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Incidence of cognitive processing dimension for the diagnostic reliability of level-1 autism spectrum disorder

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Abstract

Diagnostic processes of Autism Spectrum Disorder (ASD) just based over the observation of target- behaviors, regarding to interaction and social communication (social) and restrictive behavior (behavior), seem be most effective for level 2-3 ASD specific diagnosis; however, level 1 ASD diagnosis may be many errors, since the scores sum are within limits corresponding the other specific personality or social communication disorders (American Psychiatric Association (APA), 2013). For this reason, it´s needs complement the analysis of variables that make up the perceptual- cognitive dimension of information processing to specify the diagnosis validity and avoid initial errors that can create important prejudices along educational processes. This study delimits the differential analysis of 3 dimensions on total of 38 participants with level 1 ASD. Indeed, results indicate that, although the constant of diagnostic predictive analysis found through the linear regression analysis shows significant data for diagnosis synthesis, it´s owing to critical influence of cognitive processing dimension: .00, while other 2 dimensions analyzed individually show non-significant influence, being critical significant level for social dimension: .12 and behavior dimension: .35. Therefore, it´s need design diagnostic scales that include the basic principles of perceptual-cognitive processing functioning to avoid errors in autism diagnosis.

KEYWORDS: Autism Spectrum Disorder, Interaction and Communication Social, Behavior, Encoding, Information Processing, Perceptive- Cognitive.

INTRODUCTION

Specificity of perceptual-cognitive processing is significantly associated with genetic phenotypic complexity of this specific disorder, which significantly affects the interactive synaptic process, regarding processual flow of incoming information, especially based on the interrelationship of information new incoming with previously learned stimuli and learning. Latter, previous stimuli have possibly already had limitations to make attributions with meaning of semantic nature for their encoded transfer to permanent memory, but without a doubt, greatest difficulty lies over ability of ASD people to autonomously create significant nodes and relationships between concepts and information categories, which are the ones, that will serve as neural fluid to facilitate communication, retrieval of information from semantic permanent memory, without which, the new incoming information will find many obstacles for its cognitive attribution and, consequently, allow its comprehension and consequent coding (Mayer, 2017).

Indeed, perceptual-cognitive processing is supported on basis of semantic understanding of information, which is developed from conceptual information encoded and stored in long-term memory or semantic permanent memory, therefore limitations functional synaptic in this process alters the perceptual-cognitive system in particularly important way, whose general characteristics are specified in people with ASD to existence of partial disconnections in this dynamic process that produces limitations to link the information necessary to elaborate an adapted response over context.

In this line of research, many experimental studies have been carried out. Kelley, Paul, Fein & Naigles (2006) develop an investigation with 14 children aged 5-9 years, a study about linguistic particularities, regarding their counterparts into control group and concluded that, although the scores found between two groups, regarding grammatical structure, it´s barely imperceptible the differences in pragmatic language and, above all, language with semantic content is highly differential, in which, students with ASD present severe limitations, regarding their peers of control group.

Cronin (2014), likewise, through a study carried out with 13 children with high-functioning ASD, show that, while no significant relationship was observed in relation to oral phonological processes and the decoding of information, however, the relationships to link the information with semantic content and global comprehension present significant differences between experimental group and their peers of control group, concluding with important limitations in students with ASD, both in the processes conceptual understandings, as in the processes of cognitive coding, as well as, above all, along development of conceptual relationships and contents hierarchization.

Botting & Adams (2005) carried out a comparative study between diagnostic groups with communication disorders, of which a subgroup was made up of 6 children with ASD and a control group made up of students with neurotypical development. Results show that people with ASD obtain a significantly lower performance in semantic and pragmatic tasks than other 2 clinical groups, which shows that perceptual-cognitive semantic processing capacity constitutes a specific differential element that´s essential for learning diagnosis of people with ASD.

Bennet et al. (2015), through a study based in associations between comprehensive language and social skills, carried out with 365 children aged 2-4 yo, with and without cognitive deficits, found small cross-reciprocal associations between subgroups of children with ASD with and without cognitive impairment. In their study, they find a specific pattern that suggests the two conceptual, social, and practical domains are significantly associated in differential diagnosis process in preschool people with ASD.

Brignell et al. (2018) retrospectively analyze a description of predictors of semantic language development in verbal children aged 4-7 years with ASD (N=26-27), compared with a group of children with neurotypical development (N= 858-861) and another group with language disorders (N= 119). Resulting data indicate that, initially, children with ASD and people with phonological language disorders showed quite similar results, both being significantly lower than neurotypical development group, however, these results referring to conceptual coding development and ability to elaborate a language with semantic criteria, which corresponds to semantic-pragmatic language, present significant differences between the group of people with ASD to other two study groups, who found significantly lower data relative.

Kjelmer et al. (2012), after a longitudinal study, perform over 2 years, with 208 preschool children with ASD, highlight the basic needs that group presents in semantic-pragmatic language area and the development of cognitive coding process, which´s why they consider it essential to well-specified cognitive-linguistic evaluation analyses within the diagnostic process.

According these theoretical hypotheses owing the level 1 diagnosis of ASD is most sensitive to diagnostic error, which can be confused with other borderline personality disorders, in this study the basic aim is contrast the incidence to ASD diagnosis of 3 specific dimensions that make up the level 1 ASD diagnosis: *processing* dimension and *social* and *behavior* dimensions.

METHOD

Research design

Research study shapes observational analysis of 3 dimensions to specify level 1 ASD diagnosis: 1) *Processing*, 2) *Social* and 3) *Behavior*. Dimensions were analyzed through 5 successive steps of highly structured analysis: 1) initial perception of information to analyze the ability to understand the individual stimuli received and set of stimuli, 2) encoding of information input to research the capacity of analysis of incoming information and attribution of meanings, 3) elaboration of relationships- nodes to analyze the processes of creating relationships or neural nodes between informative contents referring to the incoming stimuli in relation to the previous knowledge acquired, 4) retrieval of learned information, too analyze the necessary steps to make the sweet of chocolate, and 5 creativity, fiction and imagination, which deepens the analysis of the capacity of fiction and imagination.

Direct scores observed along five evaluation steps are transformed to percentiles it constitute the ASD specific diagnostic, through SPSS frequency and percentiles (*p*) statistics. Hence, research design forms an experimental parametric analysis of data derived from initial observation of criteria- items it evaluate the 3 indicated dimensions.

Participants

A total of 38 students with diagnosis of level 1 ASD participated in this study. Table 1 shows the age ranges of participants, of which 5 are 3- 6.9 yo, 19 are 7-10.9 yo, 8 are 11-13.9 yo, 4 are 14-17.9 yo, and 2 are ≥18 yo (see Table 1).

Table 1: Level 1 ASD (N: 38).

ASD- 1		Frequency	Percent
Age (yo)	3-6.9	5	1.5
	7-10.9	19	5.6
	11-13.9	8	2.4
	14-17.9	4	1.2
	≥18	2	.6
	Total	*38*	*11.2*

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Variables- dimensions

Dimensions used for this analysis are social and behaviour, which also indicated in the diagnostic criteria of International classification (APA, 2103). Processing dimension incorporated at analysis to observe its incidence in ASD diagnosis:

1) DIMENSION 1: *PROCESSING*, which made up of perceptual-cognitive variables, such as meanings understanding, hierarchization processes, inter-concepts execution, the elaboration of nodes and inter-conceptual relationships and the recovery processing o semantic memory.
2) DIMENSION 2: *SOCIAL*, conformed by aspects of interaction and communication- language, social.
3) DIMENSION 3: *BEHAVIOR*, formed by structural stereotyped and restrictive behaviors way.

RESULTS

Dimensions reliability analysis.

Likewise, reliability analysis has been found for 3 dimensions. Data indicates an *Alpha* level (α) to items: .77, which be highly significant considering that participants sample size (see Table 2).

Table 2: Reliability Statistics: *Alpha de Cronbach*.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Items
.607	.770	3

Correlation indices to 3 analysis dimensions regarding reliability level show dispersed results. Processing dimension correlates with social dimension to medium-high level way (.647), however, correlation of processing dimension with behavior dimension is relatively low: .295. Finally, correlation between social and behaviour dimensions presents a medium-high level: .639 (see Table 3).

Table 3: Inter- item correlation matrix.

	PROCESSING	SOCIAL	BEHAVIOR
PROCESSING	1.00		
SOCIAL	.64	1.00	
BEHAVIOR	.29	.63	1.00

Frequencies and percentiles analysis.

Data analysis corresponding to direct scores, being 0: very low value, and 4: very high value, have found throughout the observation of these 3 study dimensions. From direct sum scores it´s possible find the percentile (p) corresponding to ASD diagnostic analysis along percentage intervals 5 by 5 are used (see Table 4).

Table 4: Frequencies and percentiles (*p*).

		SOCIAL	BEHAVIOR	PROCESSING
N	Valid	38	38	38
	Missing	301	301	301
Mean		3.34	3.34	11.56
Std. Deviation		1,21	1.93	3.78
Variance		1,47	3.74	14.33
Percentiles	5	2.00	.00	6.33
	10	2.00	.00	8.33
	20	3.00	2.60	10.33
	30	3.00	3.00	10.33
	40	3.00	3.00	10.33
	50	3.00	3.00	10.33
	60	3.00	3.00	10.33
	70	3.00	5.00	10.43
	80	3.00	5.20	12.73
	90	6.00	6.00	20.66

As can be seen, data found respond to study´ previous hypotheses. Social dimension presents a mean direct score of 2.00 belonging between *p* 5 and *p* 30, the mean score of 3.00 from *p* 30 to *p* 80 and 6.00 to *p* 90.
Behavior dimension slightly raises the average data found, corresponding an average score of 2.60 at *p* 20, 3.00 from p 30 to 60, at *p* 70 and *p* 80 there´re averages of 5.00 and 5.20 respectively.
In processing dimension, significantly higher mean scores are found, with a mean of 6.33 at *p* 5 and 8.33 at *p* 10, and from *p* 20 to *p* 70, a significantly higher sum of direct scores analyzed is obtained (10.33), being 12.73 for *p*: 80 and 20.66 for *p* 90.
In this sense, without processing dimension analysis, some participants could be left out of ASD symptomatic group owing low scores found over social and behavioral dimensions, while the application of processing dimension includes them within of level 1 ASD diagnosis criteria.

Predictive analysis.
Predictive analysis found throughout parametric regression model regarding participants age groups, corroborates these previous data, in which processing dimension presents one significant highly critical level to explain constant of regression analysis: .00. Other 2 dimensions: social and behavior don´t present decisive influence to specify the ASD diagnostic process: .12 and .35 for social and behavior respectively. Processing dimension is variable that contributes to global significant critical score of constant model: .00 (see Table 5).

Likewise, explicative sum of predictive model for level 1 ASD diagnosis presents one total R: .640 (R square: .410), std. error estimate: .827.

Table 5: Regression coefficients (a).

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(**Constant**)	2.65	.46		5.78	.00
	PROCESSING	-.21	.04	-.78	-4.45	.00
	SOCIAL	.29	.18	.34	1.56	.12
	BEHAVIOR	.08	.09	.16	.94	.35

A) Dependent Variable: Age (yo).

Comparative analysis according age.

Predictive data, frequencies, and percentiles found are independent of participant age group. Indeed, as observed over comparative Table 6 for k independent samples, the critical levels aren´t significant according to different age groups selected.

Table 6: Independent samples test.

DIMENSIONS		Levene's Test for Equality of Variances		*t*-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PROCESSING	Equal variances assumed	6.69	.04	2.41	5	.06	8.53	3.53	-.56	17.63
	Not assumed			4.03	4.00	.01	8.53	2.11	2.66	14.40
SOCIAL	Equal variances assumed	2.54	.17	.59	5	.57	.60	1.00	-1.98	3.18
	Not assumed			1.00	4.0	.37	.60	.60	-1.06	2.26
BEHAVIOR	Equal variances assumed	6.27	.05	-.86	5	.42	-1.80	2.07	-7.13	3.53
	Not assumed			1.45	4.00	.22	-1.80	1.24	-5.24	1.64

As can be seen, highest level of critical approach to comparative level concurs along processing dimension, however, assuming the variances equality, the critical level is outside to limits of bilateral significance: .06.

Other dimensions don´t test any doubt regarding to comparative analysis according to participants age, hence, age group doesn´t incidences over frequencies and percentiles associated found about.

CONCLUSIONS

Although it´s a relatively small sample, as can be seen over frequencies (*p*) Table, many people with ASD diagnosis could leave out of level 1 ASD symptomatic specific group; however, analytical sensitivity precision predicted by the processing dimension allows them to be included within this specific diagnostic group. Just observational limitation to objectified behaviors can lead to diagnostic errors important, especially at level 1 ASD when these behaviors are imperceptible and borderline with other personality disorders of International Classification. Hence, it´s necessary complement currently dimensions of DSM-5 with the neuro-perceptual-cognitive variables analysis it specify the diagnostic process with greater specificity, validity and reliability.

Indeed, although constant value of regression predictive analysis regarding to ASD diagnosis through 3 selected dimensions show a significant critical level: .00, processing dimension that includes the relationship perceptual-cognitive variables of information processing conforms the dimension most significant critical level: .00. However, two other dimensions included in currently Disorder International Classification: social and behavior present non-significant critical levels, being social dimension .12, and behavior dimension: .35. Indeed, many people with ASD show specific differential behaviors and limitations at social interaction ambit regarding other ASD people, especially to achieve initial and spontaneously relations but other people with ASD don´t show similar needs within percentage level to determine relational specific diagnosis and conclude with personality disorder and its psychoeducational consequences.

Although, behavior dimension shows significant critical levels, being predictive dimension to ASD diagnostic process, so restriction, behavioral repetition, and physical-emotional stereotypes are important aspects for ASD diagnostic consideration, however, these symptoms aren´t always so obvious and sometimes given very subtle way. Therefore, it´s necessary complement this analysis with specific dimension of information psycho-neurological processing, regarding to perceptual-cognitive area and, above all, to development of neurocognitive relationships between the incoming information and previous contents of semantic permanent memory to determine diagnostic process with highly empirical validity.

Finally, indeed, as observed over comparative table t for independent samples based on participants age ranges, no differences are indicated in data found, both in frequencies and percentage measurements either regression analysis data to participants age.

DISCUSSION

Penner, Anagnostoy, Andoni & Ungar (2017) develop an exhaustive analysis of diagnostic processes and their implications in practice, both, in terms of quality and content of 839 documents they analyzed. Resulting data indicate the presence of important inconsistencies in the diagnostic documents analysed, both in relation to the aspects of the evaluation, and based on the instruments used for the elaboration of the diagnosis, showing a low quality in rigor and a certain lack of experimental evidence of basic instruments.

Probably, these needs may be due to absence of available empirical evidence, regarding to different

components that make up the systematic evaluation of disorder, so compensate for this absence of current empirical evidence, Graham, Reghr & Wrigth (2003) propose, precisely, the use of *Delphi* integrated diagnostic and intervention method, which implies an analysis based on participation process and joint collaboration of social type with peers, during which children learn to understand and share the meanings of most complex social actions and type of participation and active collaboration is observed.

Within this dynamic observation, the processes of negotiation, problem solving and coping with conflicts that arise during interactions stand out, which, sometimes, can be complex conflicts since they require a process of metacommunication or capacity for fiction or imagination to be able understand and, consequently, actively participate along interactive social response. Therefore, to facilitate this shared evaluation process, it´s necessary that participants have learned a set of flexible scripts and action plans that allow them to face situations according to particular target evaluation process. Precisely, it´s over simulation area, fiction and imagination along social context, where they are the correlations higher levels regarding the specific table of ASD diagnosis, both in relation to abilities of social skills, such as assertiveness processes and interactive social cooperation, reciprocal and emotional, especially when interactions become more sophisticated and complex, owing to demands the specificity of social communication linguistic- pragmatics and perceptual processes-cognitive, related to comprehension, coding and recovery of media information (Coplan & Abrau, 2009; Harris, 2017).

In this sense, Ben-Sasson et al. (2007) and Neufeld et al. (2021) consider that differentiation of cognitive processing, more specifically, sensor processing in people with ASD constitutes the basic signs of ASD diagnosis, which is already observable from 6 months of age.

From this neurosensory perspective, following elements, among others, become core elements of ASD diagnosis: 1) restrictive-sensory behaviors (Uljarević et al., 2017; Wigham et al., 2015), 2) limitations in reciprocal social communication (Glod et al., 2015) and anxiety (Green et al., 2012), and finally 3) the analysis of comorbidity associated, such as attention deficit hyperactivity disorder (Bijlenga et al., 2017), anxiety disorders and severe overt distress (Serafini et al., 2017), depressive signs (Kraper et al., 2017), and hypo or hyper-creativity behaviors (Ben-Sasson et al., 2019).

Therefore, the indicated sensory specificity influences the development of cognitive attributions of stimuli, which severely limits the process to perform the processes of codification and the understanding of information without errors and become basic elements of diagnostic conditions, being, at present, one of the priority aims of current experimental research within the area of this disorder (Pellicano et al., 2014).

However, despite the importance of the criteria that make up this cognitive dimension and the empirical evidence of the importance of the perceptual-cognitive dimensions as highly significant factors of diagnosis, they aren´t properly specified in the existing diagnostic instruments of ASD diagnosis.

Hence, it´s essential delve into empirical evidence of technical instruments to service of pragmatic-semantic processes analysis, in order enhance the validity and reliability to levels ASD diagnosis, as well as, consequently, facilitate basic aims for an intervention integrated psycho-educational and social, as facilitated through the Bishop's ALICC procedure, which relate and significantly associate skills and social communication, restrictive behaviors and perceptual-cognitive processing (Adams, Lloyd and Baxendale,

2006). These studies conclude with a series of recommendations for future research in ASD area, among which it´s worth highlighting: 1) the need develop instruments to comprehensively measure pragmatic and semantic skills, 2) develop skills programs for the development of pragmatic practices of integrated social language, and 3) encourage the active participation of families and professionals during the diagnostic processes and consequent intervention.

Hence, it´s need deepen about search for scales and analysis tests to include the variables that involve the information psycho-neurological processing to avoid diagnostic frequent errors and facilitate suitable treatments, therapies and educational adjustments for people with ASD, especially in situations of Level 1 ASD, as corroborated along this research.

REFERENCES

Adams, C., Lloyd, J., Aldred, C., & Baxendale, J. (2006). Exploring the effects of communication intervention for developmental pragmatic language impairments: A signal- generation study. *International Journal of Language and Communication Disorders, 41*(1), 41-65. http://taylorandfrancis.metapress.com/link.asp?target=contribution&id=G617W0516556G008

American Psychiatric Association. Diagnostic and statistical manual of mental disorders (5th). 2013. American Psychiatric Publishing. https://www.psychiatry.org/psychiatrists/practice/dsm

Bennett, T. A., Szatmari, P., Georgiades, K., Hanna, S., Janus, M., Georgiades, S., ... & Thomson, A. (2015). Do reciprocal associations exist between social and language pathways in preschoolers with Autism Spectrum Disorders? *Journal of Child Psychology and Psychiatry*, *56*(8), 874-883. http://dx.doi.org/10.1111/jcpp.12356

Ben-Sasson, A., Gal, E., Fluss, R., Katz-Zetler, N., & Cermak, S. A. (2019). Update of a meta-analysis of sensory symptoms in ASD: A new decade of research. *Journal of Autism and Developmental Disorders, 49*(12), 4974-4996. DOI: 10.1007/s10803-019-04180-0

Ben-Sasson, A., Gal, E., Fluss, R., Katz-Zetler, N., & Cermak, S. A. (2019). Update of a meta-analysis of sensory symptoms in ASD: A new decade of research. *Journal of Autism and Developmental Disorders, 49*(12), 4974-4996. DOI: 10.1007/s10803-019-04180-0

Bijlenga, D., Tjon-Ka-Jie, J. Y. M., Schuijers, F., & Kooij, J. J. S. (2017). Atypical sensory profiles as core features of adult ADHD, irrespective of autistic symptoms. *European Psychiatry, 43*, 51-57. DOI: 10.1016/j.eurpsy.2017.02.481

Botting, N., & Adams, C. (2005). Semantic and inferencing abilities in children with communication disorders. *International Journal of Language and Communication Disorders, 40*(1), 49-66. http://taylorandfrancis.metapress.com/link.asp?target=contribution&id=R092EJRQC636XB1F

Brignell, A., Williams, K., Jachno, K., Prior, M., Reilly, S., & Morgan, A. T. (2018). Patterns and predictors of language development from 4 to 7 years in verbal children with and without Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders, 48*(10), 3282-3295. http://dx.doi.org/10.1007/s10803-018-3565-2

Coplan, R., & Abreau, K. A. (2009). Peer interactions and play in early childhood. In K. H. Rubin, W. M.

Bukowski, M. William, & B. Laursen (Eds.), *Handbook of peer interactions, relationships, and groups: Social, emotional, and personality development in context* (pp. 143-161). New York: Guilford Press. https://cat2.lib.unimelb.edu.au/record=b3208548~S30

Cronin, K. A. (2014). The relationship among oral language, decoding skills, and reading comprehension in children with Autism**.** *Exceptionality, 22*(3), 141-157. http://dx.doi.org/10.1080/09362835.2013.865531

Glod, M., Riby, D. M., Honey, E., & Rodgers, J. (2015). Psychological correlates of sensory processing patterns in individuals with autism spectrum disorder: A systematic review. *Review Journal of Autism and Developmental Disorders, 2*(2), 199-221. https://doi.org/10.1007/s40489-015-0047-8

Graham, B., Reghr, G., & Wright, J. G. (2003). Delphi as a method to establish consensus for diagnostic criteria. *Journal of Clinical Epidemiology 56*(12), 1150- 1156.

Green, S. A., Ben-Sasson, A., Soto, T. W., & Carter, A. S. (2012). Anxiety and sensory over-responsivity in toddlers with autism spectrum disorders: Bidirectional effects across time. *Journal of Autism and Developmental Disorders, 42*(6), 1112-1119. https://doi.org/10.1007/s10803-011-1361-3

Harris, P. L. (2017). Tell, ask, repair: Early responding to discordant reality. *Motivation Science, 3*(3), 275-286. https://doi.org/10.1037/mot0000075

Kelley, E., Paul, J. J., Fein, D., & Naigles, L. R. (2006). Residual language deficits in optimal outcome children with a history of Autism**.** *Journal of Autism and Developmental Disorders, 36*(6), 807-828. http://dx.doi.org/10.1007/s10803-006-0111-4

Kjellmer, L., Hedvall, A., Holm, A., Fernell, E., Gillberg, C., & Norrelgen, F. (2012). Language comprehension in preschoolers with Autism Spectrum Disorders without Intellectual Disability: Use of the Reynell Developmental Language Scales. *Research in Autism Spectrum Disorders, 6*(3), 1119-1125. http://dx.doi.org/10.1016/j.rasd.2012.03.003

Kraper, C. K., Kenworthy, L., Popal, H., Martin, A., & Wallace, G. L. (2017). The gap between adaptive behavior and intelligence in autism persists into young adulthood and is linked to psychiatric co-morbidities. *Journal of Autism and Developmental Disorders, 47*(10), 3007-3017. https://doi.org/10.1007/s10803-017-3213-2

Mayer, J. L. (2017). The relationship between autistic traits and atypical sensory functioning in neurotypical and ASD adults: A spectrum approach. *Journal of Autism and Developmental Disorders, 47*(2), 316-327. DOI: 10.1007/s10803-016-2948-5

Neufeld, J., Eriksson, L. H., Richard Hammarsten, R., Remnélius, K. L., Tillmann, J., Isaksson, J., & Bölte, S. (2021).The impact of atypical sensory processing on adaptive functioning within and beyond autism: The role of familial factors. *Autism, 25*(8), 2341-2355. DOI: 10.1177/13623613211019852. journals.sagepub.com/home/aut

Pellicano, E., Dinsmore, A., & Charman, T. (2014). What should autism research focus upon? Community views and priorities from the United Kingdom. *Autism, 18*(7), 756-770. DOI: 10.1177/1362361314529627

Penner, M., Anagnostou, E., Andoni, L. Y., & Ungar, W. J. (2018). Systematic review of clinical guidance

documents for Autism Spectrum Disorder, diagnostic assessment in select regions. *Autism: The International Journal of Research and Practice, 22*(5), 517-527. http://dx.doi.org/10.1177/1362361316685879

Serafini, G., Engel-Yeger, B., Vazquez, G. H., Pompili, M., & Amore, M. (2017). Sensory processing disorders are associated with duration of current episode and severity of side effects. *Psychiatry Investigation, 14*(1). DOI: 10.4306/pi.2017.14.1.51

Uljarević, M., Baranek, G., Vivanti, G., Hedley, D., Hudry, K., & Lane, A. (2017). Heterogeneity of sensory features in autism spectrum disorder: Challenges and perspectives for future research. *Autism Research, 10*(5), 703-710. DOI: 10.1002/aur.1747

Wigham, S., Rodgers, J., South, M., McConachie, H., & Freeston, M. (2015). The interplay between sensory processing abnormalities, intolerance of uncertainty, anxiety and restricted and repetitive behaviours in autism spectrum disorder. *Journal of Autism and Developmental Disorders, 45*(4), 943-952.