Exploring the Meta-Comprehension Abilities of Students with Intellectual Disabilities

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Abstract

The purpose of this investigation was to explore the importance of different meta-comprehension aspects in students with intellectual disabilities, and to determine which one of them can best explain their performance on reading comprehension. For this purpose, metacognitive measurement instruments, an inconsistency detection tasks, and confidence in performance judgments on reading performance were applied together with a reading comprehension standardized test (LECTUM). By means of regression analyses of the data, results revealed that the detection of inconsistencies as a meta-comprehension monitoring measure, more specifically the detection of internal inconsistencies, some dimensions of the meta-comprehension inventory as a measure of metacognitive skills (planning , evaluation of the reading process, regulation of comprehension/incomprehension) and absolute calibration accuracy were the best predictors of performance of the participants on reading comprehension. It is of importance to understand the nature of the problems presented by the students when facing a text in order to develop adequate approaches to reading comprehension according to the needs of learners with intellectual disabilities. According to the results, we concluded that theoretically-relevant metacognitive elements significantly predicted the performance of reading comprehension. Implications for learning and instruction are discussed.

Keywords*: reading comprehension, intellectual disabilities, metacognition.*

Introduction

From the first studies on metamemory in the seventies (Flavell, 1971; Flavell, Friedrichs & Hoyt, 1970), scientists and researchers have been particularly interested in metacognition, its components, and how it is used in different cognitive processes such as attention, learning and memory. Reading comprehension is among them as well. Such interest has been the impetus for an important number of studies in the field, and thus, it has been one of the most productive subject matters in the last twenty years (Martí, 1995).

This interest has also lead to investigations on the metacognitive processes in specific groups, such as students with special needs, as there is a general consensus regarding metacognition in which metacognition has a significant impact on students' achievement (Garcia & Pintrich, 1994; Metcalfe, 1998; Verschaffel, 1999; Wong, 1996). However, such studies have focused on children with learning disabilities (LD) more than on those with intellectual disabilities (ID). The difference between these two diagnostics is that in LD the dysfunction affects one or more cognitive processes and there exist a discrepancy between their measured potential (e.g., on a standardized IQ test) and their actual performance on academic tasks, instead of limiting overall intellectual ability, as is the case with ID (Wong, 1985). Therefore, the results obtained with studies that recruited samples of students with LDs are not necessarily applicable to learners with IDs. The working definition of intellectual disability and its diagnostic criteria that will be used as reference in the present study is the latest version of the Diagnostic and Statistical Manual of Mental Disorders of the American Psychiatric Association (DSM-V). Thus, "intellectual disability" is understood as a disorder with onset during the developmental period that includes both intellectual and adaptive functioning deficits in conceptual, social, and practical domains.

The purpose of comprehension is to build a coherent mental representation, called situation model, from the knowledge of the reader and the information in the text (Gernsbacher, 1990; Kintsch, 1988). And supporting the ongoing cognitive process is metacognition, which was defined by the pioneer in the area, Flavell (1976), as the knowledge of one's cognitive processes. When facing a text, students with intellectual disabilities experience many difficulties. For instance, for these students the processing of information is slower, and they frequently fail at establishing meaningful relationships among a set of ideas (Banikowski & Mehring 1999; Guzel-Ozman, 2006). They also show limitations using effective memory and rehearsal strategies and they do not spontaneously organize, chunk, or elaborate in ways that facilitate the learning process (Belmont & Butterfield 1971; Turner, Dofny & Durka, 1994). Finally, they exhibit little use of metacognitive processes such as control, monitoring, planning, or awareness of their own cognitive processes (Erez & Peled, 2001). Blackorby and colleagues (2010) conducted a study with students who met the criteria of the Individuals with Disabilities Education Act (IDEA), which is a federal law in the U.S. that requires schools to serve the educational needs of eligible students with disabilities. They compared the outcomes of children identified for services under IDEA and, as appropriate, in comparison with the outcomes of samples including their non-disabled peers, and found that on measures of letter-word recognition the mean standard score was 83.2 for typical students, but for students with IDs, the

mean standard score was 61.7. A similar pattern exists for text comprehension in which the average scores were 100 for the population, 82.9 for special education and 62.4 for students with IDs. Regarding graduation rates, across disability categories, students with IDs are least likely to receive a diploma (37%), and they have the fourth highest rate (5%) of aging out of the public school system without some form of certificate or diploma. Therefore, under this scenario the teaching of literacy becomes a challenge for educators.

The World Health Organization in the International Classification of Functioning, Disability and Health (ICF) states that the promotion of social participation of all human beings is encouraged and that the ability to read and comprehend a text is as a necessary prerequisite for full participation in modern society. Taking this into account, the purpose of this investigation was to explore the importance of different meta-comprehension aspects in students with intellectual disabilities and to determine which of these can best explain their performance on reading comprehension in order to generate knowledge which could more effectively guide the training on reading comprehension of this particular group of learners.

When discussing metacognition, one must understand that there is no general consensus among researchers regarding its components. In order to avoid any complications, however, the initial definition by Flavell (1976) and Brown (1978) will be used. We distinguish between knowledge of cognitive processes and their regulation. That is to say, that there is one part of knowledge that is more static and one part that constantly monitors and regulates one's ongoing cognitive process.

Metacognitive knowledge

Within the label "*metacognitive knowledge*" there are three sub-procedures. First, declarative knowledge (to know what), which includes notions of the reader, the task and comprehension strategies. Second, there is procedural knowledge (to know how), which entails the knowledge of strategic processes and actions to perform. Third, conditional knowledge (to know when, why, and where to apply), which involves the recognition of when to use a specific strategy given task demands (Brown, 1980, 1987; Jacobs & Paris, 1987). This has been closely related to successful learning (Baker & Bell, 2009; Schraw & Dennison, 1994). One implication of this process is that a person who is acquainted with the use of strategies will be more likely to use them than someone who is not. This is demonstrated in research studies in which metacognitively aware learners are more strategic and perform better than unaware learners (Garner & Alexander, 1989; Pressley & Ghatala, 1990). A reason for this would be that metacognitive knowledge allows individuals to plan, sequence, and monitor their learning process so that they can improve their performance (Schraw & Dennison, 1994). Furthermore, metacognitive knowledge is related to learning transfer (i.e., that the acquired knowledge is used within a context different from that in which it was originally learned; Bransford, Brown, & Cocking, 2000). In this way, conditional knowledge is considered to be fundamental for the acquisition of this ability. Finally, McNamara (2004), who has deeply studied the training of reading comprehension strategies, argues that reading strategies can help the reader who has little knowledge to use logic and common sense instead of prior knowledge to fill conceptual gaps.

Regarding metacognitive knowledge in students with intellectual disabilities, Erez and Peled (2001) found less awareness of their own cognitive strategies or strategy implementation

in this population of learners. On the other hand, in students with learning disabilities, it has been shown that they have difficulties in thinking about their thoughts (Wiens, 1983) and a deficit in self-knowledge which leads to difficulties in learning (Vaidya, 1999). They also apply metacognitive strategies ineffectively compared to typically developing peers at a similar age (Butler, 1998; Desoete & Roeyers, 2002), possibly due to the lack of strategy transfer (Moreno & Saldana, 2005).

Monitoring and Regulation and its Relation to Reading Comprehension Performance

In order to achieve coherence within the situation model, the inference creation process is regarded as fundamental (Graesser, Singer, & Trabasso, 1994; van Dijk & Kitsch, 1983; Vieiro & Gómez, 2004). The metacognitive aspect directly related to the search of meaning of the text is the working part of metacognition: monitoring and regulation. These processes are related yet distinct. Monitoring is the process by which an individual evaluates the state of his/her understanding of information (Oakhill, Hartt & Samols, 2005) while regulation is the process used to achieve cognitive consistency in the knowledge elements of a text when they appear to be inconsistent (Otero, 2002). In spite of this, to proceed with the text and establish a coherent model, it is necessary that both processes occur concurrently. That is to say, if an inconsistency is detected, it must be solved in order to continue reading for comprehension (Hacker, 1998).

To evaluate and access the monitoring processes, the inconsistencies detection paradigm has been broadly used (Baker, 1984; Otero & Campanario, 1990; Ruffman, 1999; Oakhill, 2005; Kim & Phillips, 2014; Helder, Van Leijenhorst & van den Broek, 2016). This has been made under the assumption that detecting an error intentionally introduced into the text could be a way of accessing the evaluation performed by the readers of their own understanding of the text during the construction of meaning. According to the model of G>MAL by Otero (2002), the evaluation of the coherence standard must satisfy certain constraints in which the value of G (i.e., coherence index, the goodness of the representation) must be superior to the MAL (i.e., minimum acceptable level). If not followed, and the result of the evaluation is unsatisfactory (for instance, when detecting an inconsistency), the regulatory process is activated. According to this model, the regulation process consists of generating new inferences, which allows the coherence to increase, and the minimum acceptable level to be reached. Previous research has investigated the relation between monitoring, regulation, and reading comprehension performance, in which the performance of inconsistencies detection of proficient and poor comprehenders was compared (Paris & Myers, 1981; Long & Chong, 2001; Cain, Oakhill, & Lemmon, 2004). This led to the conclusion that proficient comprehenders show better performance in inconsistencies detection tasks compared to poor comprehenders. Nevertheless, little research exists regarding monitoring skills in students with special needs and no research was found on children with intellectual disabilities. Kotsonis and Patterson (1980) compared comprehension monitoring skills of students with LDs and typically-developing students in the context of a game-learning task where they found that there was a deficiency in comprehension monitoring skills in students with LDs. Bos and Filip (1982) noticed that students with LDs only detected inconsistencies under a cued condition, interpreting this as supporting the conceptualization of students with LDs as inactive learners.

Metacognitive Accuracy and its Relation to Reading Comprehension Performance

To calculate meta-comprehension accuracy the performance judgment of the readers is compared with their comprehension of the text. Therefore, proficient meta-comprehension accuracy entails a high relation between the performance judgment on reading comprehension and actual performance. Poor meta-comprehension accuracy entails an inconsistency between judgments about learners' understanding and actual performance as such. This measure is a link between metacognitive aspects and text comprehension. It is also regarded as a meta-comprehension monitoring measure, and thus, when students successfully evaluate their level of comprehension they should be quite accurate in their predictions (Soto, Jacovina, Gutierrez de Blume, McNamara, Benson, & Riffo, 2017).

As for the calibration applied to reading comprehension, no research was found that applied to students with intellectual disabilities. According to the research of Klassen (2002), students with LDs have a tendency to underestimate their performance in different academic tasks (e.g., writing, reading, arithmetic). More specifically, regarding reading comprehension tasks, it can be argued that even though students with learning disabilities displayed lower levels of metacognitive knowledge and reading comprehension, they did not differ from the students without learning disabilities on self-efficacy judgments (Pintrich, Anderman, & Klobucar, 1994).

The Present Study

Predicated on the previous literature reviewed, we sought to answer the following research questions in the present investigation.

Research Questions and Hypotheses

1. To what degree do aspects of meta-comprehension knowledge (knowledge about cognition, planning, evaluation during reading, evaluation after reading, regulation after problematic understanding, regulation to deepen comprehension), inconsistency detection tasks performance (low frequency words, internal inconsistencies, and external inconsistencies), and absolute calibration accuracy predict the reading comprehension performance of students with intellectual disabilities?

H_1: We predicted that, according to theory and extant research, specific aspects of meta-comprehension would significantly predict the reading comprehension performance of students with intellectual disabilities. More specifically, we believe that inconsistency detection as a meta-comprehension monitoring measure, the subscales of the meta-comprehension inventory as a measure of metacognitive knowledge, and absolute calibration accuracy would significantly predict reading comprehension performance.

2. To what degree do the three types of inconsistency detection tasks (low frequency words, internal inconsistencies, and external inconsistencies) predict the absolute calibration accuracy of students with intellectual disabilities? Do the dimensions of meta-comprehension (awareness of comprehension, planning, evaluation of learning outcomes, evaluation of the learning process, regulation of comprehension, regulation of incomprehension) provide incremental variance to the prediction of absolute calibration accuracy after controlling for the effect of the three types of inconsistencies?

H_2: We hypothesized that the three inconsistency detection tasks would significantly positively predict absolute calibration accuracy and that the dimensions of meta-

comprehension would significantly positively predict absolute calibration accuracy and account for incremental variance after controlling for the effect of inconsistency detection performance.

Method

Participants

The participants were 15 special education students who attended a public special education school in San Pedro de la Paz, Chile. Eight of the participants were female (7 males). The students' age ranged from 10 years and 10 months to 16 years and 5 months. All participants have been diagnosed with a mild or moderate intellectual disability, albeit they have literacy skills which allow them to read sentences fluently.

Materials

LECTUM. LECTUM is an instrument developed by Riffo, Véliz, Castro, Reyes, Figueroa, Salazar, and Herrera. (2011) to evaluate reading comprehension in Chilean students. LECTUM evaluates the textual, pragmatic and critical aspects involved in reading comprehension. Each student must answer 32 multiple-choice questions from four different texts. The scores in the measure are coded as correct (1) or incorrect (0) and are added together to obtain a total score. Scores are transformed to percentiles, based on raw score performance, to facilitate interpretation. The internal consistency reliability coefficient, Kuder-Richardson (KR) 20, for this measure was adequate, KR-20 = .74.

Confidence in performance judgments. Confidence in performance judgments were collected locally (i.e., item-by-item) by asking students to complete a question regarding their confidence in whether they felt they answered the item correctly. A "yes" response indicated that the participants felt confident they answered the item correctly whereas a "no" response indicated they felt confident they answered the item incorrectly. The "yes" responses were coded as "1" and no responses were coded as "0" to match the coding scheme for the performance measure. Responses were then summed across all items and subsequently transformed to percentiles, as with performance, to more readily compare the two.

Calibration accuracy. Absolute accuracy scores were calculated by comparing participants' confidence in performance against their actual assessment percent correct score—that is, the *residual score approach*. Raw scores were converted to a proportion and subtracted from the composite confidence in performance ratings to calculate absolute accuracy. Comparing confidence in performance against actual performance yielded continuous, *absolute* calibration accuracy scores, as described by Schraw (2009). A score of "0" indicates perfect calibration; on the other hand, the higher the value, and thus the farther away from "0", the greater the inaccuracy. In essence, the higher the accuracy scores, the greater the *mis-calibration* exhibited by the participant.

Inconsistency detection tasks. The text "Las Ballenas" (The Whales) was presented to the students. It was previously manipulated with the introduction of errors of internal consistency, external consistency and, additionally, words of low frequency use. They were instructed to highlight every part of the text that seemed difficult or confusing. The text had a total of four paragraphs that were placed alternately, meaning that if one presented inconsistencies the

following did not. Each paragraph with inconsistencies had one external inconsistency, one internal inconsistency and two words of low frequency use. This produced a total of eight inconsistencies within the entire text, across the three types of inconsistencies (low frequency words, internal inconsistencies, and external inconsistencies).

By "external inconsistency" it is understood that there is a cognitive conflict between the information in the text and the participant's knowledge of the concept. By "internal inconsistency" it is understood that there is conflict between the elements of the text. Even though low frequency use words are not considered as inconsistencies per se, they do hinder the optimal comprehension of the text, activating, as a consequence, a possible strategy to compensate for the incomprehension. This measure is scored according to the number of inconsistencies detected and, therefore, the higher the score, the more inconsistencies the student detects.

Meta-comprehension Inventory (MI). The MI is comprised of 23 Likert-type items, originally developed by Soto, Gutierrez de Blume, Asún, Jacovina, and Vasquéz (2018). It explores the following six metacognitive dimensions: knowledge about cognition, planning, evaluation during reading, evaluation after reading, regulation after problematic understanding, and regulation to deepen comprehension. All items of *knowledge of cognition* were answered using a response format from *strongly disagree* to *strongly agree*. In contrast, the *control of cognition* items employed a format from *never* to *always*. Considering the characteristics of the participants, we used an adapted inventory where the vocabulary was simplified and the Likert scale was reduced from 5 to 3 options.

Procedure

University IRB approval was obtained prior to the commencement of any data collection activities. Informed consent was secured according to the policies and procedures outlined by the Universidad de Concepcion. Data collection was divided into two parts: first, the reading comprehension test LECTUM was applied as a group instead of individually. In tandem, students were asked about their confidence in performance judgments in relation to each of their answers. This first part was conducted without interruption and lasted one hour and thirty minutes.

Next, all students were examined individually and asked to answer the MI and the inconsistency detection task. This second part was conducted without interruption as well and lasted about twenty to forty minutes, depending on the participant. Once all the data were collected, they were transferred to an EXCEL file for further statistical analysis.

Data Analysis

Prior to data analysis, data were first screened for univariate outliers and evaluated against requisite statistical assumptions according to the procedures outlined by Tabachnick and Fidell (2013) via the Statistical Package for the Social Sciences (SPSS) version 23. No extreme outliers that would otherwise undermine the trustworthiness of the data were detected for the outcome variables. Data were also tested for univariate normality using histograms with the normal curve overlay and skewness and kurtosis statistics. Data approximated a normal distribution. Furthermore, data were evaluated for assumptions including multicollinearity (all

correlations were < r = .85) and linearity. All of the aforementioned assumptions were met, and thus, data analysis proceeded without making any adjustments to the data.

The first research question was answered by conducting a simultaneous/standard ordinary least squares (OLS) regression. In this analysis, the different aspects of meta-comprehension knowledge (knowledge about cognition, planning, evaluation during reading, evaluation after reading, regulation after problematic understanding, and regulation to deepen comprehension), inconsistency detection tasks (low frequency words, internal inconsistencies, and external inconsistencies) performance, and absolute calibration accuracy served as predictors and reading comprehension performance served as the criterion. The second research question was answered by conducting a hierarchical linear regression in which the MI dimensions were entered in the first Block and the different types of inconsistencies were entered in the second Block, with absolute calibration accuracy as the criterion. We used the adjusted squared multiple correlation coefficient ($R^2_{adjusted}$) as measure of effect because this value corrects the observed effect based on criteria such as sample size and sampling error. Cohen (1988) specified the following interpretive guidelines for R^2: .010-.299 as small; .300-.499 as medium; and ≥ .500 as large. We adjusted the p-value to account for the multiple ordinary least squares regressions using the Bonferroni adjustment to obviate Type I error rate inflation (i.e., our new actual a priori p-value was .025 [.05/2]).

Results

Results of the standard regression with the meta-comprehension knowledge dimensions (knowledge about cognition, planning, evaluation during reading, evaluation after reading, regulation after problematic understanding, and regulation to deepen comprehension), inconsistencies detection task (low frequency words, internal inconsistencies, and external inconsistencies), and absolute calibration accuracy as predictors revealed that the model with ten predictors was unnecessarily complex, as awareness of comprehension, evaluation of learning outcomes, external inconsistencies, and detection of low frequency words were not significant predictors (all p-values ≥ .32). Thus, to simplify the model and make it more meaningful and considering the small sample size, we removed these non-significant predictors from the model. The final model with six predictors—planning, evaluation of the learning process, regulation of comprehension, regulation of incomprehension, internal inconsistencies, and absolute calibration accuracy was statistically significant, $F_{(6,8)} = 9.95$, $p = .002$, $R^2_{adjusted} = .79$. All six predictors significantly predicted reading comprehension performance: planning (b = 4.19 [$CI_{95\%}$ = .02, 8.37]; β = .47); evaluation of the learning process (b = -21.88 [$CI_{95\%}$ = -35.62, -8.14]; β = -.89); regulation of comprehension (b = 6.35 [$CI_{95\%}$ = 1.64, 14.35]; β = .49); regulation of incomprehension (b = -7.62 [$CI_{95\%}$ = -15.96, -1.71]; β = -.35); internal inconsistencies (b = 37.56 [$CI_{95\%}$ = 7.90, 67.52]; β = .71); and absolute calibration accuracy (b = -.53 [$CI_{95\%}$ = -.91, -.15]; β = -.67).

With respect to interpreting positive regression coefficients, for every one unit increase in the predictor, reading comprehension increases by the value of the standardized regression coefficients (β) associated with each predictor. The negative coefficients bear further explanation, however. The negative regression coefficient of evaluation of the learning process suggest that for every one unit increase in students' proficiency in evaluating their learning process, reading comprehension decreases by .89 of one standard deviation. Because of the way the items for this scale are worded this indicates that students appropriately adjust confidence

and performance when they realize they do not know or understand the topic particularly well, which necessarily undermines performance. The negative regression coefficient of regulation of incomprehension suggests that as students' incomprehension decreases due to increased regulation and monitoring, their reading comprehension increases. As to absolute calibration accuracy, because these scores were calculated such that higher values signify greater *miss-calibration* and lower values indicate increased accuracy, the negative association indicates that as *mis-calibration* increases, and thus inaccuracy, reading comprehension performance decreases by a sizable amount, .67 of one standard deviation, which makes theoretical sense.

Initial findings of the hierarchical linear regression indicated that, as with the previous results, the model was overly saturated with predictors, as planning, evaluation of learning outcomes, evaluation of the learning process, external inconsistencies, and detection of low frequency words were not significant predictors (all *p*-values $\geq$ .46). As with the previous analysis, we simplified the model and improved its fit by removing these non-significant predictors. The final model revealed that awareness of comprehension, regulation of comprehension, regulation of incomprehension, and internal inconsistencies significantly predicted absolute calibration accuracy, $F_{(4,10)} = 5.34$, $p = .01$, $R^2_{adjusted} = .55$. Results of the first block, in which the three inconsistency detection tasks were added as predictors, showed that only internal inconsistency detection was a significant negative predictor of *mis-calibration*, $\Delta F_{(1,10)} = 3.98$, $p = .02$, $\Delta R^2_{adjusted} = .11$, ($b$ = -34.31 [$CI_{95\%}$ = -75.92, -27.91]; β = -.51). The three meta-comprehension dimensions provided significant incremental variance to the prediction of absolute calibration accuracy, $\Delta F_{(3,11)} = 4.95$, $p = .01$, $\Delta R^2_{adjusted} = .44$: awareness of comprehension (b = -12.15 [$CI_{95\%}$ = -20.80, -3.50]; β = -.76); regulation of incomprehension (b = 16.99 [$CI_{95\%}$ = 2.28, 31.79]; β = .62); and regulation of comprehension (b = -15.11 [$CI_{95\%}$ = -24.35, -5.87]; β = -.92) were statistically significant predictors.

The negative regression coefficients of internal inconsistency detection and regulation of comprehension suggest that for every one unit increase in internal inconsistency detection and regulation of comprehension, *mis-calibration* decreases by .51 and .92 of one standard deviation respectively. Stated differently, for every one unit increase in internal inconsistency detection and regulation of comprehension, absolute calibration accuracy increases by .51 and .92 of one standard deviation respectively. With respect to regulation of incomprehension, the positive regression coefficient indicates that as students' ability to regulate and monitor their incomprehension increases calibration accuracy increases as well (by .62 of one standard deviation).

Discussion

The results of this study suggest that meta-comprehension skills effectively predict reading comprehension performance of students with intellectual disabilities. Although both static (knowledge) and dynamic (monitoring/regulation) aspects of meta-comprehension have a significant effect, not all skills evaluated have the same impact.

Metacognitive knowledge was expected to be a relevant variable. We speculated that the explicit knowledge of strategies and processes could compensate for the different cognitive difficulties presented by this group of students when presented with a text, such as difficulties in linking ideas, abstract thinking and learning through experience. As Schraw and Dennison

(1994) asserted, metacognitive knowledge plays a compensatory role in cognitive performance by means of the encouragement of the use of strategies. As observed in the results of this study, by itself, only the dimension of regulation of reading (understanding) of the MI had a significant effect on reading performance. However, when combining meta-comprehension skills with inconsistency detection tasks, in the search for a more comprehensive explanatory model, other dimensions of metacognitive knowledge take relevance: planning, evaluation of the reading process and regulation of incomprehension.

As observed in other research, we also expected that meta-comprehension monitoring would have a significant effect on reader performance, and so it was. An innovative finding supported by our study is what happens to the type of inconsistency that best predicts performance in reading comprehension. In this investigation, only internal inconsistencies had a significant effect. This highlights the importance of coherence relationships established within the text as a key factor in achieving the overall meaning of the text.

A surprising result was the significant effect achieved by absolute calibration accuracy. While in other research the tendency of students with LD was to underestimate their performance and, therefore, to show *mis-calibration*, here we see that this variable had a moderate impact on reading comprehension performance. Therefore, it could be an aspect to be considered when developing innovative educational interventions.

It is worth highlighting the results obtained when looking for a model that integrates the different metacognitive aspects to explain the performance in reading comprehension of these students. Here we see that it is possible to explain 79% of the reading comprehension performance of students with intellectual disabilities due to the combination of the metacognitive abilities with greater impact by themselves, that is to say: detection of internal inconsistencies, calibration accuracy and MI dimensions related to reading planning, process evaluation, regulation of understanding and misunderstanding. Although this result should be analyzed with discretion due to the size of the sample, it does provide a ripe avenue for additional inquiry that should not be overlooked.

Implication for Special Education Practice and Avenues for Future Research

The written language allows us to overcome the barriers of oral media of communication and to transmit messages despite the distance or the time in which the orators are. In a person, their development extends the possibilities of future progress in school life, as well as their potential for progress in working life (OECD, 2013), but also allows proper, more integrated participation in the literate societies in which we live today.

The teaching of literacy is a major challenge for those who work with students with intellectual disabilities. According to the student and the methodology used, learning the conversion of phonemes to graphemes can take a while. However, we must not forget that literacy does not end when the student learns to read a text fluently, but he/she also must understand what he reads.

Unfortunately, this aspect has not been the subject of in-depth research. So, there is still much to know about how students with intellectual disabilities read and which methodologies or

strategies can improve their reading performance. Thus, additional research should be conducted on how certain strategies that align to specific dimensions of metacognition influence reading comprehension and metacognitive monitoring in this population of students, especially through rigorous experimental studies.

The results of this exploratory research demonstrate that meta-comprehension skills have a high impact on reading comprehension performance. Therefore, these results have direct educational implications, such as an intervention approach that incorporates the training of meta-comprehension abilities to compensate for the cognitive deficit and improve performance in reading comprehension must be adopted.

Leaning on metacognitive knowledge for teaching comprehension strategies that fit with the characteristics and motivations of learners may be an interesting option. For this, one should not forget the three sub-processes of knowledge, that is, the declarative, procedural and conditional knowledge. Therefore, to explain what the strategy is about, how and when to use it, and then put it into practice in several texts to promote its generalization need to be considered when developing new strategy training interventions.

In addition, the monitoring of understanding is possible to be worked through playful activities such as, for example, games of detection of inconsistencies. Here the student should evaluate the coherence of the mental model, according to his/her knowledge of the world and the information contained in the text. In the same way, the generation of questions to the text or to the author, promotes the critical reading and, at the same time, the monitoring of what is being read.

In this way, the student will be able to face a text with better tools, promoting their motivation for reading and allowing him/her to carry out daily activities like ordering in a restaurant, taking the right bus, to entertain and discover fictional worlds, but also to learn new academic content, among others.

Limitations

In interpreting the findings of this study, there are several limitations that must be considered. First, the small sample size and lack of definitive research with this population of students regarding meta-comprehension of reading makes this study exploratory (i.e., a feasibility/pilot study). Nevertheless, the innovative character of this research should be emphasized because no similar studies were found. One of the reasons for the limited number of participants was the exclusion criteria related to students' reading fluency.

It should also be considered as a limitation the fact of not having similar studies among this population of students, making it impossible to find comparative studies with which to compare the stability of the results obtained. Finally, there is a conceptual limitation related to the metacognition construct. As has been pointed out, there is currently no consensus among researchers on the components of metacognition. Thus, when assessing the metacognitive aspects considered in this research, researchers could be evaluating different metacognitive constructs or the same construct but from different perspectives. In any case, this research helps to clarify these differences and helps us to better understand how higher-order thinking skills such as those needed in metacognition operate in learners with intellectual disabilities.

Conclusion

It is important for researchers and educators to better understand how meta-comprehension and metacognitive monitoring in reading comprehension operate for all learners. However, most of the research on this topic involves samples of typically-developing learners or learners with learning disabilities which, as we have demonstrated, differ from learners with an intellectual disability. Our study, however exploratory, reveals four main conclusions. The first is that, even among learners with intellectual disabilities, various aspects of meta-comprehension of reading and metacognitive monitoring, as higher-order thinking skills, significantly predict reading comprehension performance. The second is that proficiency in inconsistency detection—more specifically, internal inconsistency detection—also predicts reading comprehension performance. The third is that specific dimensions of meta-comprehension in reading and proficient inconsistency detection uniquely predict metacognitive monitoring skill (i.e., absolute calibration accuracy) among learners with intellectual disabilities. The fourth and final conclusion is that the fact that the effect sizes were so robust in spite of the small sample size warrant further research in these topics among this understudied population of learners.

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