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Examining cross-cultural differences in autism spectrum disorder: A multinational comparison from Greece, Italy, Japan, Poland, and the United States

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Abstract

Autism spectrum disorder (ASD) is characterized by social and communication impairments as well as restricted, repetitive behavior patterns. Despite the fact that ASD is reported worldwide, very little research exists examining ASD characteristics on a multinational scale. Cross-cultural comparisons are especially important for ASD, since cultural differences may impact the perception of symptoms. Identifying behaviors that are similarly

reported as problematic across cultures as well as identifying behaviors in which there is cultural variation could aid in the development and refinement of more universally effective measures. The present study sought to examine similarities and differences in caregiver endorsement of symptom severity through scores on the Baby Infant Screen for Children with autism Traits (BISCUIT). The BISCUIT was utilized to examine ASD core symptomology in 250 toddlers diagnosed with ASD from Greece, Italy, Japan, Poland, and the United States. Significant differences in overall ASD symptom severity and endorsement were found between multinational groups. Implications of the results are discussed.

1. Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by impairments in social interaction and communication, as well as the presence of repetitive, restricted patterns of behavior, interests, and activities [1,2]. ASD presents early in life and can often be diagnosed as early as 24 months of age [3,4]. Early identification and treatment of ASD and other developmental disorders is crucial for optimizing the outcomes of individuals with an ASD diagnosis [5–9]. Therefore, timely screening practices have significant implications for early diagnosis.

Although ASD is a universal disorder with strong biological underpinnings that occurs with similar core features, symptom presentation appears to be susceptible to cultural influences [10]. Culture has been defined as ‘‘a set of behavioral norms, meanings, and values or reference points utilized by members of a particular society to construct their unique view of the world, and ascertain their identity’’ [11]. Cross-cultural comparisons are especially important for ASD since cultural views regarding appropriate behaviors and normal development for a certain culture may impact parent/caregiver reports and ultimately the ASD diagnosis [10,12].

As culture is such a complex and pervasive construct, it can be difficult to determine the best way to accommodate cultural influences in regards to psychological assessment. Rogler [13] proposed a hierarchical, three level framework for understanding how culture affects the diagnostic process of psychiatric disorders that may be useful in conceptualizing how culture influences the diagnosis of ASD. Rogler suggested that, rather than trying to control for cultural influences, culture should be recognized as a fundamental aspect of all phenomenological experience and therefore as an integral factor in psychological disorders. The first level describes how culture influences the assessment of symptoms and symptom severity. The second level of Rogler’s hierarchy is the configuration of symptoms into disorders which is particularly relevant to the use of culturally sensitive diagnostic and screening measures. The third level is cultural factors in the diagnostic situation, or the impact of cultural differences between the patient and diagnostician. Although all three

tiers are important when considering the diagnostic process, the first level pertaining to symptom assessment is the most relevant to the current study.

According to Rogler's framework, cultural norms mediate the endorsement of symptoms and rating of symptom severity. Parent report of child symptoms thus may be influenced by the aspects of development most valued within a culture. For example, results of research conducted in the United States suggest that American parents tend to be more concerned about language delays [14]. In contrast, Indian parents have been found to tend to have early concerns about social difficulties [15] and Latina mothers may tend to be concerned about temperament [16]. Culture may also influence how willing parents are to report certain symptoms. For instance, parents may be less likely to report symptoms that they view as socially undesirable, as they may associate this with social stigma. The degree to which socially undesirable symptoms lead to societal stigma may differ across cultures [17]. This suggests that ethnically-based cultural norms can influence perception of social undesirability of mental symptoms, and ultimately the endorse-ment of those symptoms.

Researchers have found some multinational differences in endorsement of problems related to ASD, including core sympto-mology [18,19], challenging behaviors [17], social skills [20], and sensory issues [21]. To assess these symptoms, several ASD screening and assessment measures such as the Modified Checklist for Autism in Toddlers (M-CHAT) [22] and the Baby and Infant Screen for Children with aUtIsm Traits [23] have been adapted for cross-cultural use. However, there is currently a dearth of research on multinational endorsement of symptoms, and therefore there is little consensus on how culture impacts ASD symptom perception.

Identifying behaviors in which there are cultural variations in parent endorsement and expectation could help with measure refinement and provide clinicians with increased cultural-compe-tency when conducting ASD assessments. The aim of the current study was to compare parent symptom endorsement on the Baby and Infant Screen for Children with aUtIsm Traits – Part 1 (BISCUIT – Part 1) in several country sites to examine cultural differences. The BISCUIT – Part 1 was utilized to examine ASD core symptomology in toddlers from five different countries: Greece, Italy, Japan, Poland, and the United States.

2.Methods

2.1. Participants

The initial pool for this sample consisted of 656 participants: 122 participants from Greece, 74 from Italy, 49 from Japan, 210 from Poland, and 203 from the United States. As a diagnosis of ASD was required for study inclusion, 350

participants who did not meet ASD diagnostic criteria were removed from the initial sample, leaving 39 participants from Greece, 50 from Italy, 49 from Japan, 114 from Poland, and 54 from the United States. Due to unequal group sizes, participants were randomly deleted from the largest group, the Polish sample, as recommended by Nimon [24], until it was no more than 1.5 times larger (n = 58) than the smallest group, the Greek sample [25]. Random deletion of cases was conducted using SPSS. The final sample consisted of 250 participants (Table 1).

The sample from Italy was recruited from a national referral center that assesses children suspected of having a developmental disability. Participants from Italy received a clinical diagnosis of ASD according to Diagnostic Statistical Manual-Fifth Edition (DSM- 5) criteria, confirmed by the Autism Diagnostic Interview-Revised (ADI-R), Autism Diagnostic Observation Schedule (ADOS) and the Childhood Autism Rating Scale (CARS). Participants from Greece were recruited from pediatric and psychiatric hospitals from different parts of Greece and through referral to the author's private practice. Diagnoses for all Greek participants were made by a psychologist based on DSM-5 criteria using the ADOS. Participants from Poland were recruited from Early Diagnosis and Intervention Centers from three cities in Poland and through pediatrician referral and were diagnosed by child psychiatrists with more than 10 years of experience in the field according to International Classification of Diseases-Tenth Edition (ICD-10) diagnostic criteria.

The sample from Japan was recruited through referrals from pediatric hospitals, child developmental centers, and pediatrician referral. Participants from Japan were diagnosed by child psychiatrists or pediatricians based on Diagnostic Statistical Manual-Fourth Edition-Text Revised (DSM-IV-TR) criteria, using scores attained from the Japanese version of the M-CHAT [26] and the Kyoto Scale of Psychological Development Test (KSPD), which is comparable to the Bayley Scales of Infant Development- Second Edition [27]. Participants from the United States were recruited through a through referral from a statewide early intervention program under the Individuals with Disabilities Education Act, Part C. Diagnoses were made by a licensed psychologist with more than 30 years in the field according to either DSM-IV-TR or DSM-5 criteria, depending on the date of assessment, using the CARS and Autism Spectrum Disorder Observation for Children (ASD-OC) [28].

Table 1
Participant demographics by country.

	Greece ($n=39$)	Italy ($n=50$)	Japan ($n=49$)	Poland ($n=58$)	USA ($n=54$)	Total ($n=250$)
Age (in months)						
M	28.65	29.76	29.65	29.07	28.61	29.14
SD	6.04	5.45	5.17	5.83	5.17	5.48
Range	19.00	26.00	17.00	25.00	20.00	32.00
Gender						
Male (%)	82.1	72.0	75.5	74.1	87.0	78.1
Female (%)	17.9	28.0	24.5	25.9	13.0	21.9

2.2. Ethical considerations

This study was approved by the following institutions: the Louisiana State University Institutional Review Board; the Ethics Committee of the Faculty of Psychology at the University of Warsaw; the Ethics Committee of the National Center of Neurology and Psychiatry, Japan; the University of Trento's Department of Psychology and Cognitive Science Internal Board; and the ethics committee of the diagnostic and therapeutic center ''Learning through Play'' in Greece. All procedures were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all informants, who were parents or legal guardians of the participating children.

2.3. Measures

The BISCUIT is an informant rated measure used to screen for ASD in children 17 to 37 months of age [29]. The measure contains three parts assessing ASD symptomatology, comorbid psychopathology, and challenging behaviors. The BISCUIT was translated using a 3-step translation method or double translation model into the primary language for each country with the authorization of the original developers [30]. In Part 1, informants are instructed to rate their child's behavior in comparison to same-aged peers on a Likert scale ranging from 0 to 2. A score of 0 corresponds to ''not different; no impairment'', 1 corresponds to ''somewhat different; mild impairment'', and 2 corresponds to ''very different; severe impairment'' from same-aged peers. An item with a score of either 1 or 2 was considered to be endorsed for the purposes of this study. A total score below 17 indicates ''no autism/atypical development'', a total score between 18 and 34 suggests ''possible ASD/PDD-NOS,'' and a total score of 35 or higher indicates ''probable ASD/PDD-NOS'' [31]. Part 1 of the BISCUIT is reported to have excellent internal reliability (r = 0.97) and has been found to have an overall correct classification rate of 0.89 [31]. The measure has been shown to have good convergent validity with the M-CHAT and the Personal-social domain of the Battelle Developmental Inventory, Second Edition [32].

Factor analysis of the items in part 1 revealed three distinct factors: Socialization/Nonverbal Communication, Repetitive Beha-viors/Restricted Interest, and Verbal Communication [33]. The Socialization/Nonverbal Communication factor consists of 24 items and has an internal consistency of a = 0.93. The Repetitive Behaviors/Restricted Interest factor contains 23 items and has an internal consistency of a = 0.90. Lastly, the Verbal Communication factor has an internal consistency of a = 0.87 and has 7 items [33].

2.4. Statistical analyses

Statistical analyses were performed using SPSS statistics (version 23). Univariate analyses were conducted to describe the characteristics of the sample and to perform variable diagnostics. Descriptive analysis was conducted to report means and standard deviations of total BISCUIT – Part 1 scores and subscales of the BISCUIT – Part 1. One-way analysis of variance was performed to determine group differences in total BISCUIT – Part 1 score. A multivariate analyses of variance analysis (MANOVA) was conducted with the subscales of the BISCUIT – Part 1 as dependent variables and country site as an independent variable. Post-hoc comparisons with adjustments for multiple comparisons were performed to further investigate group differences. Chi2 analyses were used to determine group differences in BISCUIT – Part 1 item endorsement.

3. Results

A priori analyses were conducted to determine if country site groups differed in regards to age and gender. Results of a one-way analysis of variance (ANOVA) revealed that the mean age of participants did not vary significantly across groups, F (4.249) = 0.46, P > 05. A Chi2 test found no significant association between country site and gender distribution, x2 (4) = 4.67, P > 05. Descriptive results for total scores on the BISCUIT – Part 1 as well as subscales of the BISCUIT – Part 1 are presented in Table 2.

An ANOVA was conducted to determine if the participants from different countries had significantly different total scores on the BISCUIT – Part 1. There was a significant effect of country site after controlling for age, F (4.244) = 12.93, P < 0.001, h2 = 0.02. Participants from the United States (M = 70.08, SD = 19.16) had the highest average total score on the BISCUIT – Part 1 and participants from Greece (M = 38.67, SD = 18.70) had the lowest. Follow-up analysis was conducted with separate ANOVAs using Sidak adjustments for multiple comparisons (Table 2). To increase confidence in the results, only significant results with P < 0.01 after Sidak adjustments are reported. The Greek sample was found to have significantly lower total scores than the Japanese (P < 0.01), Polish (P < 0.001), and United States samples (P < 0.001). The Italian sample had significantly lower scores than the Polish sample (P < 0.001) and United States sample (P < 0.001).

A MANOVA was conducted to compare participant scores on the three factor subscales of the BISCUIT – Part 1 across country sites. The three BISCUIT – part 1 subscales are Nonverbal Communica-tion/Socialization, Repetitive Behaviors/Restricted Interests, and Verbal Communication. There was a significant difference between country sites when controlling for age, Pillai's Trace = 0.33, F (12, 732) = 7.33 P < 0.001, hp2 = 0.12. Post-hoc analyses on the BISCUIT – Part 1 subscale scores adjusted for age were conducted with Sidak adjustments for multiple comparisons (Table 2). A cut-off value for significance of P < 0.01 post-Sidak adjustments was used to increase confidence in results.

Chi2 analyses were conducted to compare BISCUIT – Part 1 item endorsement across country sites. Frequency of item endorsement and results of significant tests for the Socialization/Non-Verbal Communication subscale are presented in Table 3, Repetitive Behavior/Restricted Interest in Table 4, and Verbal Communication in Table 5.

4. Discussion

Many factors may influence scores on ASD screening and diagnostic measures. The majority of previous research has focused on individual characteristics, such as level of intellectual functioning, presence of challenging behaviors, level of adaptive functioning, and comorbid psychopathology [34–38]. However, many screening and diagnostic measures for ASD reply upon parent or caregiver report, especially for young children. Scores based on parent report are likely to be influenced by a range of additional factors, including the parent's perceptions, judgments, and beliefs concerning appropriate development and behavior, as theorized in the first level of Rogler's framework for understanding the influence of culture on the diagnostic process of psychiatric disorders (Fig. 1). It is at this level that culture becomes worthy of consideration, as it may play an important role in how parents perceive, conceptualize, and report on their child's behavior. The country that one is acculturated with may influence what behaviors are viewed as problematic and developmentally abnormal. Looking at similarities and differences in parent symptom endorsement across-countries is an important step towards developing an understanding of how culture may influence scores on ASD screening and diagnostic measures.

This study investigated cross-cultural differences in caregiver reported symptoms of ASD and comorbid psychopathology. Differences in symptom endorsement for core ASD symptom domains (i.e., nonverbal communication/socialization, repetitive behaviors/restricted interests, verbal communication) were ex-amined between multicultural samples of infants and toddlers with ASD from Greece, Italy, Japan, Poland, and the United States.

Significant differences in endorsement of ASD symptom severity were found between multinational groups. The sample from the United States had the

highest average total score on the BISCUIT – Part 1. Children from Greece had the lowest average total scores and were found to have significantly lower scores than children from Japan, Poland, and the United States. Children from Italy were also found to have significantly lower scores than children from Poland and the United States. Differences in symptom endorsement were also found between groups for ASD symptom domains. Patterns across scores for the BISCUIT subscales for Socialization/Nonverbal Communication, Repetitive Behaviors/Restricted Interest, and Verbal Communication were similar to those of total symptom severity. Children from Greece had the lowest scores and children from the United States had the highest on all subscales.

Analysis of group differences in item endorsement revealed some interesting findings. Generally, children from the United States and Poland had higher endorsement frequency for items on the Socialization/Nonverbal Communication while children from Greece and Italy had lower endorsement frequency. However, this pattern was not consistent across all items. Notably, children from the United States had a much lower endorsement frequency (23.3%) for item 2 (‘‘Intellectual abilities’’) and those from Japan had the highest (69.4%). Children from Japan had the highest endorsement frequency (85.7%) for item 46 (‘‘Understanding age appropriate jokes, figures of speech, or sayings’’). For item 22 (‘‘Use of too few or too many social gestures’’), children from Japan again had the highest endorsement frequency (84.5%) while those from Poland had the lowest (44.8%).

On the Verbal Communication subscale, this trend was continued, with children from the United States and Poland having the highest endorsement frequencies. However, there was greater variation in frequency of item endorsement for the Repetitive Behaviors/Restricted Interest subscale. Items related to restricted interests (27, 39, and 55) had greater endorsement frequency among children from Poland. Those related to repetitive motor movements (4, 57, and 58) had higher endorsement among children from the United States, while those related to routines (33, 48, and 49) had higher endorsement among children from Greece. Children from Poland had higher endorsement of items related to facial expressions (26 and 41) than other groups.

Taken together, the item endorsement analysis indicates that patterns of endorsement were fairly consistent across those related to socialization and communication, with more variation among those related to restricted, repetitive behaviors (RRBs). This may suggest that culture has a larger influence on how RRBs are perceived by parents than other symptoms related to ASD. Behaviors related to socialization and communication may be more universal, while interpretation of RRBs may be more culturally subjective. This has important implications for the international implementation of ASD screening and diagnostic measures, as cultural variations in perception and endorsement of RRBs may affect measure outcomes and the diagnostic process.

There are several complex factors that may influence parent symptom endorsement. First, there may be differences in the general knowledge of child development, such as appropriate developmental milestones, and awareness of ASD. These differences may be related to cultural differences in expectations as well as differences in the dissemination of related information. Addition-ally, social stigma associated with ASD or certain behaviors, such as RRBs, may also impact parents' willingness to acknowledge behavioral symptoms. National policies related to health care and child services are likely to be influential, as well. For example, policies related to child care may influence parents' access to peer comparison groups. The guidelines and policies related to medical screenings and ASD specific screenings differ across countries, which may influence how physicians and families monitor development. All of these variables may differ across societies and may impact how parents view and report their child's behavior.

Limitations of the current study however should be considered when interpreting findings. The recruitment and diagnostic procedures for the current study were not uniform across countries, as described in the method section. As such, we cannot rule-out the possibility that differences in symptom endorsements across groups may result from procedural and methodological differences across sites. This limitation highlights the need for further international studies to validate measures for screening and diagnosing ASD across countries. Further, differences in public awareness of autism, ASD screening practices, and socioeconomic status across countries may also influence symptom endorsement. Additional limitations include differences in samples sizes across sites and overall small samples. Increasing samples sizes should be a target for future research to increase confidence in study findings. That being said, this study had several strengths, as well. The use of a single measure, the BISCUIT, translated into multiple languages and used at five international sites provides valuable insight into differences in symptom endorsement that would not be possible with the use of multiple measures. Additionally, this study represents an important step towards greater collaboration among international researchers and a more global understanding of ASD.

The outcomes of this research should be considered preliminary and highlight an area of need in ASD research. Expanding on this line of research and achieving a better understanding of ASD internationally has the potential to provide a multitude of benefits. Future research should focus on identifying and investigating specific aspects of culture that impact parental report of symptoms. Although it can be methodologically difficult to isolate distinct cultural influences, further investigation of these variables would help to explain differences in symptom endorsement and inform diagnostic considerations. The evaluation of existing assessment measures, as well as specific items within those measures, in relation to cultural validity and sensitivity would be useful to this end. Creating more uniform methods and culturally sensitive measures for diagnosing ASD will allow researchers from

around the world to collaborate, make more accurate comparisons, and share findings with greater ease. Further, as treatments generalize across cultures, adaptations based on local cultural practices and beliefs can be made to improve treatment effectiveness. Culturally-informed research of ASD symptomatology is likely to produce the most generalizable findings and thus should be a priority within the field.

Table 2
Means of total BISCUIT – part 1 score and BISCUIT – part 1 subscales with significant post-hoc country site comparisons.

	Greece		Italy		Japan		Poland		USA		Total	
Scale (maximum score)	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
BISCUIT – part 1 (124)	$38.67^{a,b,c}$	18.70	45.22^{d}	32.19	57.14^{a}	25.14	$56.16^{b,d}$	27.09	64.76^{c}	24.88	70.08	19.16
Subscales												
Nonverbal Communication/ Socialization (48)	$16.95^{a,b,c}$	8.35	$21.62^{d,e}$	16.75	27.02^{a}	12.47	$25.92^{b,d}$	13.63	$29.95^{c,e}$	13.07	31.36	10.39
Repetitive Behaviors/ Restricted Interests (44)	$12.03^{a,b}$	8.46	$12.18^{c,d}$	11.36	16.06	8.86	$16.28^{a,c}$	9.77	$19.43^{b,d}$	8.96	20.24	8.86
Verbal Communication (14)	$6.05^{a,b}$	2.57	8.10^{c}	2.57	8.57^{d}	4.14	$9.24^{a,e}$	4.22	$10.03^{b,c,d,e}$	3.66	12.6	2.35

^{a,b,c,d,e}: means in a row sharing subscripts are significantly different from each other ($P<0.01$).

Table 3
Frequency of item endorsement on the BISCUIT-Part 1 Nonverbal Communication/Socialization subscale and results of Chi^2 analyses.

BISCUIT – Part 1 factor/item	Greece (%)	Italy (%)	Japan (%)	Poland (%)	USA (%)	Total (%)	χ^2
Socialization/Non-Verbal Communication							
14. Peer relationships	69.2	70.0	79.6	84.5	**94.4**	80.4	13.91^{b}
18. Ability to keep and make friends	76.9	68.0	85.7	86.2	**90.7**	82.0	11.27^{a}
10. Social interactions with others his/her age	76.9	70.0	89.8	89.7	**92.5**	84.3	14.39^{b}
52. Socializes with other children	76.9	62.0	83.7	84.5	**90.7**	80.0	15.39^{b}
59. Development of social relationships	71.8	76.0	83.7	91.4	**98.1**	85.2	17.94^{c}
35. Plays appropriately with others	76.9	62.0	85.7	**93.1**	**88.9**	82.0	21.27^{c}
19. Interest in participating in social games, sports, and activities	56.0	79.6	72.4	55.2	**84.9**	71.1	15.02^{b}
62. Participation in games or other social activities	66.7	60.0	77.6	77.6	**83.3**	73.6	9.23
21. Able to understand the subtle cues or gestures of others	64.1	54.0	73.5	79.3	**81.5**	71.2	12.94^{a}
36. Reads nonverbal cues	71.8	40.0	67.3	**82.8**	79.6	68.8	27.75^{c}
20. Interest in another person's side of the conversation	74.4	50.0	77.6	79.3	**92.5**	75.1	26.10^{c}
28. Motivated to please others	51.3	52.0	65.3	**86.2**	75.9	67.6	21.29^{c}
46. Understanding age appropriate jokes, figures of speech, or sayings	**76.9**	62.0	**85.7**	75.9	64.2	72.7	9.66^{a}
12. Response to others' social cues	66.7	58.0	71.4	**86.2**	79.2	73.1	12.77^{a}
51. Responds to others' distress	53.8	44.0	71.4	72.4	**80.8**	65.3	19.87^{c}
22. Use of too few or too many social gestures	52.0	59.2	**84.5**	44.8	**81.1**	68.3	20.62^{c}
47. Gives subtle cues or gestures when communicating with others	71.8	58.0	75.5	**81.0**	69.8	71.5	7.52
32. Facial expression corresponds to environmental events	43.6	50.0	61.2	**72.4**	51.9	56.8	10.41^{a}
23. Body posture and/or gestures	53.8	54.0	59.2	**75.9**	48.1	58.8	10.37^{a}
7. Ability to recognize the emotions of others	43.6	46.0	69.4	**77.6**	70.4	62.8	19.86^{c}
2. Intellectual abilities	53.8	68.0	**69.4**	62.1	23.3	65.5	4.01
17. Shares enjoyment, interest, or achievements with others	59.0	58.0	61.2	**86.2**	74.1	68.8	14.67^{b}
45. Make-believe or pretend play	74.4	58.0	73.5	**86.2**	77.8	74.4	11.65^{a}
3. Age appropriate self-help and adaptive skills	64.1	70.0	73.5	75.9	**79.6**	73.2	3.26

Highest percentage in each row is in bold.
[a] $P<0.05$.
[b] $P<0.01$.
[c] $P<0.001$.

Table 4
Frequency of item endorsement on the BISCUIT – Part 1 Repetitive Behavior/Restricted Interests subscale and results of chi^2 analyses.

BISCUIT – part 1 Factor/Item	Greece (%)	Italy (%)	Japan (%)	Poland (%)	USA (%)	Total (%)	χ^2
Repetitive behavior/Restricted Interests							
42. Abnormal fascination with the movement of spinning objects	46.2	20.0	51.0	56.9	**66.7**	48.8	25.23[c]
34. Abnormal preoccupation with parts of an object or objects	51.3	26.0	46.9	74.1	**71.7**	55.0	33.05[c]
27. Restricted interests and activities	61.5	50.0	67.3	**86.2**	66.0	67.1	16.78[b]
39. Interest in a highly restricted set of activities	56.4	44.0	67.3	**72.4**	58.5	60.2	10.43[a]
55. Limited number of interests	48.7	48.0	55.1	**79.3**	63.0	60.0	14.77[b]
4. Engages in repetitive motor movements for no reason	51.3	42.0	4.8	63.8	**75.5**	55.4	18.42[c]
57. Abnormal, repetitive hand or arm movements	46.2	36.0	20.4	44.8	**64.8**	42.8	21.95[c]
58. Abnormal, repetitive motor movements involving entire body	25.6	14.0	32.7	44.8	**48.1**	34.0	18.01[c]
33. Sticking to odd routines or rituals that don't have purpose or make a difference	**53.8**	28.0	44.9	50.0	44.4	44.0	7.60
48. Becomes upset if there is a change in routine	**51.3**	34.0	34.7	48.3	50.0	43.6	5.81
49. Needs reassurance, especially if events don't go as planned	**53.8**	38.0	40.8	48.3	50.0	46.0	3.25
43. Curiosity with surroundings	46.2	34.0	**63.3**	50.0	40.7	46.8	9.67[a]
11. Reactions to normal, everyday sounds	38.5	24.0	38.8	44.8	**48.1**	39.2	7.44
13. Reaction to normal, everyday lights	38.5	20.0	30.6	**39.7**	27.8	31.2	6.11
30. Reaction to sounds and sights	20.5	26.0	53.1	**69.0**	59.3	47.6	34.97[c]
6. Prefers foods of a certain texture or smell	35.9	16.0	38.8	43.1	**50.0**	37.1	14.23[b]
26. Displays a range of socially appropriate facial expressions	48.7	56.0	55.1	**75.9**	49.1	57.8	10.95[a]
41. Use of facial expression	51.3	66.0	61.2	**81.0**	61.1	65.2	10.49[a]
38. Expects others to know their thoughts, experiences, and opinions without communicating them	64.1	50.0	**79.6**	72.4	**77.8**	69.2	13.75[b]
44. Saying words and phrases repetitively	20.5	10.0	**38.8**	29.3	24.1	24.8	12.04[a]
8. Maintains eye contact	53.6	58.0	77.6	**91.4**	87.0	75.2	29.81[c]
29. Eye-to-eye gaze	48.7	52.0	73.5	**93.1**	87.0	72.8	39.96[c]

Highest percentage in each row is in bold.
[a] $P < 0.05$.
[b] $P < 0.01$.
[c] $P < 0.001$.

Table 5
Frequency of item endorsement on the BISCUIT – Part 1 Communication subscale and results of chi^2 analyses.

BISCUIT – part 1 factor/Item	Greece (%)	Italy (%)	Japan (%)	Poland (%)	USA (%)	Total (%)	χ^2
Verbal Communication							
1. Communication skills	84.6	78.0	81.6	93.1	**98.1**	87.6	13.13[a]
5. Verbal communication	87.2	82.0	83.7	94.8	**98.1**	89.6	10.98[a]
9. Use of language to communicate	71.8	76.0	75.5	93.1	**100.0**	84.4	23.65[c]
50. Language development	74.4	82.0	89.8	96.6	**100.0**	89.6	22.10[c]
16. Use of language in conversation with others	71.8	72.0	75.5	75.9	**94.4**	78.4	10.89[a]
24. Communicates effectively	48.7	66.0	81.6	84.5	**96.3**	77.2	35.02[c]
53. Use of nonverbal communication	74.4	56.0	73.5	**84.5**	79.6	74.0	12.63[a]

Highest percentage in each row is in bold.
[a] $P < 0.05$.
[b] $P < 0.01$.
[c] $P < 0.001$.

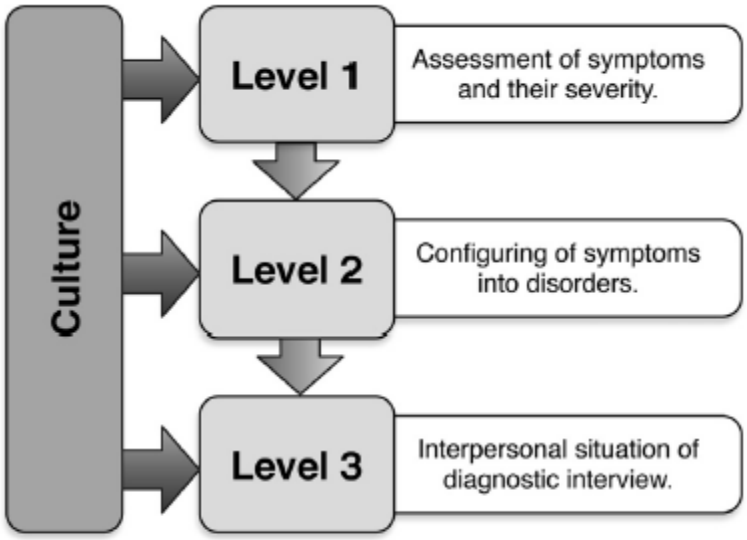

Fig. 1. Graphic representation of the framework proposed by Rogler (1993) for understanding how culture affects the diagnostic process of psychiatric disorders.

Disclosure of interest

Deann Matson, Dr. Johnny Matson's wife, is the sole owner of the Baby and infant screen for children with autism traits (BISCUIT) and sells the scale.

The other authors declare that they have no competing interest.

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