in connection with cortical and sub-cortical areas (Heyder, Suchan & Daum,

2004; Stelzer et al., 2011). The environmental factor is also relevant for the development of the EFs since these structures would be susceptible not only to be modified by the surrounding socio-environmental context, but also stimulated and supported by it (Noble, Norman & Farah, 2005). In fact, the structure of neural networks for the development and articulation of the EFs is closely related to the quality of the environmental stimulation (Hackman & Farah, 2008; Noble et al., 2005; Zelazo, 2003).

Among the most relevant EFs described in the literature, we highlight the inhibitory control of impulsive responses, the ability of cognitive flexibility that allow changing action strategies when it is necessary and timely, the working memory and the ability of planning and organization (Anderson, 2002; Arán Filippetti & López, 2013; Davidson, Amso, Anderson & Diamond, 2006; Miyake & Friedman, 2012; Sastre-Riba, 2006). Since these high-order cognitive processes manifest themselves in the self-regulation of the cognitive, behavioral and emotional activity, the insertion of their study in the education field has been particularly valuable. Studies in this line has demonstrated that EFs predict the development of pre-academic skills (Espy, McDiarmid, Cwik, Stalets, Hamby, & Senn, 2004; Shaul & Schwartz, 2014) as well as learning and academic performance in school age (Jacobson Williford, & Pianta, 2011; St Clair-Thompson & Gathercole; 2006; Thorell, Veleiro, Siu, & Mohammadi, 2013). In addition, they are recognized as important processes for the autonomy of the child in his daily operation, development of socio-emotional competencies (Riggs, Jahromi, Razza, Dillworth-Bart, & Mueller, 2006), emotional understanding (Martins, Osório, Veríssimo, & Martins, 2016) and the creative potential in school age (Krumm, Arán Filippetti & Gutiérrez, 2018). The EFs as well as the metacognitive skills contribute to the academic performance in a different way (Bryce, Whitebread, & Szűcs, 2015) and they would be an even more important school success predictor than the level of general intelligence (Arán Filippetti & Richaud, 2017).

Taking into account the implications of the recognition of these cognitive processes as skills attributable to an intelligent behavior, important to achieve a self-regulated learning, the objectives of this study were (a) inquiry about the conceptions that children aged 8 to 12 have about the concept of intelligence, (b) analyze the characteristics that they attribute to the concept and (c) know the assessment they make of their own intellectual capacities. To that end, a qualitative methodology was used and particularly, the Grounded Theory, methodological perspective that allows discovering the concepts deduced from the context researched and that underlie the concept of study was applied. (Charmaz, 2007) Therefore, they give us knowledge situated.

Method

A qualitative methodology was used since this approach is in line with the purpose of collecting information about the conceptions the children have about the intelligence construct, how they characterize it and the self-perception of their own intellectual performance. To achieve this objective, the grounded theory was applied since it allow us to identify the determinants of the intelligence construct children have. That is, this method allowed knowing the meanings given by the participants to this research work (Ruíz, 2003), making it possible the construction of a situated theory of the construct under study, through the interrelation of the categories and subcategories emanated from the context researched (San Martín, 2014; Vivar, Arantzamendi, López-Dicastillo & Gordo, 2010).

Participants

A theoretical sampling was used and for that reason, participants were selected according to the need for construction of an explanatory theory of the intelligence construct, from the categories and subcategories emanated from the perceptions and characterizations that the study sample gave to the intelligence construct. The data collection process was carried out until the theoretical saturation criterion, process that finishes “when the collection of new data does not give any

additional or relevant information to explain the existing categories or discover new categories” (Vivar, et al., 2010, p. 287). The sample was composed of 16 subjects aged 8-12. The selection of children was according to the chronological criterion and the requirement of being regular students of the Chilean education system. The selection was intentional, and voluntary and was subject to the authorization of the parents since they are underage (França-Tarragó, 2008; Losada & López, 2003; Ruíz, 2003).

Data Production Techniques

To achieve the objective of knowing the meanings children give to the intelligence concept, structured interviews were used in order to identify the intelligence conceptualization, the characteristics attributed and the assessment of their own intellectual skill made by the participants of this study. The structured interview is characterized because the questions included in it are pre-established in advance and are proposed in the same order to the participants under study (Fernández, 2001). The topics discussed in the interviews¹ responded to three elements specifically: conception, characteristics and self-perception of intelligence managed by the recipients of this study.

Procedure

First, children who meet the required conditions for the study were contacted through their parents or legal guardians. Then they were asked for an informant consent and before starting the activities, children were asked if they were willing to participate in the interviews (positive answer), informing the possibility of leaving the activities at any moment (França-Tarragó, 2008). Once the children answered the survey, they were fully transcribed in order to carry out the analysis detailed of them. The data analysis was carried out through the grounded theory, using the ATLAS.ti program version 8. With these findings, a model was built where relationships between categories and subcategories are defined.

Data Analysis

The data analysis was carried out following the perspective of the grounded theory, characterized by a systemic, inductive and comparative approach to analyze data and implement the development of theories of topics studied (Charmaz, 2007; Charmaz, 2014). To that end, the interviews were rigorously transcribed and analyzed in order to identify meaning units and assign initial codes that represented the action or idea of the participants in the study (Gaete, 2014). The codification is a relevant process for the methodology proposed, reason why at first an open codification were executed and by using it, topics elements, characteristics and/or patterns were identified and collected (Bonilla & López, 2016; Gaete, 2014; Reyes, Altamar, Aguirre & Murillo, 2014). Once the open codification is concluded, central categories were identified through a comparative analysis process of the codes found. This contrast process is called axial coding (Vivar et al., 2010). Then, through the selective coding process, the data are synthesized and integrated, discovering the centrality of some categories of analysis, both for their explanatory capacity as well as for the sense given by the relationships and all the information found, resulting in the intelligence theory managed by children who participated in this study, grounded in their responses (Reyes et al., 2014; Vivar et al., 2010)

Results

Meaning attributed to the Intelligence Concept

The results of the meaning attributed to the intelligence construct, product of the analysis of the relationships between categories and subcategories show six key concepts when meaning the

¹ The script of the interview is found in the appendixes.

term. The concept related to the management or possession of school content is important when requiring the intelligence construct. In fact, the subjects participating in the study define intelligence, mainly based on the ability to manage content given in the school context, both at general and specific level, mainly in the field of mathematics and language (*“for me, intelligence is to know the subjects, mainly to be very good at mathematics and language”*, *“I think that intelligence is to know everything, I mean everything and every subject”*, *“it is to know all the disciplines, mathematics, language and all the subjects, but without forgetting anything, “I think that intelligence is to know everything that is taught.”*). Another concept related to the foregoing, although it appears less, is the school performance, referred specifically to the quantitative success that is shown in school grades and that in the participants’ words, it is expressed in: *“intelligence is to get good grades, is to have only sevens²”*, *“it is to have seven in everything, I think that it is to have the best grades of the subject”* (see Figure 1).

It is also relevant that, when defining intelligence, assertions regarding processes involving to executive functions (FEs) appear with considerable intensity. They include self-regulatory processes and executive components related to inhibitory control, working memory, verbal fluency and capacity of planning and organization. Self-regulatory processes are categories that appear much more in the responses of children to mean the intelligence construct. Assertions such as *“to know what one processes or studies for a test or something like that”*, *“use 100% of your brain or your head”*, *“use information that you learned in the past and use it”* are elements proposed by part of the participants involving in the subcategory of cognitive regulation. There are also expressions related to the ability to regulate one’s behavior (*“being intelligent is to behave well and listen to”*, *“is to obey and do the tasks and stand up only when necessary, it is not to stand up and bother the other students at any time”*) and the ability to solve problems (*“it is to be able to solve difficult exercises and not give up”*, *“being intelligent is to solve problems and not being in doubt”*) like relevant significances for the construct under study. It is relevant to observe that these self-regulatory processes are viable thanks to the performance of different executive components such as inhibitory control, working memory, verbal fluency, cognitive flexibility, ability of planning, among other functions.

The ability to inhibit impulsive and automated responses, while pursuing a goal, is another category present in the responses of the informants when conceptualizing the intelligence construct. This function requires the ability to learn to ignore distracting or not relevant stimuli and to focus on those involving in a specific purpose (Gaitán & Rey, 2013). Expressions such as *“intelligence is to study hard and not get distracted with other things”* *“it is to strive to understand and stop thinking in other things like football or play station”*, *“it is to pay attention in class, to do the homework and to try not to talk too much with friends”*, They are elements that explain the inhibitory control as an aspect present in the meaning of intelligence that children put on.

Figure 1 also shows conceptualizations of intelligence focused on the development of social skills (*“intelligence for me is to be a good person, get along well with others”*, *to know how to make friends and feel good with the family”*) and with less intensity, external regulation aspects specifically referred to the recognition of abilities or skills of third parties (*“it is that my parents and teachers congratulate me”*).

The uncertainty category present when requesting meanings of the intelligence construct is an element of remarkable interest in the analysis conducted. In fact, we can observe that this category appears in the third place, if we consider the hierarchy or importance of appearance, and shows discomfort, anxiety and some perplexity when facing this topic of study (*“well intelligence for me is like...people engaged to...”*, *“it is something that”... with what we...”*, *“I do not know how to say it... this questions is easy, but it makes me feel nervous...”*

² Maximum grade considered in the Chilean education system.

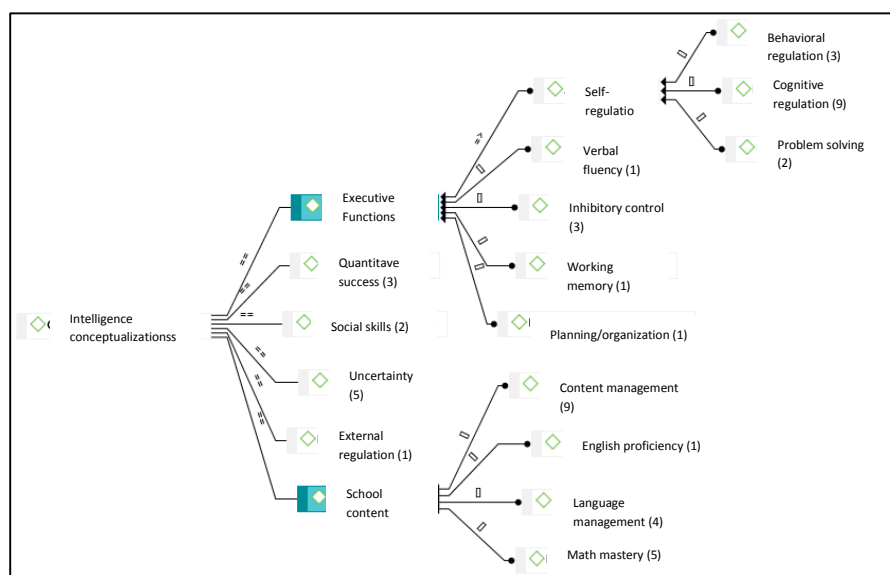


Figure 1. Categories and relationships of the conceptualizations of the intelligence construct

Characteristics attributed to a girl or boy considered intelligent

The characteristics attributed to a girl or boy considered intelligent are the second topic of analysis. The participants, as shown in Figure 2, attribute mainly characteristics related to quantitative success and the management or acquisition of the EF. The aspect related to the quantitative success is referred specifically to school performance, that is, an intelligent boy or girl, according to the opinions of their classmates, should have good grades, which is reflected in the following expressions *“he gets good grades”, “he has only sevens”, he does not have bad grades”, “he always get good grades.”* It is interesting to note that the management of contents, although it is a quality attributed to an intelligent retained subject, their intensity of appearance is reduced with respect to the relevance given to the meaning or conceptualization of the intelligence construct by the participants.

The EF are elements that emerge with more intensity in the responses given by the participants when characterizing intelligent retained subjects. Among them, stand out: self-regulation, inhibitory control, ability to organize and verbal fluency. Such as in the case of intelligence conceptualizations, the characterization of the above-mentioned construct by the children is also focused on the elements involving in self-regulatory functions, such as cognitive regulation (*“he pays attention to class”, “he has clear thoughts”*), behavioral (*“he behaves well in the room”, “he has to behave well in the classroom”, “intelligence also comes with good behavior”*), emotional (*“he does not have emotional problems because if he is intelligent he will know how to control himself”*) and perseverance (*“he does not give up easily”, “if he does his homework badly, he always try again”*). It is noteworthy that although elements related to cognitive self-regulation (manifestation of the *cool* EFs) prevail, as in the case of the conceptualization of the intelligence construct, aspects related to behavioral and emotional regulation strongly emerge (manifestation of the *hot* EF) when characterizing an intelligent retained subject.

Another executive skills attributed to intelligence are explicitly related to the inhibitory control, aspect that is stronger in the characterization the subjects make of the construct under study and that is reflected in expressions such as: *“he is focused, is not worried about what others are doing”, “first of all, he has to make an effort in what he does and then he can do whatever he wants”, “he is a responsible boy who first do his homework and then plays with his friends”*. Assertions that allude to the ability to dominate more instinctive and automatic responses to give rise to more analytical and reflective ways of processing in view of the achievement of specific

objectives, that in turn make it possible more adaptive modalities (Flores et al., 2014; Miyake, Friedman, Emerson, Witzki, Howerter & Wager, 2000).

The school organization also appears in the EFs, understood as the ability to order, prioritize and sequence information or strategies in view of the pursuit of school goals (Gioia, Isquith, Guy & Kenworthy, 2017) and that in the children's words who participated in the study, it is expressed in assertions like: *"he always takes notes"*, *"he do all his homework"*, *"he has study habits"*, *"he always brings his materials"*. Responses that allow us to differentiate not only the main strategies used to achieve school goals proposed, but also their frequency. The executive component of verbal fluency is another subcategory that emerges, although less important, when characterizing the intelligence construct and it is expressed by the participants like: *"he knows how to speak well ... better than others"*, *"knows how to read fast and speaks well"*; expressions that emphasize the ability to organize and transmit information in a suitable manner and with certain speed (Benjumea, Ocampo, Vega, Hernández & Tamayo, 2016).

Figure 2 also shows the presence of other two categories emerging when characterizing the construct under study. The first of them refers to the development of social skills, understood specifically as the ability to establish cordial and solidary relationships with others (*"I think that an intelligent boy is not a fighter and know how to make friends"*, *"intelligent is someone who does not fight and share his materials"*, *"being intelligent is to be a good person in his daily life and generous"*). While the second one refers to the external recognition and although it appears with less intensity, it is interesting, since in this case the characterization is determined by the delivery of an external object that certify the possession of the skill under study (*"always obtain diplomas"*).

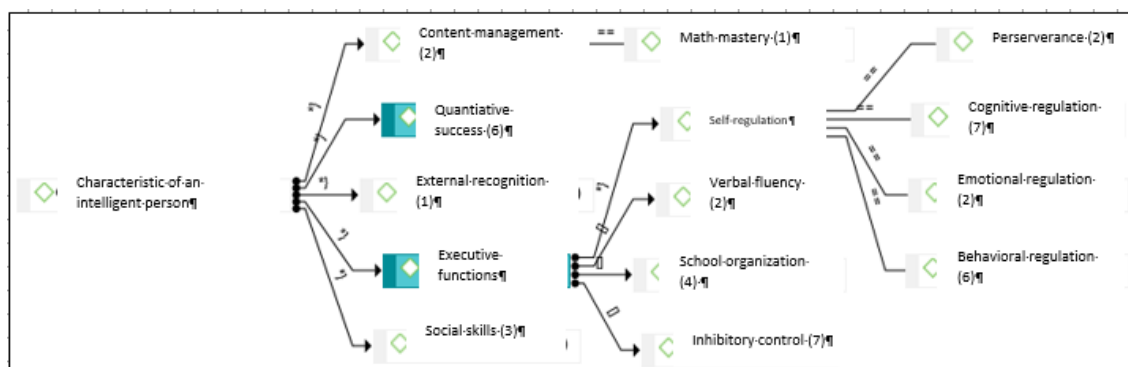


Figure 2. Categories regarding the characterization of an intelligent subject.

Consideration about Intelligence

Regarding the third and last topic of study, referred to the question about the consideration of the intelligence, the results show that only 56% of the participants considered themselves are intelligent girls and boys (see Figure 3). Among the argumentations of such consideration, the fact of obtaining good grade prevails. In fact, the quantitative success is a main argument of the positive intellectual assessment and it is expressed in assertions such as: *"I have always gotten good grades and I am doing well in school"*, *"because I have gotten better grades, I have good GPA"*, *"I am doing well in the tests, I have good grades"*, *"my GPA is always the best of the course"*. In accordance with this foundation, the category related to the management of school contents emerges as argument of the positive intellectual consideration, although it appears less and is explicitly expressed in assertions such as: *"I am doing very well in mathematics, also in language and in all the subjects."*

The use of resources referred to cognitive regulation (*"I have always paid attention in class, that is why I can answer well the questions I am asked"*, *"because I learn fast"*), to the

inhibitory control (“when I set my mind on something, I pay attention and stop talking”) and to the perseverance (“I never give up with any task”) are elements related to the EFs that also appear to support a positive assessment of the positive intellectual skills.

On the other hand, it is relevant that 46% of girls and boys who participate in the study show a negative intellectual opinions of themselves. Among the main argumentations that support this assessment, we find the deficit perception in the cognitive, behavioral self-regulation and in the EF development with the inhibitory control. In fact, among the foundations related to the cognitive regulation, we find the following assertions: “Although I strive to do my homework and study, I am doing badly, I am not intelligent”, “sometimes I study a lot, but in the test, my mind goes blank”, “I never give a good answer to a question”. Argumentations that show a certain level of difficulty to manage and handle cognitive processes. In the same way, we find statements that explain difficulties in the regulation of one’s impulses (“actually, I do not strive a lot, I want to, but I do not do it, “sometimes I am lazy and I do not want to study, I prefer to do other things”, “I have left the studies aside, I prefer to play”) and in the behavior control (“I do not have a good behavior, I do not obey”, “I behave badly in class, I am always moving and sometimes I am a fighter”). It is curious that when stating a negative consideration of their intellectual abilities, participants, in the study use less arguments related to school performance (“I get bad grades”, “I have very bad grades”) and give privilege to elements related to executive components.

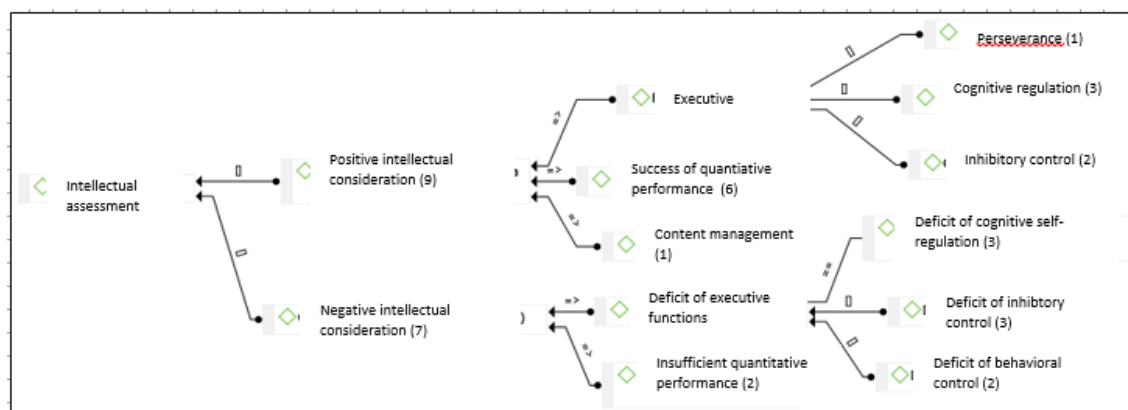


Figure 3. Categories and relationships regarding the own intellectual assessment

Discussion

The objective of this study was to recognize the conceptions that boys and girls aged 8-12 have about the intelligence concept, the characteristics they attribute to it and the assessment of their intellectual skills. Specifically, we sought to discover through the ground theory the explanatory models related to the intelligence theory that schoolers manage in our contexts, relevant aspect because the results show us situated information, that is, concepts, conjectures and propositions emerging from the informants and not exclusively from the assumptions *a priori* (Charmaz, 2014; San Martín, 2014, Vivar et al., 2010). For that reason, it is highly probable that these meanings and attributions significantly influence the school experience of most of them.

First, the results show that the management of school contents is the main category when conceptualizing the intelligence construct. Information that along with the elements referred to a successful school performance is a significant part of the situated theory of the intelligence conceptions that the participants of this study manage. Meanings referred to the content and the school performance that have a strong agreement with theoretical approaches that understand intelligence not only as abstract and logical processes (Gf), but also crystallized in knowledge and contents explicitly acquired through educational and cultural experience (Gc) (Arán Filippetti et al., 2015, Ardila, 2010; Cattell, 1943). The emphasis put on the school contents when meaning intelligence has been also favored by the development of the psychometric perspective, which in

view of the experienced difficulty to measure intelligence in a direct way, has evaluated it through school contents, using samples coming also from these contexts (Isaza & Calle, 2016; Rosas, et al., 2005). From this basis, it is simple to understand not only the association between the concepts of intelligence and learning, but also between these terms and the school performance (Bravo, 2012; Heaven & Ciarrochi, 2012), meanings of the intelligence construct that currently emerge in the opinions of girls and boys studying in our educational contexts. Intense relationship between situated knowledge and theoretical knowledge already systematized, that it is not evidenced in the case of meanings related to social aspects, which appear with much less intensity in the statements of the participants.

On the other hand, we observe with admiration the emergence of the contents related to the EFs as a relevant part of the situated theory that girls and boys manage, of the intelligence construct. In this regard, we note that the intelligence meanings are not mainly concentrated only in the specific executive components, but in the ability to self-regulation that these functions make possible. At this point, it makes sense to reflect on the implications of the EF concept, which is focused on highlighting the multidimensionality of this construct, to emphasize what comprises a set of cognitive functions, what allows or makes feasible the ability of self-regulation, not only cognitive but also behavioral, affective and social, allowing the decision making and the development of affordances (Arán Filippetti et al., 2013; Gioia et al., 2017; Goldberg, 2001; Miyake & Friedman, 2012).

The characterization attributed to a retained intelligent subject is the second topic of analysis. The results show the EFs as categories that are important when characterizing the construct under study. In fact, assertions related to the self-regulatory processes that are feasible by the presence of executive components related to the inhibitory control, the ability of organization and verbal fluency. In the category of self-regulation, elements related to cognitive regulation and behavioral regulation emerge. The cognitive regulation is the dimension that emerges with greater intensity, not only when characterizing the intelligent performance, but also when conceptualizing the construct under study and comprises elements referred to the intentional control of thinking, to meta-cognitive processes, to the use of intellectual resources available, the updated affordances and the transference of information. While behavioral regulation expresses deliberate control efforts to adapt behavior to school objectives, such as following instructions, occupying an specific position in the classroom and being quiet to attend to relevant stimuli of the school experience. Although this subcategory is a constant topic in the study, it gets stronger when characterizing a retained intelligent subject. The same happens with the executive component of the inhibitory control, aspect that emerges from the answers of the participants in the study, as a relevant characteristic of the intelligent performance and alludes to the ability to ignore distracting or non-relevant stimuli (Gaitán & Rey, 2013) and it is expressed in the deliberate control of the concentration process where sustained, selective and monitored attention acquires an important role.

Among the characteristics attributed to an individual considered intelligent, elements related to the possession of school contents and successful school performance also emerge. They are categories already installed in the first topic of analysis. Although it is necessary to note that the category referred to successful school performance appears more than the management of contents when characterizing the intelligent performance. Relevant aspect because although the school content is an important aspect of the conceptualization of intelligence, its realization is estimated based on the school performance, specifically in grades. These results show us evidences of the transpositions and confusions that continue to date regarding the conceptualization of intelligence and is a largely product of the mechanisms used to measure this construct.

Regarding the third topic of analysis, goal of which is focused on knowing the assessment of their own intellectual abilities by the participants, it is at least interesting to observe the new emergence of the categories related to successful school performance and the executive

functioning, as central foundations of the intellectual assessment; although there are different levels of intensity in the saturation of these categories, levels that depend on the type of consideration of one's intellect. In fact, girls and boys who show a positive assessment of their intellectual ability support their consideration in the categories above mentioned, with very similar levels of appearance. While the subjects that present a negative assessment of their intellectual resources support their consideration mainly in elements referred to difficulties in the EFs, especially to deficit in the inhibitory, cognitive control and behavioral processes.

It is important to highlight that the elements related to cognitive regulation, behavioral regulation (assigned to the self-regulation category) and inhibitory control are relevant aspects coming from the context researched, not only when assessing the intellectual ability, but also when conceptualizing and characterizing the intelligence construct. When analyzing these functions, we can observe elements that differentiate among them, such as the emphasis on cognitive-intellectual recourses, the intentionality in the control of the behavior and the processes supporting concentration. However, we find cross-sectional elements that unite them, such as the ability to inhibit or control impulses, trends, ideas, interests and automated responses, in order to regulate cognition-intellect, behavior and attention-concentration; aspects related to the self-control or self-regulation skills in decision making, central skills to achieve the self-regulated learning. It is important to highlight that, if the EFs emerge with intensity in the explanatory models of the participants, it not considered as a synonym of intelligence construct, but as differentiated cognitive abilities (but not necessarily related) linked to the intelligence concept.

The results of this study acquire great relevance not only for the educational field, but for educational psychology and neuroeducation, when we are given the information situated about the intelligence theory that girls and boys manage of our educational contexts, being the explanatory model by excellence that is used when meaning their experiences and processes related to only to school learning, but also to relevant motivational, affective and social elements for the development of affordances and the comprehensive development. Analyzing the conceptions, characteristics and assessments of intelligence was a strategy to allow us to know the meanings, beliefs and attributions present in the children, elements assumed in the methodological opinions. We are also aware of the richness of having a situated theory of the construct studied that gives us information to understand and undertake new perspectives of analysis.

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Appendix 1**Script of the Interview Structured**

Date: ____/____/____

Name of the Interviewee: _____

Age: _____

School: _____

GENERAL OBJECTIVE:

To know the conceptions of girls and boys aged 8-12 given to intelligence, the characteristics attributed and the assessment they make of their own intellectual abilities.

Study Topics:

- Conceptions given to the intelligence concept.
- Characteristics attributed to the intelligent performance.
- Assessment of their own intellectual abilities.

Relevant instructions: in addition to greeting and thanking for the participation of the boy/girl, contextualize the activity giving the general coordinates of the work and situating this information collection technique (here it is necessary to inform about the fact that a voice recording will be conducted). Then explicitly ask the boy/girl if he/she wants to participate in the activity and with the consent already given by the parents. If they do not agree to the proposed work, thank for their sincerity and let them to continue with their activities; in that case, they must continue with the questions in the same order proposed.

QUESTIONS:

1. If you have to define the concept of intelligence, how would you do it? What is intelligence?
2. What are the characteristics that you observe in an intelligent boy or girl?
3. Do you consider yourself an intelligent boy or girl? Why?