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RELATIONSHIP BETWEEN WEAK CENTRAL COHERENCE AND MENTAL STATES UNDERSTANDING IN CHILDREN WITH AUTISM AND IN CHILDREN WITH ADHD.

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Abstract: The central coherence involves the processes of perceptual coding and attention mechanisms, highly deficient in children with ADHD (Booth & Happé, 2010). According to this theory, also children with autism are overly focused on details to the expense of a global perspective, and this negatively affects their ability to integrate environmental stimuli into a coherent whole (Happé, Booth, Charlton, Hughes, 2006). The aim of this study was to determine differences in central coherence of children with high functioning autism (ASD; n=10), children with attention-deficit hyperactivity disorder (ADHD; n=10) and typically developing peers (n=10). Individuals with ADHD exhibit significant deficits in perceptual skills and problem solving, failing also in mental states understanding tasks. While the children with autism spectrum disorder show impairments in making pragmatic inferences. Future research should therefore concentrate on the investigation of the cognitive and psychological mechanisms underlying these effects.

Keywords: Weak central coherence, Autism spectrum disorder, Attention-deficit hyperactivity disorder, Perceptual skill, Pragmatic inference, Mental states understanding.

1. INTRODUCTION

The central procedures of information processing are typically characterized by the drive for "coherence", which allows giving a meaning to experiences, placing them in a broader context (Frith & Happé, 1994). The cognitive flexibility/shifting and response selection/inhibition (Mackinlay, Charman, & Karmiloff-Smith, 2006; Miyake, Friedman, Emerson, Witzki, Howerter, Wager, 2000) represent different mechanisms likely to be started to support people establish goals and find different strategic solutions for attaining individual objectives, adapting answers to events. Although several abilities are not usually engaged during the execution of automatic or semi-automatic sequences, they are critical for unknown and inexperienced situations that need high levels of attention and a flexible use of goal-oriented strategies. The attention is one of the most important cognitive processes that allow understanding the stimulus meaning within the context (Buckley, 2003; Wilson & Sperber, 1988). Specifically, the processes of selective attention permit to isolate the important features of stimuli, both perceptual and semantic, that come from outside, ignoring those less salient.

At this regard, it has been argued that the process of central coherence assigned to organization of information allows individuals to give priority to understanding meaning, and to comprehend the context in which events occur. So, in a phrase it is possible to grasp the meaning of the message, which is remembered even better if it can be placed in a wider context (Vulchanova, Talcott, Vulchanov, & Stankova, 2012).

But, whereas several studies (Brock, Norbury, Einav, & Nation, 2008) have demonstrated that the ability to use context in language comprehension is positively related to structural language competence, most recent findings (Volden, Coolican, Garon, White, & Bryson, 2009) suggested that the impact of structural language measures can justify a significant variance in pragmatic skills.

The pragmatics of communication refers to the ways in which context contributes to meaning. Specifically, the meaning of a sentence depends on an understanding of the context and the speaker's intent. To pay attention to the influence that a given context can have on the message is one of the ability more involved in the pragmatic inference process, addressed to the understanding of the explicit and implicit meaning of the same sentence (Loukusa & Moilanen, 2009).

In this direction, empirical evidences (Happé, 1999) on semantic

coherence (reading for meaning *vs* reading for sound) and processing preference (local or global) in visual-spatial and constructive tasks (e.g. Embedded Figures Test and Block Design*)* have been used to successfully explain how some aspects of perceptual organization can be referred to more specific research areas, such as semantic studies.

At this regard, the Weak Central Coherence hypothesis (WCC) (Frith & Happé, 1994; Happé & Frith, 2006) offers an explanatory approach for enclosing behavioral and cognitive dissociations associated with ASD. Specifically, many researchers have defined the distinct cognitive profile in children with autism, characterized by a fragmented perceptual–cognitive style that enhances ability to detect details in a stimulus and difficulties in integrating information into a coherent whole (Baron-Cohen & Klin, 2006; Landry & Bryson, 2004). This limited ability to understand context or to "see the big picture" drives individuals with autism spectrum disorders to have a tendency for fragmented perception, and to benefit less from the contextual meaning in perceptual or verbal-semantic and global-local processing tasks (Dakin & Frith 2005).

This detailed processing is suggestive of a weak central coherence (Frith & Happè, 1994). Thus, the WCC model is based on a cognitive abnormality that affects a wide range of psychological functions: perception, language and social skills. Individuals with autism spectrum disorders tend to process information "piece by piece", rather than in their global context, focusing on the development of its component parts. Consequently, the information obtained are isolated and fragmented, due to a "weak" capacity of central coherence.

Furthermore, recent studies (Mundy & Jarrold, 2010) have suggested that the Weak Central Coherence could also explain social impairments in autism spectrum disorders. At this regard, deficits in both responding to others' joint attention directives and initiating joint attention have been noted in children with ASD. These impaired joint attention behaviors, which require taking into account oneself and the others, are evident very early and persist over the years. In addition, a specific delay in one of the critical precursors of ToM, and, specifically, the ability to process an environmental stimulus within the context in which it occurs, negatively affects the typical development of Theory of Mind (Chevallier, Noveck, Happé, & Wilson, 2011). Therefore, the two models, Central Coherence and ToM, seem to be closely related and have particularly important role in helping children to understand the experiences and for improving their social development.

An interesting conceptualization of the Weak Central Coherence model (Mottron & Burack, 2006), rather than focusing primarily on perceptual deficits, suggests a superior attention to detail in the environment to the exclusion of overall understanding of context. From this point of view, the savant skills in individuals with ASD could be explained by their intense focus on little details, their differences in processing and perception, and tendencies of obsessive and repetitive behaviors.

More in depth, in a recent research overview, Happé and Frith (2006) have argued that the Weak Central Coherence refers to the detail-focused processing style. While the initial explanation was consistent with the presence of a core deficit in central processing resulting in failure to extract global form and meaning, recently different and more interesting interpretations of this cognitive process have been provided. First, the cognitive failure could be explained by a possible superiority in local or detail-focused processing rather than a central processing deficit (Soulieres, Zeffiro, Girard, & Mottron, 2011). Second, the lack of coherence might not be necessary a deficit but it could be an atypical processing style. In fact, in ASD, the local bias is not the only processing mode available, although it might be the default, and a more holistic processing is also possible when patients are well instructed (Davis & Plaisted, 2007). Last, the Weak Central Coherence may occur simultaneously to deficits in social cognition, rather than explains them.

So, many studies (Frith & Happè, 1994) have sustained the central coherence hypothesis as an atypical local processing in ASD, at the expense of a weak processing at a more central level. Furthermore, the local processing style does not seem to be a simple negative consequence of executive dysfunction, but rather it appears to be strongly independent from ToM deficits.

The Weak Central Coherence model suggests, therefore, that the cognitive functioning, in individuals with autism spectrum disorders, is based on the processing of contextual data and, specifically, of social information (Jolliffe & Baron-Cohen, 2001). As consequence, the limited ability to reach a central coherence leads people with autism to experience the world in a fragmented way, and this processing style could have a crucial role in their poor understanding of social stimuli and meaning.

Moreover, full development of mentalizing abilities ensures a cohesive interpretive device of contextual information, and plays a significant role in central coherence improvement. Specifically, the ability to mentalize puts together complex information from totally disparate

sources into a pattern which has meaning. Individuals with ASD can show impaired mentalizing capacities due to a specific deficit on integrating information at different levels, and this can explain certain ASD symptoms and clinical characteristics (Frith & Happè, 1994).

Nevertheless, it also true that difficulties in shifting from local to global could also represent a side-effect of an executive function deficit (Harris & Leevers, 2000; Rinehart, Bradshaw, Moss, Brereton, & Tonge, 2000). In addition, as is well known, executive dysfunction can impair communication ability. Specifically, individuals with ASD may find difficult to start and maintain a conversation, interpreting utterances in an appropriate way, and also the formulation of an appropriate language, through intuitive knowledge of others' mental states and by reading related contextual cues, may be weakened in these patients. Therefore, the problem solving skills appear closely linked to executive functions, because they allow individuals to process information within the context and understand the mental states of interaction partners. The most commonly suggested explanations for pragmatic inference deficits are theory of mind and central coherence (Loukusa & Moilanen, 2009).

This is also important for children with ADHD. Impulse control problems are common in individuals with ADHD and may include difficulty to inappropriate response inhibition. Moreover, they tend to overly focus on the detail and fail to grasp the whole picture, and the cognitive perseveration does not allow them to maintain attention and concentration on task (Solomon, Ozonoff, Cummings, & Carter, 2008). In addition, they, which usually manifest lack of executive control, may exhibit difficulty on processing the stimuli, due to the marked inattention/impulsivity and the inability to attribute mental states to others for the incapacity to remain "attached" to the context.

Despite the considerable amount of literature has clearly demonstrated severe executive deficits in both disorders, they are characterized by two different ways of directing attention to stimuli: overselectivity in children with ASD and inattention /impulsivity in children with ADHD. Usually, children with autism show inflexible and overselective behaviors, and also hyper-reaction to modification of routines characterizes their behavioral patterns (Fabio, Oliva, & Murdaca, 2011; Lam, Bodfish, & Piven, 2008). Moreover, planning and cognitive flexibility are significantly reduced in individuals with ASD (Ozonoff & Jensen, 1999), which tend to involve in highly perseverative strategies on cognitive flexibility tasks (Hughes, Russell, & Robbins, 1994). Comparing to ASD, subjects with ADHD

display more severe deficits of inhibitory control, and the response inhibition deficits cause and maintain their impulsive behaviors in everyday life (Solomon et al., 2008).

So, the focus of the present investigation rests on these different clinical profiles (ASD *vs*. ADHD). For the first time, we explore the possible impact of these two different attentive models on the ability to direct selective attention to relevant contextual stimuli and to analyze them according to the context intent.

While there is widespread agreement on a general description of executive functions, controversial data are been recorded comparing Weak Central Coherence and ToM performances of different clinical populations that show an impairment in these specific cognitive abilities. This aspect needs to be more examined, verifying whether the two different cognitive constructs are related or they follow different developmental trajectories. In addition, most of the studies on WCC have focused attention on the perceptual aspects. According to this framework, the Central Coherence refers to the ability to collect stimuli from the context into a coherent whole, reserving a secondary role to the ability to grasp the meaning of the actions taking place in the context.

Starting from these theoretical premises, in the present research we explored ASD and ADHD children's ability to process contextual information through perceptual organization and semantic inference tasks. While in previous research (Booth & Happè, 2010) exclusively perceptual tasks have been used to measure central coherence in autistic samples, in this study perceptual and semantic tasks have been introduced for evaluating the central coherence level, considering both capacities as essential to the overall organization of the context and for understanding contextual information meaning. A second, perhaps even more important, novel aspect of the present investigation is to analyze the ability to use the context for story completion task that implies the attribution of mental states to the protagonist of the story. More in depth, the aim of this study was to investigate the nature of central coherence in children with high functioning autism, children with ADHD and typically developing peers, in order to verify which of the two different impairments, overselectivity or impulsivity, may have a greater impact on the ability to organize and process information.

2. METHOD

2.1 Participants

Thirty individuals participated in the study, 10 diagnosed with autistic spectrum disorder, 10 affected by ADHD, and 10 typically developing controls. The first group included 10 high functioning children with autism ranging from 6 to 12 years (M = 8.25; SD = 2.44). They will hereby be referred to as the group of children with autistic spectrum disorders (ASD). Children with ASD were diagnosed according to the DSM-IV-TR (American Psychiatric Association, 2000) criteria for autism. IQ scores were measured with the WISC-III (Wechsler, 1991 – Italian version) (see Table 1). In addition, symptom profile of the participants in the ASD group was measured using the Childhood Autism Rating Scale (Schopler, Reichler, DeVellis, & Daly, 1980).

Total scores range from 15 to 60. A score of 30 represents the cutoff for a diagnosis of autism on the mild end of the autism spectrum. In the present study a mean of 35.46 emerged (SD=1.74) which corresponds to mild to moderate levels of autism.

The Attention-Deficit/Hyperactivity Disorder (ADHD) group comprised 10 children, aged from 6 to 13 years (M= 8.34; SD= 1.62), with a formal diagnosis of ADHD based on DSM-IV-TR criteria and a normally ranged Full Scale IQ score (see Table 1). ADHD participants were included immediately after their first clinical diagnosis and had thus not received any pharmacological or psychoeducational therapy before.

The typically developing (TD) comparison group comprised 10 IQ matched neurotypical children (see Table 1), recruited from two different schools. They were engaged via local primary schools and they all attended normal classes corresponding to their age level schools and were free of psychiatric disorders at the time of testing. They were chosen on the basis of their age and IQ scores.

Experimental children were recruited from two different rehabilitation centres operating in the area of the city of Messina. Only participants without comorbidity of behavioural disorders, learning impairments, and mental retardation were included. Potential autistic subjects were excluded if found to have an associated neurological, genetic, infectious, or metabolic disorder such as fragile X syndrome, encephalitis, or other known medical conditions associated.

There were no significant differences between the autism, ADHD, and control groups with respect to age, educational level, and IQ levels. All

participants were native Italian speakers. Each child was individually tested and informed about the procedure of the experiment. Parental informed consent was obtained for all subjects and the experimental procedure was approved by the local ethics committee.

2.2 Measures and procedure

2.2.1 Perceptual skill task

For assessment of perceptual abilities, Raven's Colored Progressive Matrices (Raven, 1998) and Objects Assembly subtest of WISC III R (Wechsler, 2006) were used. In this study, it was administered only a part of the CPM (Series: A1-A4-A8-A12- Ab1- Ab4- Ab8- Ab12- B1 -B4- B8- B12), progressing to increased levels of complexity. That is because children with ASD and ADHD might have more trouble with tasks that require a high attention level, so as to invalidate the results. For the Objects Assembly subtest of WISC III R, the child must analyze the picture (an apple, a car, a girl and a child face) and construct the whole visual object from its parts within time constraints.

Two specially created tools namely, Pragmatic Inference Test (Filippello & Marino, unpublished results) and Mental-states Test (children version) (Filippello & Marino, unpublished results) were constructed to assess semantic competences.

2.2.2 Pragmatic inference task

The *Pragmatic Inference Test* measures the semantic aspect of cognitive coherence. It was specially structured to evaluate the ability to connect two events, using the context to infer the missing information. The test has been previously validated by administering to a sample of 200 typically developing children ranging in age from 4 to 5 years (M=4.5, SD=.70) and its coefficient alpha was good (α= .79), demonstrating very good psychometric properties. The pragmatic inference task consists of a short description of pragmatic inference and 8 short everyday stories in which there are described a started event and a subsequent situation cause-related to the event previously mentioned. Each time, after reading one of the eight short stories, participants were instructed to respond to about each story. They were asked to tell to the researcher the cause explicitly and logically linked to the event mentioned in the started situation [e.g.: *Someone gives a candy to Louis - The enclosure of the candy is dropped. (a) Louis threw the enclosure on the floor. (b) Louis ate the candy (??)*]. Verbal

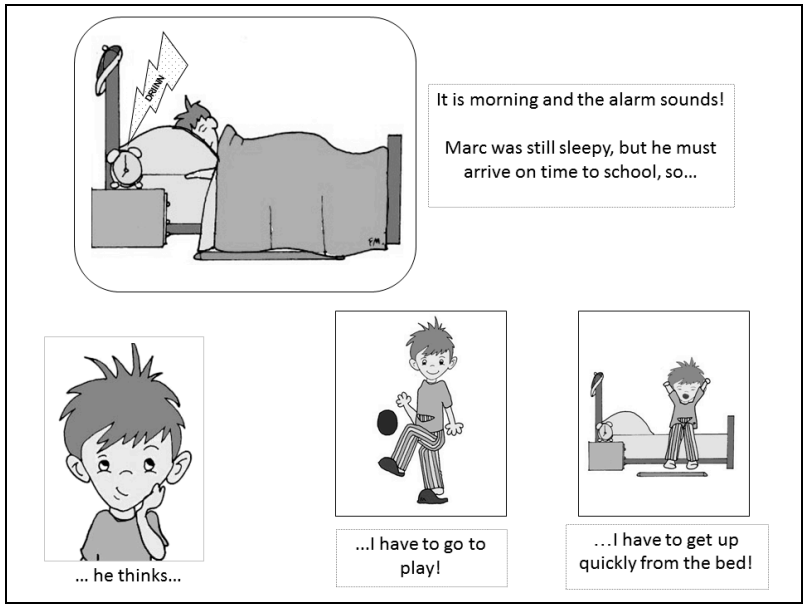
responses were recorded on paper and the accuracy of each response was rated on a 1–3 scale by a researcher: 1 for a not given answer, 2 for an incorrect answer, and 3 for a fully correct answer. A maximum score of 24 was therefore possible. Higher scores indicate more pragmatic inference abilities.

2.2.3 Mental-states understanding task

The *Mental-states Test (children version)* evaluates the children understanding of psychological states in certain contexts and the ability to complete the description of story fragments using the context. Although there are good tools designed to assess the ToM ability (Blijd-Hoogewys, van Geert, Serra, & Minderaa, 2008), none of these is structured in such a way as to ensure that the responses of the child to be guided by the context. Even this test has been previously validated by administering to a sample of 200 children with typical development ranging in age from 4 to 5 years (M=4.5, SD=.70). The results showed that the instrument has excellent psychometric properties of validity and reliability in measuring the understanding of psychological states corresponding to specific context [α =.84]. It is a task (purely semantic) consists of a single story, composed of 40 chronologically connected events, in which the protagonist (a boy named Marco) carries out several everyday activities. Although the story unfolds as the day progressed (morning, time at school, afternoon and evening), in this study it is preferred to use a shortened version of the test (22 slides rather than 44), so only morning and school time were selected for the assessment. Each piece of story is represented by a picture that describes the initial state of the protagonist and two other drawings depicting the two possible response options. It was possible to choose between two different response options: one was consistent with both the protagonist's mental state and the context (correct choice), the other one was reliable with the mental state but not with the context (incorrect choice) (see Figure 1). The sequence (correct or incorrect) of responses presented was randomized. It was preferred to restrict the choice of two possible responses in order to analyze the children ability to use the context for successfully completing each piece of history. For describing the events, it was used terms relating to five mental states. The five types of mental states considered were: the epistemic state (e.g., he opens your eyes and thinks, imagines, remembers, pretends, etc); the decisional state (e.g., he decides), the emotional one (e.g., he is happy, angry, sad, fear, etc.); the physical state (e.g., he snorts, claps his hands, pouts, jumps on the bed, etc.) and the motivational state (e.g., he expects, wants, hopes, wishes, demands etc.). The accuracy of each response was

rated on a 1–2 scale: 1 for an incorrect answer, 2 for correct answer. A total maximum score of 44 was therefore possible. Higher scores indicate more understanding of psychological states abilities.

Figure 1
Example of mental-states understanding task.



3 RESULTS AND DISCUSSION

Study data were analyzed using SPSS (Statistical Package for Social Sciences) 17.0 for Windows.

A 3 (group: ASD, ADHD and control group) X 4 (type of task: CPM/12, Object Assembly test, Mental States understanding Test, Pragmatic Inference Test) between-subjects design was used.

The significance of differences in all dependent variables between groups was also determined using independent t-tests. Therefore, Pearson correlations were run to examine the relationship among the variables involved in the analyses. A .05 significance level was allocated in all tests.

Raw data, as it was relative frequencies, has been transformed into $\sin^{-1}$ (Freeman & Tukey, 1950).

Table 1 reports means and standard deviations of Colored Progressive Matrices, Object Assembly subtest, Mental States and Pragmatic Inference scores, obtained by three groups.

Table 1
Descriptive statistics for developmental and study variables.

	Autism		ADHD		Typical	
	M	SD	M	SD	M	SD
Developmental level						
Chronological age	8.25	2.44	8.34	1.62	8.33	1.91
Full Scale IQ	87.03	7.57	87.52	10.79	89.03	5.92
CPM	1.05	.30	.68	.22	1.20	.15
Object Assembly	1.07	.34	.52	.30	1.20	.10
Pragmatic Inference making	.87	.42	.94	.17	1.47	.11
Mental states understanding	1.37	.25	1.11	.35	1.57	.00

The factor ‘‘groups’’ shows significant effects ($F_{2,27}$=12.009, p <.001). Typically developing children reach higher levels of performance in all presented tasks compared to their peers in atypical development. Specifically, while the ADHD group performing overall more poorly than both other groups, the ASD group generally failed the Pragmatic inference test.

The factor ‘‘type of tasks” has significant effects ($F_{3,81}$=17.44, p <.001). This means that there are differences among the understanding and learning of the different cognitive tasks.

Lastly, a significant ‘‘groups x type of tasks” interaction was found ($F_{6,81}$=8.07, p < .05), indicating that children with autism and ADHD group had notable difficulties selecting correct answers; in fact, they were substantially worse than the control subjects on recognizing the right

contents. Data suggest that, regarding these types of tasks, children affected by autism and ADHD have, in a different way, more difficulties to achieve high performances.

For a more detailed statistical analysis, comparisons between two groups were made using Student's t-tests. Results indicated that there are statistically significant differences in pragmatic inference task between ASD and normally developing children ($t= -4.29$, $p <.001$): children with autism have been found to not use this cognitive ability more frequently than control children. While ADHD group showed more difficult than controls in providing correct answers to the Colored Progressive Matrices Test ($t= -5.77$, $p <.001$), in understanding of mental states ($t= -4.003$, $p <.05$), and in pragmatic inference task ($t=-7.95$, $p <.001$). Therefore, performances on the Object Assembly subtest significantly differed between ADHD children and control group ($t=-6.62$, $p <.001$) and comparing the two clinical groups (ADHD vs, ASD group) ($t = -3.76$, $p <.05$), with the ADHD children performing more poorly than other group.

Finally, significant positive correlations between the all dependent variables were found. Table 2 reports Pearson's correlation coefficient of examined factors.

Table 2
Correlations between all dependent variables.

	CPM	Object Assembly
Pragmatic inference making	.398 (*)	.526(**)
Mental states understanding	.671(**)	.567(**)

** $p < .01$ level; * $p < .05$ level

Correlational analysis supported the idea of a strong linking among different cognitive abilities. Specifically, the results suggest that with the increasing of intellectual abilities also the discriminative and inferential skills improve, and the adequate understanding and attribution processes of psychological states to specific contexts appear more efficient. This is consistent with the hypothesis that the assessment measures used in this study underpin single central coherence ability in integrating environmental stimuli, both visual and semantic, into a coherent whole.

4. CONCLUSIONS

The present study was aimed to investigate significant differences in

central coherence between children with high functioning autism, children with ADHD and typically developing peers. The comparisons between participants occurred on central coherence tasks and on ToM tasks, or the ability to give meaning and coherence to fragmented elements and attribute psychological states according to context analysis.

Results revealed significant differences in the scores obtained by the three groups (ASD, ADHD and TD). Generally, individuals with ASD and ADHD exhibited significantly worse performance in all four tests compared to their typical developed peers. However, comparing the two clinical groups, perceptual skills and the ability to understand and allocate the different psychological states in specific contexts appear to be more compromised in children with ADHD. Specifically, the impulsivity of children with ADHD can cause problems with control and response inhibition, impairing acquisition and development of certain cognitive abilities. Increasing latency between the presentation of the stimulus and the child's response might, however, facilitate a more quick learning process and support children with an attention deficit.

Regarding individuals with ASD, they massively failed the pragmatic inference tasks. This finding confirms that basic visual and linguistic perceptual functions may be affected in individuals with ASD, and also their ability to integrate fragmented stimuli into a coherent whole it has been demonstrated to be significantly impaired.

As already noted, in fact, the unusual perceptual and cognitive style of individuals with autism is characterized by an inability to integrate information in relevant context, a segmented processing experience, an inability to experience wholes, and a persistent preoccupation with parts of objects'.

Based on these perceptual and cognitive deficits, a "weak central coherence" in children with ASD was confirmed in this study. Specifically, in both perceptual and semantic tasks, the group with ASD scored significantly lower than the control group, due to the fact that these patients are not able to integrate experience elements in a coherent scene, and hence unable to well completed administered tasks. To meet the complex needs of people with autism, it could be useful design specific interventions for coping central coherence deficits. A cognitive-rehabilitative treatment, conducted by a professional multidisciplinary team, could achieve results in both the acquisition of more complex learning skills and the social competences of children. Specifically, the implementation of special autism cognitive treatment, based on a central coherence intensive and early

intervention, can also enhance motivation for social interaction and prompting specific social behavior usually impaired in these patients.

This study expands upon research on the role of Weak Central Coherence and ToM performances of different clinical populations in several ways. Although research has been abundant on the impact of specific cognitive impairments, these aspects need to be more examined, verifying whether the two different cognitive constructs are related or they follow different developmental trajectories. Past research on WCC have focused attention on the perceptual aspects of Central Coherence hypothesis, or rather on the role of the ability to collect stimuli from the context into a coherent whole. This study expanded upon this perspective by measuring the ability to grasp the meaning of the actions taking place in the context, including additional forms of central coherence assessment. Up until this time, no study has examined ability to process contextual information through perceptual organization and semantic inference tasks in ASD and ADHD children. Although the intention of many studies is to understand WCC effects on children psychological and social functioning, exclusively perceptual tasks have been used to measure this construct in clinical samples, with the result that it is often unmeasured or inadequately measured. In the current study, perceptual and semantic tasks have been introduced for evaluating the central coherence level, considering both capacities as essential to the overall organization of the context and for understanding contextual information meaning.

Another important contribution of this study is the comparison of clinical groups (ASD *vs* ADHD) that show two different attentive impairments, overselectivity and impulsivity. These specific cognitive functioning can impact in a different way on the ability to organize and process information. In addition, this study expanded upon these cognitive mechanisms by measuring the ability to use the context for story completion task that implies the attribution of mental states to the protagonist of the story.

Despite all this study presents some considerable limitations. First, the sample size is small. This is due to the rigidity of the inclusion criteria related to determining characteristics disorders taken into consideration. Second, the current study was cross-sectional in design and its results should be interpreted as such. A longitudinal study that tracks cognitive children development over time would supplement this research by showing how changes in central coherence and ToM relate to social functioning over time and how attentive impairments differently affect the overall cognitive

development in the life span. Moreover, the groups were too heterogeneous, because it was not possible to control gender variable. Future studies, testing potential moderating variables, such as gender, socioeconomic status and rehabilitation program, may help provide valuable information for designing interventions for certain groups of children. Future work, therefore, may be necessary to enlarge the sample and have a better chance of generalization. It may also be interesting to see whether training aimed at the modification of dysfunctional attentive styles, can produce effects on the ability to use the context to process environmental stimuli.

Nevertheless, this research can be considered a first step towards the knowledge and study of the central coherence mechanisms and processes involved. It can be a starting point for the formulation of specific treatments aimed to the development of this important capacity that regulates the perceptual and semantic mechanisms. The purpose of these training should be to promote and improve the cognitive, behavioral and social functioning of these specific impaired patients. Specifically, the inability to have a global vision of the stimuli, certainly inhibits many learning behaviors not only for the subjects with autistic disorder but also for children with attention-deficit/hyperactivity disorder.

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