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ORIGINAL ARTICLE

The 12-item self-report Questionnaire for Difficulty in Social Communication as a simultaneous prescreening of autism spectrum and social anxiety

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Abstract

Aim: Young patients with social communication difficulties are often diagnosed with autism spectrum disorder (ASD), social communication disorder (SCD), or social anxiety disorder (SAD). This study aimed to develop a questionnaire, especially focusing on the prescreening of SAD complicated by ASD/SCD.

Methods: The 12-item self-report Questionnaire for Difficulty in Social Communication (DISC-12) was developed and analyzed using exploratory factor analysis in 94 patients with ASD/SCD (35 with SAD, 59 without). An additional 17 patients with only SAD were included. Convergent validity was assessed via correlations with the Autism Spectrum Quotient (AQ) and Liebowitz Social Anxiety Scale (LSAS). DISC-12 scores and demographics were compared across ASD/SCD, ASD/SCD + SAD, and SAD groups. Receiver operating characteristic (ROC) analysis of DISC-12 subscales distinguished autistic traits from social anxiety.

Results: Factor analysis revealed a three-factor model for the DISC-12, comprising nonassertiveness, poor empathy, and interpersonal hypersensitivity. DISC-12 showed significant correlations with the AQ ($r = 0.412$, $p < 0.001$) and LSAS ($r = 0.429$, $p < 0.001$). Patients with ASD/SCD had higher Poor Empathy scores, while SAD patients had higher Interpersonal Hypersensitivity scores than the other groups. ROC analysis indicated that Poor Empathy and Interpersonal Hypersensitivity subscale scores effectively differentiated ASD/SCD from patients with SAD and vice versa.

Conclusion: DISC-12 is a rapid and effective prescreening tool for identifying both ASD and social anxiety, particularly in young patients with self-reported difficulties in social communication.

KEYWORDS

autism spectrum disorder, DISC-12, interpersonal hypersensitivity, poor empathy, social anxiety disorder

INTRODUCTION

Autism spectrum disorder (ASD) is a neurodevelopmental condition marked by qualitative impairments in social communication and interactions, repetitive behaviors, and abnormal sensory sensitivities, including both hypo- and hypersensitivity.[1] ASD is commonly associated with social anxiety disorder (SAD),[2,3] with studies indicating that up to 50% of individuals with ASD may also experience SAD.[4,5] However, both disorders often manifest similar social interaction deficits, making it difficult to distinguish whether these deficits arise from ASD, SAD, or both.[6,7] Consequently, identifying the overlap between ASD and SAD remains a challenge in clinical practice.

The co-occurrence of ASD and SAD significantly impacts patients' social functioning, underscoring the importance of effective screening.[8] Patients with both ASD and SAD tend to exhibit reduced social competence and diminished social motivation.[9,10] This dual diagnosis can lead to a compounded lack of social skills, with additive and synergistic effects between the two disorders.[11] Several studies emphasize the need for targeted interventions for patients with overlapping ASD and SAD.[12,13] Given these challenges, accurate screening to differentiate SAD from ASD and vice versa is crucial, especially in the early stages of diagnosis.

Profiles of subjective difficulty in social communication reported by patients with coexisting ASD and SAD can offer valuable diagnostic cues and inform treatment strategies. Feelings of social alienation stemming from autistic traits tend to amplify social avoidance and distress.[14] The inability to tolerate uncertainty in social interactions is also strongly associated with anxiety in patients with ASD.[15] Furthermore, several studies[16,17] suggest that individuals with ASD who are aware of their social communication difficulties often employ camouflaging strategies. Such compensatory overadaptation, as a defensive mechanism, may lead to heightened repressive behaviors and anxiety symptoms.[18] These mechanisms underlying anxiety in individuals with ASD are considered qualitatively different from those observed in pure patients with SAD without autistic traits.[19] Therefore, profiling subjective difficulty in social communication can provide critical insights for empathetic understanding and the development of individualized psychological interventions.

Meanwhile, social communication disorder (SCD) is a clinically significant neurodevelopmental disorder characterized by communication impairments similar to those observed in ASD, though SCD does not involve sensory hypersensitivity, restricted interests, or stereotyped behaviors.[1] As a result, SCD does not meet the diagnostic threshold for ASD[20] but is considered to fall on the ASD continuum.[21] In fact, patients with SCD exhibit significant overlaps in clinical presentation with those diagnosed with ASD,[22] showing various social impairments.[23] Studies have also shown that patients meeting the DSM-5 criteria for SCD include 1% of individuals previously diagnosed with autistic disorder, 8% of those diagnosed with Asperger's disorder, and 32% of individuals with pervasive developmental disorder not otherwise specified (PDD-NOS) according to DSM-IV criteria.[24,25] This suggests a degree of overlap with ASD, though SCD tends to reflect a milder and more atypical manifestation of autistic traits.

In practice, patients with ASD/SCD often experience significant difficulties in social communication, which can lead to clinically relevant symptoms of SAD. However, the Liebowitz Social Anxiety Scale (LSAS),[26] considered the gold standard for assessing SAD, was originally designed to measure social anxiety at a neurotic level and avoidant behaviors in public situations. Consequently, it may not be fully applicable to assessing social anxiety resulting from communication impairments in individuals with ASD/SCD. Therefore, a quick, simultaneous prescreening tool targeting both autism spectrum traits and social anxiety, especially for patients with ASD/SCD, could be valuable in routine clinical practice.

In patients with both ASD/SCD and SAD, it is hypothesized that difficulties in social communication act as a mediator between autistic traits and social anxiety, offering insights into underlying psychological mechanisms and providing specific diagnostic cues. To date, there have been only a few studies focusing on this perspective. Thus, this study aimed to develop a prescreening tool for both autistic traits and social anxiety, specifically for young individuals who may experience both autism spectrum traits and social anxiety in social interactions.

METHODS

Development of the 12-item self-report Questionnaire for Difficulty in Social Communication

Prior to developing the 12-item self-report Questionnaire for Difficulty in Social Communication (DISC-12), a preliminary interview was conducted with 94 individuals diagnosed with ASD or SCD (40 males and 54 females). This sample comprised 35 individuals with comorbid SAD and 59 without SAD. Notably, 17 individuals with only SAD were excluded, as the primary objective was to develop a questionnaire that captures the subjective communication difficulties experienced by individuals with autistic traits. Diagnoses of ASD, SCD, and SAD were made according to the DSM-5 criteria.[1] Participant ages ranged from 12 to 51 years, with a mean age of 19.8 ± 8.9 years.

The first draft of the questionnaire contained 15 items based on the most common communication difficulties, which were rated on a four-point Likert scale: 0 = *never* (almost 0%), 1 = *sometimes* (around 25%), 2 = *often* (around 50%), and 3 = *always* (more than 75%). This 15-item version of the questionnaire was administered to 94 patients with ASD/SCD. However, exploratory factor analysis did not yield a well-fitting factor model. After excluding three items with the least factor loadings—fear of equal relationship ("It is scary for me to talk with others my age"), avoidance of group communication ("I prefer one-on-one dialogue to group conversations"), and blind trust ("I trust others too naively and easily"), the 12-item self-report questionnaire (Figure 1a, b) was found to be the best fit for exploratory factor analysis (Table 1), which is further detailed in the result section. Thus,

(a) ∗ Names of the items need to be withdrawn for clinical use.

The 12-item self-report questionnaire for difficulty in social communication (DISC-12)

"Regarding your relationship with others, please select one among 0–3 and put on."

0: never almost 0%
1: sometimes around 25%
2: often around 50%
3: always more than 75%

1. Oversensitivity to criticism:	"I am vulnerable to others' comments."	0	1	2	3
2. Fear of evaluation:	"I am afraid that someone speaks ill of me."	0	1	2	3
3. Camouflaging for emotional concealment:	"I pretend to be cheerful even when suffering."	0	1	2	3
4. Forceful statements:	"I turn others off because I insist too much."	0	1	2	3
5. Poor situation-reading:	"Others point out that I don't read the situation."	0	1	2	3
6. Unreserved remarks:	"I think I speak too honestly."	0	1	2	3
7. Adherence to justice:	"I can't compromise about the right thing that I believe."	0	1	2	3
8. Lack of adaptation to the topic	"I can't keep up with the topic that others commonly enjoy and share."	0	1	2	3
9. Passivity in disclosure:	"I hesitate to reveal my worries to others."	0	1	2	3
10. Difficulty in emotional expression:	"I am not good at expressing my feelings to others."	0	1	2	3
11. Inappropriate timing of remarks:	"I'm not sure of the timing when I can start my talk in the group."	0	1	2	3
12. Non-participatory listener:	"I tend to take the role of the listener in the group."	0	1	2	3

(b) ∗ 臨床使用の際は項目名を除く。

社会的コミュニケーションの困難さに関する12項目の自記式質問票（DISC-12）

人との関係において、０～３ のうち、
あなたに最もあてはまるものに ○ をつけてください。

0: まったくない ほぼ 0%
1: たまにそうなる 25%前後
2: しばしばそうなる 50%前後
3: いつもそうである 75%以上

1. 批判に対する過敏性：	人に言われたことで傷付きやすい。	0	1	2	3
2. 評価への恐怖：	人に陰口を言われないか心配である。	0	1	2	3
3. 感情隠蔽のためのカモフラージュ：	苦しいのに明るく振る舞ってしまう。	0	1	2	3
4. 強引な発言：	言い過ぎて人から引かれてしまう。	0	1	2	3
5. 場の読めなさ：	場の空気を読まないと言われる。	0	1	2	3
6. 率直過ぎる発言：	自分は正直にしゃべり過ぎると思う。	0	1	2	3
7. 正義への固執：	自分が正しいと思うことはゆずれない。	0	1	2	3
8. 話題への適応不足：	皆が盛り上がる話題についていけない。	0	1	2	3
9. 開示への消極性：	自分の悩みを人には打ち明けにくい。	0	1	2	3
10. 感情表現の困難さ：	気持ちを伝えるのが苦手である。	0	1	2	3
11. 発言のタイミングの不適切さ：	自分が話すタイミングがわからない。	0	1	2	3
12. 非参加型の聞き手：	グループ内では聞き役になりがちである。	0	1	2	3

FIGURE 1 (a) English and (b) Japanese versions of the 12-item self-report Questionnaire for Difficulty in Social Communication (DISC-12).

the DISC-12 was applied to the following subjects for further investigation into subjective communication difficulties.

Participants and data collection

Following the inclusion of 17 individuals diagnosed with SAD without ASD or SCD in the initial sample of 94 individuals with ASD or SCD, the total sample comprised 111 participants (43 males and 68 females) aged 12 to 51 years, with a mean age of 19.5 ± 8.6 years. The inclusion of these 17 participants with only SAD was intended to assess whether the DISC-12 could effectively identify autistic traits among individuals with SAD. These participants were categorized into three groups: ASD/SCD ($n = 59$), SAD ($n = 17$), and comorbid with both diagnoses ASD/SCD + SAD ($n = 35$). All patients visited the University of the Ryukyus Hospital between September 2022 and

TABLE 1 Three-factor model of the DISC-12 in 94 patients with ASD or SCD with autistic traits.

Subscales and items	Factor 1	Factor 2	Factor 3
Nonassertiveness (Cronbach's α = 0.792)			
Difficulty in emotional expression	**0.763**	−0.046	0.073
Passivity in disclosure	**0.734**	−0.067	0.015
Inappropriate timing of remarks	**0.675**	0.173	−0.096
Lack of adaptation to the topic	**0.512**	0.078	0.281
Nonparticipatory listener	**0.410**	−0.198	0.128
Poor Empathy (Cronbach's α = 0.756)			
Forceful statements	−0.069	**0.825**	0.056
Poor situation-reading	0.171	**0.817**	−0.242
Unreserved remarks	−0.175	**0.547**	0.308
Adherence to justice	−0.072	**0.414**	0.180
Interpersonal Hypersensitivity (Cronbach's α = 0.674)			
Oversensitivity to criticism	0.039	0.048	**0.727**
Fear of evaluation	0.070	0.064	**0.551**
Camouflaging for emotional concealment	0.112	−0.018	**0.505**

Note: This analysis was conducted on 94 patients, including those diagnosed with ASD/SCD with or without social anxiety disorder. Bold indicates statistical significance at $p < 0.05$.

Abbreviations: ASD, autism spectrum disorder; DISC-12, 12-item self-report Questionnaire for Difficulty in Social Communication; SCD, social communication disorder.

July 2024 and were diagnosed by two specialists according to the DSM-5 criteria.[1] Participants with organic brain disorders or those under the acute influence of substances, which could potentially confound cognitive-behavioral assessments, were excluded.

Measures

In addition to the DISC-12, two established psychological assessments were administered to the entire cohort of 111 participants.

Liebowitz Social Anxiety Scale

The Liebowitz Social Anxiety Scale (LSAS)[26] was used to assess the severity of SAD as it is widely regarded as the gold standard for this purpose. The LSAS consisted of 24 items that measured two dimensions: fear/anxiety and avoidance. Each dimension included 12 items, with questions addressing different situations categorized into performance and social interaction scenarios. Participants rated their fear/anxiety and avoidance separately for each situation using a four-point Likert scale (0 = *none*, 1 = *mild*, 2 = *moderate*, 3 = *severe* for fear/anxiety; 0 = *never*, 1 = *occasionally*, 2 = *often*, 3 = *usually* for avoidance). The total score ranged from 0 to 144, with higher scores indicating greater severity of social anxiety. In this study, the validated Japanese version of the LSAS, for which reliability and validity have been confirmed,[27] was used.

Autism Spectrum Quotient

The Autism Spectrum Quotient (AQ) was developed by Baron-Cohen et al.[28] as a self-report screening tool to assess traits associated with the autism spectrum. The scale consists of 50 items divided into five subscales: Social Skills, Attention Switching, Attention to Detail, Communication, and Imagination. Each item has four response options: *strongly agree*, *slightly agree*, *slightly disagree*, and *strongly disagree*. Responses were scored as either 1 or 0, with higher scores indicating stronger autistic traits. The total score ranged from 0 to 50, with higher scores reflecting greater severity of autism spectrum tendencies. The AQ has been translated into Japanese, with confirmed validity.[29] For children aged 6–15 years, the AQ Japanese Children's Version[30] was used. This version also consists of 50 items and has been validated in Japanese. In this study, the adult or children's version was administered based on the participant's age to ensure a comprehensive measure of autism spectrum tendencies.

Statistical analyses

The factor structure of the DISC-12 was examined using exploratory factor analysis with maximum likelihood estimation after Promax rotation in 94 participants with ASD/SCD with or without SAD. Eigenvalues above 1 were used to determine the number of factors to retain. Items with factor loadings of at least 0.40 were retained. Internal consistency was assessed using Cronbach's α.

Further analyses were conducted in the full cohort of 111 participants, divided into three groups: ASD/SCD, SAD, and coexisting ASD/SCD and SAD. The Kruskal–Wallis test compared background characteristics across the three groups, with post-hoc analyses using the Steel–Dwass test, Fisher's exact test, or χ^2 test for pairwise comparisons. Total, subscale, and item scores of the DISC-12 were compared among the groups using the Kruskal–Wallis test, followed by the Steel–Dwass post-hoc test for multiple comparisons.

To evaluate the convergent validity of the DISC-12, Pearson correlations were computed between the total and subscale scores of the DISC-12 and the total scores of the AQ and the LSAS.

Receiver operating characteristic (ROC) analysis differentiated individuals with SAD who also had ASD/SCD from those without ASD/SCD ($n = 35$ vs. $n = 17$) and individuals with ASD/SCD who also had comorbid SAD from those without SAD ($n = 35$ vs. $n = 59$) using DISC-12 subscale scores. The subscale with the highest area under the curve was highlighted in the results.

A two-tailed p-value < 0.05 was considered statistically significant. All analyses were performed using SPSS 28.0.0.0 J for Windows (SPSS Japan).

RESULTS

Figure 1a and 1b display the DISC-12 in its English and Japanese versions, respectively. The original Japanese version (Figure 1b) was used for all participants in this study. The English version (Figure 1a) was prepared for international readers who do not understand Japanese; however, its validity has not yet been demonstrated. The English version was developed using a back-translation procedure to ensure accuracy and consistency, with two native speakers involved.

The results of the exploratory factor analysis are presented in Table 1, where three distinct components of the DISC-12 were identified. The final model retained 12 items, grouped as follows: Nonassertiveness (Cronbach's $\alpha = 0.792$), which included difficulty in emotional expression, passivity in disclosure, inappropriate timing of remarks, lack of adaptation to the topic, and nonparticipatory listener; Poor Empathy (Cronbach's $\alpha = 0.756$), which included forceful statements, poor situation-reading, unreserved remarks, and adherence to justice; and Interpersonal Hypersensitivity (Cronbach's $\alpha = 0.674$), which included oversensitivity to criticism, fear of evaluation, and camouflaging for emotional concealment.

Demographic characteristics of the participants are outlined in Table 2, highlighting significant sex differences and LSAS scores across the groups. Significant differences were observed among the three groups in sex ($p = 0.002$) and total LSAS scores ($p = 0.014$). Post-hoc analyses revealed that females were more predominant in the SAD group (82.4%, $p = 0.035$) and ASD/SCD + SAD group (77.1%, $p = 0.014$) than those in the ASD/SCD group (45.8%). The ASD/SCD + SAD group showed significantly greater total LSAS scores (81.8 ± 30.2, $p = 0.015$) than the ASD/SCD group (61.8 ± 32.7).

Further analysis of the DISC-12 scores across the three groups is shown in Table 3, with significant differences observed in the Poor Empathy and Interpersonal Hypersensitivity subscales. No difference was found in total DISC-12 scores among the groups. However, Poor Empathy subscale scores were higher in the ASD/SCD ($p = 0.004$) and the ASD/SCD + SAD groups ($p = 0.014$) than in the SAD group, while Interpersonal Hypersensitivity subscale scores were higher in the SAD group ($p = 0.039$) and ASD/SCD + SAD groups ($p = 0.002$) than in the ASD/SCD group. Multiple comparisons also revealed significant differences in various item scores, particularly those related to the Poor Empathy and Interpersonal Hypersensitivity subscales, as indicated in Table 3.

The convergent validity of the DISC-12 is illustrated in Figure 2, which depicts the correlations between AQ and LSAS. Positive correlations were found between the DISC-12 and the AQ ($r = 0.412$, $p < 0.001$) and LSAS ($r = 0.429$, $p < 0.001$) total scores (Figure 2). Among the DISC-12 subscales, Nonassertiveness showed the strongest correlation with the AQ total score ($r = 0.462$, $p < 0.001$), followed by Poor Empathy ($r = 0.261$, $p = 0.006$). Regarding the LSAS total score, Interpersonal Hypersensitivity showed the strongest correlation ($r = 0.438$, $p < 0.001$), followed by Nonassertiveness ($r = 0.282$, $p = 0.003$) and Poor Empathy ($r = 0.262$, $p = 0.006$).

TABLE 2 Comparison of demographic characteristics among groups with ASD/SCD, SAD, and comorbid ASD/SCD + SAD diagnoses.

	ASD/SCD ($n = 59$)	ASD/SCD + SAD ($n = 35$)	SAD ($n = 17$)	p value	ASD/SCD vs. ASD/SCD + SAD (p value)	ASD/SCD vs. SAD (p value)	ASD/SCD + SAD vs. SAD (p value)
Age (years)[a]	19.6 ± 9.6	20.1 ± 7.8	18.0 ± 6.4	0.499	—	—	—
Sex, n (%)[b]							
Male	32 (54.2)	8 (22.9)	3 (17.6)				
Female	27 (45.8)	27 (77.1)	14 (82.4)	0.002	0.014	0.035	—
History of school refusal[c]	36 (61.0)	21 (60.0)	9 (52.9)	0.834	—	—	—
Adults (18 years or older), n (%)[c]	21 (35.6)	19 (54.3)	5 (29.4)	0.121	—	—	—
Years of education (in adults)[a]	13.5 ± 2.5	13.3 ± 2.3	13.4 ± 0.9	0.603	—	—	—
AQ (total score)[a]	25.6 ± 8.3	29.0 ± 5.8	25.0 ± 9.2	0.103	—	—	—
LSAS (total score)[a]	61.8 ± 32.7	81.8 ± 30.2	75.9 ± 32.3	0.014	0.015	—	—

Note: Continuous variables are presented as mean ± SD.

Abbreviations: AQ, Autism Spectrum Quotient; ASD, autism spectrum disorder; LSAS, Liebowitz Social Anxiety Scale; SAD, social anxiety disorder; SCD, social communication disorder.

[a]Kruskal–Wallis test followed by the Steel–Dwass test as a post-hoc analysis was conducted to compare age, years of education, and total AQ and LSAS scores.

[b]Fisher's exact test or [c]χ^2 test with post-hoc analysis was used to compare sex, history of school refusal, and ratio of adults.

p value < 0.05 is considered significant.

TABLE 3 Comparison of total, subscale, and item scores of the DISC-12 among groups with ASD/SCD, SAD, and comorbid ASD/SCD + SAD diagnoses.

Item	ASD/SCD (n = 59)	ASD/SCD + SAD (n = 35)	SAD (n = 17)	Kruskal–Wallis test (p value)	ASD/SCD vs. ASD/SCD + SAD (p value)	ASD/SCD vs. SAD (p value)	ASD/SCD + SAD vs. SAD (p value)
Total scores	20.2 ± 7.4	24.1 ± 6.0	19.8 ± 5.9	—	—	—	—
Nonassertiveness	9.5 ± 3.7	11.3 ± 3.5	10.1 ± 3.9	—	—	—	—
Difficulty in emotional expression	2.0 ± 1.1	2.4 ± 0.9	2.2 ± 1.1	—	—	—	—
Passivity in disclosure	2.1 ± 1.0	2.2 ± 1.0	2.1 ± 1.0	—	—	—	—
Inappropriate timing of remarks	1.6 ± 1.0	2.3 ± 0.9	1.7 ± 1.2	0.013	0.010	—	—
Lack of adaptation to the topic	1.7 ± 1.1	2.2 ± 0.8	1.8 ± 0.9	—	—	—	—
Nonparticipatory listener	2.1 ± 1.0	2.3 ± 1.0	2.4 ± 0.9	—	—	—	—
Poor Empathy	5.2 ± 3.2	5.5 ± 3.7	2.6 ± 1.8	0.004	—	0.004	0.014
Forceful statements	1.0 ± 1.0	1.1 ± 1.2	0.4 ± 0.9	0.040	—	0.028	—
Poor situation-reading	0.9 ± 1.0	0.9 ± 1.0	0.3 ± 0.5	0.047	—	—	—
Unreserved remarks	1.6 ± 1.2	1.7 ± 1.2	0.8 ± 0.8	0.029	—	0.036	0.041
Adherence to justice	1.6 ± 1.2	1.8 ± 1.0	1.1 ± 0.9	—	—	—	—
Interpersonal Hypersensitivity	5.5 ± 2.6	7.3 ± 2.0	7.2 ± 2.1	0.001	0.002	0.039	—
Oversensitivity to criticism	2.0 ± 1.0	2.7 ± 0.7	2.6 ± 0.6	<0.001	<0.001	0.046	—
Fear of evaluation	1.7 ± 1.2	2.5 ± 1.0	2.4 ± 0.9	0.002	0.003	—	—
Camouflaging for emotional concealment	1.8 ± 1.2	2.1 ± 1.0	2.2 ± 1.0	—	—	—	—

Note: Continuous variables are presented as mean ± SD. Statistical analysis was performed using the Kruskal–Wallis test with the Steel–Dwass post-hoc test for multiple comparisons.

Abbreviations: ASD, autism spectrum disorder; DISC-12, 12-item self-report Questionnaire for Difficulty in Social Communication; SAD, social anxiety disorder; SCD, social communication disorder.

p value < 0.05 is considered significant.

ROC analysis using the Poor Empathy subscale of the DISC-12 showed that the cut-off score of 5 effectively differentiated patients with SAD comorbid with ASD/SCD from those without ASD/SCD, demonstrating high specificity (94.1%) and a high positive predictive value (95.2%), as illustrated in Figure 3.

In contrast, ROC analysis using the Interpersonal Hypersensitivity subscale of the DISC-12 showed that the cut-off score of 8 moderately differentiated patients with ASD/SCD comorbid with SAD from those without SAD, with modest specificity (76.3%) and a negative predictive value (76.3%), as illustrated in Figure 4.

DISCUSSION

In line with the hypothesis that subjective difficulty in social communication may mediate the relationship between autistic traits and social anxiety, we developed the DISC-12, comprising 12 simple questions (Figure 1). This tool was designed based on the real-world experiences of teenagers and young adults who struggle with social communication. Both potential ASD/SCD and SAD diagnoses are frequently linked to such communication difficulties, especially among younger populations. However, in clinical practice, administering both the AQ (50 items)[28] for ASD and the LSAS (48 items)[26] for SAD as routine screening for all young patients is often impractical due to the time and effort required from both patients and clinicians. In contrast, the DISC-12 takes ~5 min to complete and is more accessible, as it uses patient-friendly language (Figure 1). Furthermore, the significant correlations between the DISC-12 and the AQ and LSAS (Figure 2) suggest that the DISC-12 is a valid tool for identifying communication difficulties in individuals with ASD/SCD and/or SAD. Thus, the DISC-12 can serve as a rapid, simultaneous prescreening tool to identify both autism spectrum traits and social anxiety. Notably, females with autistic traits may particularly benefit from this prescreening, as they are more likely to exhibit co-occurring SAD than males (Table 2).

Regarding the subscales of the DISC-12, patients with ASD/SCD scored higher on the Poor Empathy subscale, while patients with SAD

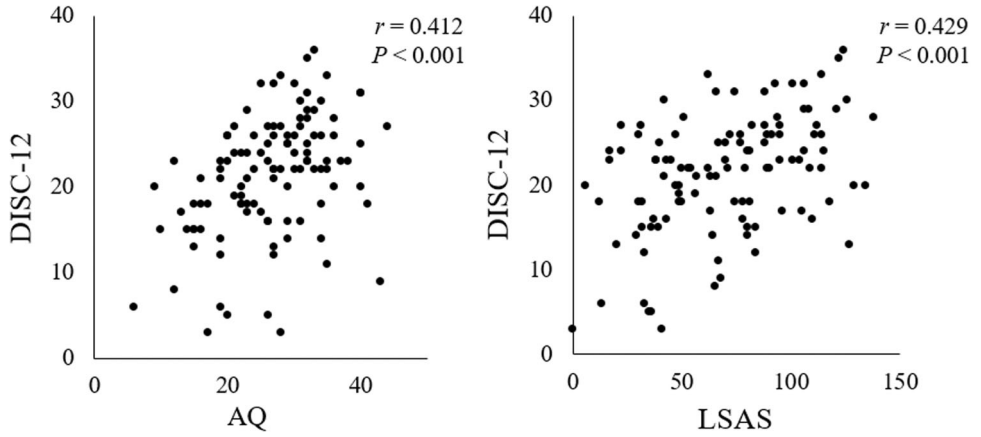

FIGURE 2 Correlations between the 12-item self-report Questionnaire for Difficulty in Social Communication (DISC-12) and the Autism Spectrum Quotient (AQ) or the Liebowitz Social Anxiety Scale (LSAS) total scores among 111 participants with single or combined diagnoses of autism spectrum disorder/social communication disorder (ASD/SCD) and social anxiety disorder (SAD).

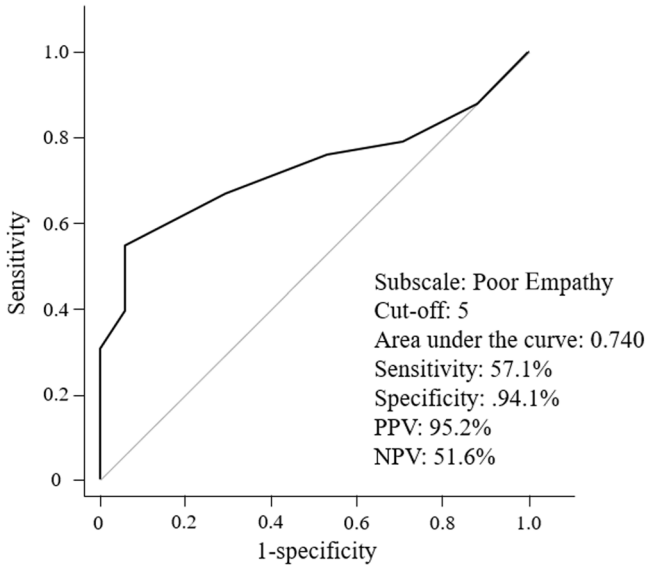

FIGURE 3 Receiver operating characteristic curve analysis for the discrimination of patients with social anxiety disorder (SAD) comorbid with autism spectrum disorder/social communication disorder (ASD/SCD) from those without ASD/SCD using the Poor Empathy subscale of the 12-item self-report Questionnaire for Difficulty in Social Communication (DISC-12). The study included 52 patients with SAD, with 35 patients having comorbid ASD/SCD and 17 patients without ASD/SCD. NPV, negative predictive value; PPV, positive predictive value.

scored higher on the Interpersonal Hypersensitivity subscale (Table 3). Additionally, ROC analysis revealed that the subscale scores of Poor Empathy (Figure 3) and Interpersonal Hypersensitivity (Figure 4) effectively differentiated ASD/SCD cases from patients with SAD and SAD cases from patients with ASD/SCD, respectively. Therefore, by focusing on these DISC-12 subscales, clinicians can confidently apply formal diagnostic tools for ASD and SAD, such as the AQ[28] and the LSAS,[26] to patients. Beyond this diagnostic utility, reviewing the individual profiles of the DISC-12 subscales can also help clinicians and psychologists better understand and share the unspoken suffering of patients who face subjective communication difficulties, fostering more empathetic care.

The Poor Empathy subscale of the DISC-12, with a score of five or more, serves as a critical indicator for clinicians to consider a potential ASD/SCD diagnosis, offering high specificity (94.1%) and positive predictive value (95.2%), as shown in Figure 3. Moreover, patients scoring highly on the Poor Empathy subscale are highly likely to experience interpersonal challenges due to their inflexible and unsophisticated communication skills, such as forceful statements, strict adherence to justice, unreserved remarks, and poor situation-reading (Table 1). Numerous studies have already documented the association between poor empathy and ASD traits,[31,32] and the concept of poor empathy is explicitly included in the diagnostic criteria for ASD in the DSM-5.[1] Thus, poor empathy is undoubtedly a key factor signaling the presence of autism spectrum traits for clinicians and a significant source of subjective communication difficulty for patients.

Meanwhile, the Interpersonal Hypersensitivity subscale of the DISC-12 may be useful for prescreening hidden social anxiety in patients with ASD/SCD (Figure 4). Specifically, scores below eight on this subscale may help exclude the possibility of an SAD diagnosis, given its modest specificity (76.3%) and negative predictive value (76.3%) in distinguishing non-SAD participants from those with SAD among patients with ASD/SCD (Figure 4). The Interpersonal Hypersensitivity subscale, in line with previous literature, shows conceptual overlap with the established Interpersonal Sensitivity Measure.[33] Furthermore, the concept of interpersonal sensitivity has been widely discussed in relation to vulnerable traits, such as heightened sensitivity to negative evaluations from others[34] and spontaneous anxiety derived from interpersonal relationships,[35,36] both in healthy volunteers and patients with SAD. Indeed, patients with SAD without ASD/SCD diagnosis scored higher on the Interpersonal Hypersensitivity subscale than those with ASD/SCD without SAD in the present study (Table 3). Considering these findings, interpersonal

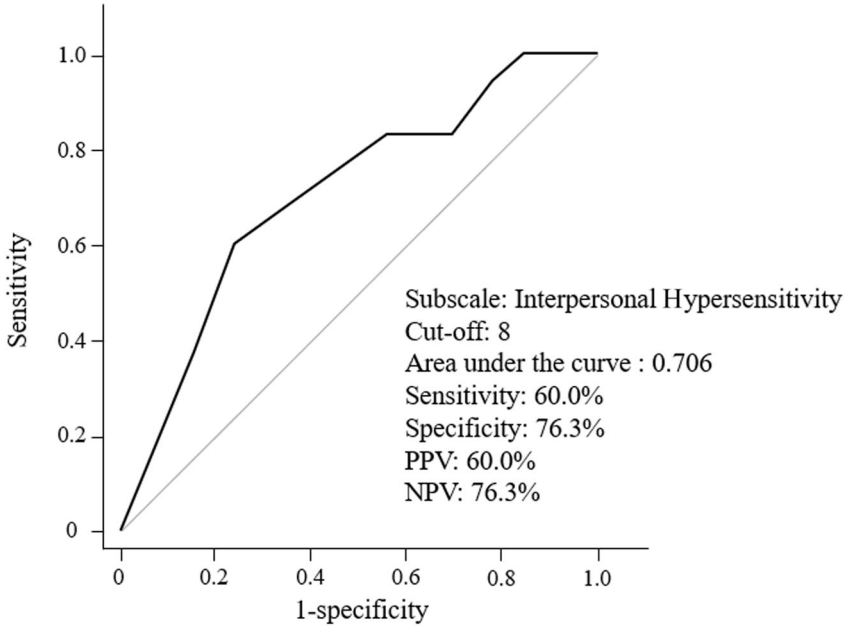

FIGURE 4 Receiver operating characteristic curve analysis for the discrimination of patients with autism spectrum disorder/social communication disorder (ASD/SCD) comorbid with social anxiety disorder (SAD) from those without SAD using the Interpersonal Hypersensitivity subscale of the 12-item self-report Questionnaire for Difficulty in Social Communication (DISC-12). The analysis included 94 patients with ASD/SCD: 35 with SAD and 59 without SAD. NPV, negative predictive value; PPV, positive predictive value.

hypersensitivity may not be exclusive to ASD/SCD, although elements like oversensitivity to criticism, fear of evaluation, and camouflaging for emotional concealment were identified from the voices of patients with ASD/SCD (Table 1).

Nonassertiveness can arise from passive and avoidant traits or can also be acquired as a secondary outcome of persistent social anxiety and repeated experiences of failure in communicating with others. The concept of assertiveness has been recognized as an essential component of social skills for patients with ASD,[37] although research directly focusing on the relationship between ASD and assertiveness is somewhat limited. In the present study, difficulty in emotional expression, passivity in disclosure, inappropriate timing of remarks, lack of adaptation to the topic, and being a nonparticipatory listener were included in the nonassertive components on the basis of the data from patients with ASD/SCD (Table 1). Despite this categorization, scores on the Nonassertiveness subscale of the DISC-12 did not significantly differ among the ASD or SCD, SAD, and ASD/SCD + SAD groups, indicating that this subscale may have limited utility in prescreening individuals with autistic traits or social anxiety. However, within the DISC-12 subscales, the Nonassertiveness cluster demonstrated the strongest correlation with the AQ ($r = 0.462$) in this study. Additionally, the Nonassertiveness cluster of the DISC-12 may share some conceptual overlap with the assimilation component of the Camouflaging Autistic Traits Questionnaire.[38] Camouflaging behaviors often involve attempts to conform to social norms by suppressing authentic self-expression, a compensatory communication strategy frequently observed in individuals with ASD, particularly those with milder forms.[16,18]

Although speculative and requiring further empirical validation, profiling social communication difficulties using the DISC-12 may serve as a valuable tool for psychological education in individuals with social communication deficits and for personalized treatment planning by clinicians. In this study, higher AQ scores did not specifically characterize the ASD or SCD group (Table 2), which may be attributed, at least in part, to the inclusion of individuals with mild or atypical autistic traits resembling SCD within these groups. The DISC-12 may prove useful in identifying these underlying difficulties and fostering a shared understanding between individuals and their therapists, ultimately contributing to psychological education and personalized intervention strategies. The DISC-12 may be useful in identifying such underlying difficulties and facilitating shared understanding between patients and therapists, ultimately contributing to psychological education and personalized treatment planning. Several studies have already suggested that psychological education[39] and social skills training[40] are generally recommended for patients with ASD, although the true necessity of these strategies has not been examined on an individual basis. Profiles of the DISC-12 subscales may offer some insights for the optimal selection of personalized treatments, including: (i) psychological education[39] and social skills training[40] for patients with high scores on the Poor Empathy subscale; (ii) selective serotonin reuptake inhibitors[41] and cognitive behavioral therapy[42] for patients with high scores on the Interpersonal Hypersensitivity subscale; and (iii) assertive training as part of social skills training[37] and small group sessions involving assertiveness training[43] for patients with high scores on the Nonassertiveness subscale. Future research using the DISC-12 is expected to investigate the rationale for individualized treatment strategies matched with each DISC-12 subscale.

This study had some limitations. First, the findings were derived from a relatively small sample of Japanese participants, which may limit the generalizability of the results to broader populations. Additionally, the number of questionnaire items may have been somewhat restricted and potentially insufficient for capturing the full spectrum of social communication difficulties. Expanding the number of questions, alongside the inclusion of additional validated instruments, may enhance the accuracy of diagnostic assessments in future research. Second, the psychological assessments used in this

study may have been influenced by self-report biases, such as psychological denial and underreporting. Third, although the DISC-12 was developed based on subjective communication difficulties reported by individuals with ASD/SCD, its diagnostic utility remains limited due to the absence of objective evaluations. The DISC-12 may not provide comprehensive coverage for the accurate diagnosis of ASD or SCD, highlighting the need for supplementary assessment methods. Moreover, the normal range and clinical cut-off values for each subscale score may require reassessment, particularly in populations that include nonclinical individuals, to ensure diagnostic validity and applicability.

CONCLUSION

The DISC-12 is a rapid, dual-purpose screening tool that helps clinicians identify both autism spectrum traits and social anxiety in young patients with subjective communication difficulties. This tool can be implemented in routine clinical practice to facilitate early diagnosis, enabling more targeted interventions and better management of these co-occurring conditions. Future research should focus on validating DISC-12 across different cultural and demographic groups, as well as exploring its utility in longitudinal studies to track the effectiveness of interventions for ASD and social anxiety.

AUTHOR CONTRIBUTION

Minami Teruya, Kazuhiro Kurihara, Takao Ishibashi, Hotaka Shinzato, and Tsuyoshi Kondo conceived and designed the study and wrote the study protocol. Minami Teruya, Takao Ishibashi, Kazuki Ota, Hotaka Shinzato, and Tsuyoshi Kondo were responsible for data collection. Takao Ishibashi and Hotaka Shinzato secured funding for the study. Minami Teruya, Kazuhiro Kurihara, Yoshikazu Takaesu, and Tsuyoshi Kondo conducted the statistical analyses and interpreted the results. Minami Teruya, Kazuhiro Kurihara, and Yoshikazu Takaesu drafted the manuscript, and all authors critically reviewed and approved the final version.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data from this study have not been made publicly available as individual data disclosure was not included in the research protocol, and consent for public data sharing was not obtained from the participants.

ETHICS APPROVAL STATEMENT

The study protocol was approved by the Ethics Committee of the Graduate School of Medicine, University of the Ryukyus (Approval No. 2001).

PATIENT CONSENT STATEMENT

Ethical guidelines were strictly followed throughout the study. All participants provided informed consent prior to participation. To ensure confidentiality, data were anonymized and analyzed in aggregate form. Participants were thoroughly informed about the study's objectives, confidentiality measures, and their right to withdraw at any time.

CLINICAL TRIAL REGISTRATION

N/A.

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REFERENCES

1. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed. Washington, DC: American Psychiatric Association; 2013.
2. Montaser J, Umeano L, Pujari HP, Nasiri SMZ, Parisapogu A, Shah A, et al. Correlations between the development of social anxiety and individuals with autism spectrum disorder: a systematic review. Cureus. 2023;15(9):e44841.
3. Carpita B, Nardi B, Bonelli C, Massimetti E, Amatori G, Cremone IM, et al. Presence and correlates of autistic traits among patients with social anxiety disorder. Front Psychiatry. 2024;14:1320558. https://doi.org/10.3389/fpsyt.2023.1320558
4. Spain D, Happé F, Johnston P, Campbell M, Sin J, Daly E, et al. Social anxiety in adult males with autism spectrum disorders. Res Autism Spectr Discord. 2016;32:13–23. https://doi.org/10.1016/j.rasd.2016.08.002
5. Maddox BB, White SW. Comorbid social anxiety disorder in adults with autism spectrum disorder. J Autism Dev Disord. 2015;45(12):3949–60. https://doi.org/10.1007/s10803-015-2531-5
6. Tyson KE, Cruess DG. Differentiating high-functioning autism and social phobia. J Autism Dev Disord. 2012;42(7):1477–90. https://doi.org/10.1007/s10803-011-1386-7
7. Capriola-Hall NN, McFayden T, Ollendick TH, White SW. Caution when screening for autism among socially anxious youth. J Autism Dev Disord. 2021;51(5):1540–9. https://doi.org/10.1007/s10803-020-04642-w
8. White SW, Bray BC, Ollendick TH. Examining shared and unique aspects of social anxiety disorder and autism spectrum disorder using factor analysis. J Autism Dev Disord. 2012;42(5):874–84. https://doi.org/10.1007/s10803-011-1325-7
9. Stark C, Groves NB, Kofler MJ. Is reduced social competence a mechanism linking elevated autism spectrum symptoms with increased risk for social anxiety? Br J Clin Psychol. 2023;62(1):129–45. https://doi.org/10.1111/bjc.12398
10. Adams D, Ambrose K, Simpson K, Malone S, Dargue N. The relationship between anxiety and social outcomes in autistic children and adolescents: a meta-analysis. Clin Child Fam Psychol

Rev. 2023;26(3):706–20. https://doi.org/10.1007/s10567-023-00450-7
11. Minami K, Horikawa E. Social anxiety tendency and autism spectrum disorder in Japanese adolescence. Pediatr Int. 2021;63(8):903–9. https://doi.org/10.1111/ped.14576
12. Bemmer ER, Boulton KA, Thomas EE, Larke B, Lah S, Hickie IB, et al. Modified CBT for social anxiety and social functioning in young adults with autism spectrum disorder. Mol Autism. 2021;12(1):11. https://doi.org/10.1186/s13229-021-00418-w
13. Spain D, Rumball F, O'Neill L, Sin J, Prunty J, Happé F. Conceptualizing and treating social anxiety in autism spectrum disorder: a focus group study with multidisciplinary professionals. J Appl Res Intellect Disabil. 2017;30(Suppl 1):10–21. https://doi.org/10.1111/jar.12320
14. Li X, Shen H, Kong H, Xie J. Autistic traits predict social avoidance and distress: the chain mediating role of perceived stress and interpersonal alienation. Scand J Psychol. 2023;64(6):802–9. https://doi.org/10.1111/sjop.12946
15. Jenkinson R, Milne E, Thompson A. The relationship between intolerance of uncertainty and anxiety in autism: a systematic literature review and meta-analysis. Autism. 2020;24(8):1933–44. https://doi.org/10.1177/1362361320932437
16. Field SL, Williams MO, Jones CRG, Fox JRE. A meta-ethnography of autistic people's experiences of social camouflaging and its relationship with mental health. Autism. 2024;28(6):1328–43. https://doi.org/10.1177/13623613231223036
17. Alaghband-rad J, Hajikarim-Hamedani A, Motamed M. Camouflage and masking behavior in adult autism. Front Psychiatry. 2023;14:1108110. https://doi.org/10.3389/fpsyt.2023.1108110
18. Hull L, Levy L, Lai MC, Petrides KV, Baron-Cohen S, Allison C, et al. Is social camouflaging associated with anxiety and depression in autistic adults? Mol Autism. 2021;12(1):13. https://doi.org/10.1186/s13229-021-00421-1
19. Spain D, Zıvralı Yarar E, Happé F. Social anxiety in adults with autism: a qualitative study. Int J Qual Stud Health Well-Being. 2020;15(1):1803669. https://doi.org/10.1080/17482631.2020.1803669
20. Mandy W, Wang A, Lee I, Skuse D. Evaluating social (pragmatic) communication disorder. J Child Psychol Psychiatry. 2017;58(10):1166–75. https://doi.org/10.1111/jcpp.12785
21. Ellis Weismer S, Rubenstein E, Wiggins L, Durkin MS. A preliminary epidemiologic study of social (pragmatic) communication disorder relative to autism spectrum disorder and developmental disability without social communication deficits. J Autism Dev Disord. 2021;51(8):2686–96. https://doi.org/10.1007/s10803-020-04737-4
22. Hui T, Goh TJ, Sung M. Clinical presentations of social communication disorder: a case series. Asian J Psychiatr. 2021;62:102718. https://doi.org/10.1016/j.ajp.2021.102718
23. Topal Z, Demir Samurcu N, Taskiran S, Tufan AE, Semerci B. Social communication disorder: a narrative review on current insights. Neuropsychiatr Dis Treat. 2018;14:2039–46. https://doi.org/10.2147/NDT.S121124
24. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed. Washington, DC: American Psychiatric Association; 1994.
25. Kim YS, Fombonne E, Koh YJ, Kim SJ, Cheon KA, Leventhal BL. A comparison of DSM-IV pervasive developmental disorder and DSM-5 autism spectrum disorder prevalence in an epidemiologic sample. J Am Acad Child Adolesc Psychiatry. 2014;53(5):500–8. https://doi.org/10.1016/j.jaac.2013.12.021
26. Liebowitz MR. Social phobia. Mod Probl Pharmacopsychiatry. 1987;22:141–73.
27. Satoshi A, Seishiro I, Fumi S. Reliability and validity of the Japanese version of the Liebowitz Social Anxiety Scale (LSAS). Clin Psychiatry (in Japanese). 2002;44(10):1077–84. https://doi.org/10.11477/mf.1405902721
28. Baron-Cohen S, Wheelwright S, Skinner R, Martin J, Clubley E. The autism-spectrum quotient (AQ): evidence from Asperger syndrome/high-functioning autism, males and females, scientists and mathematicians. J Autism Dev Disord. 2001;31(1):5–17. https://doi.org/10.1023/a:1005653411471
29. Wakabayashi A, Tojo Y, Baron-Cohen S, Wheelwright S. The Autism-Spectrum Quotient (AQ) Japanese versions: evidence from high-functioning clinical group and normal adults. JPN J Psychol. 2004;75(1):78–84. https://doi.org/10.4992/jjpsy.75.78
30. Wakabayashi A, Uchiyama T, Tojo Y, Yoshida Y, Kuroda M, Baron-Cohen S, et al. The Autism-Spectrum Quotient (AQ) Japanese children's version comparison between high-functioning children with autism spectrum disorders and normal controls. JPN J Psychol. 2007;77(6):534–54.
31. Peterson C. Theory of mind understanding and empathic behavior in children with autism spectrum disorders. Int J Dev Neurosci. 2014;39:16–21. https://doi.org/10.1016/j.ijdevneu.2014.05.002
32. Bons D, Van Den Broek E, Scheepers F, Herpers P, Rommelse N, Buitelaar JK. Erratum to: motor, emotional, and cognitive empathy in children and adolescents with autism spectrum disorder and conduct disorder. J Abnorm Child Psychol. 2013;41(3):509. https://doi.org/10.1007/s10802-012-9689-5
33. Boyce P, Parker G. Development of a scale to measure interpersonal sensitivity. Aust N Z J Psychiatry. 1989;23(3):341–51. https://doi.org/10.1177/000486748902300320
34. Otani K, Suzuki A, Kamata M, Matsumoto Y, Shibuya N, Sadahiro R. Interpersonal sensitivity is correlated with sociotropy but not with autonomy in healthy subjects. J Nerv Ment Dis. 2012;200(2):153–5. https://doi.org/10.1097/NMD.0b013e3182438cba
35. Mohammadian Y, Mahaki B, Dehghani M, VahidVahid, MA, LavasaniLavasani, FF. Investigating the role of interpersonal sensitivity, anger, and perfectionism in social anxiety. Int J Prev Med. 2018;9(2):2. https://doi.org/10.4103/ijpvm.IJPVM_364_16
36. Harb GC, Heimberg RG, Fresco DM, Schneier FR, Liebowitz MR. The psychometric properties of the Interpersonal Sensitivity Measure in social anxiety disorder. Behav Res Ther. 2002;40(8):961–79. https://doi.org/10.1016/S0005-7967(01)00125-5
37. Tawankanjanachot N, Truesdale M, Orachon P, Kidd L. Social skills interventions for Thai adolescents with Autism Spectrum Disorder (ASD): a qualitative study of the perceptions and experiences of Thai adolescents, their caregivers and healthcare professionals. Int J Ment Health Syst. 2024;18(1):1. https://doi.org/10.1186/s13033-023-00617-3
38. Hull L, Mandy W, Lai MC, Baron-Cohen S, Allison C, Smith P, et al. Development and validation of the Camouflaging Autistic Traits Questionnaire (CAT-Q). J Autism Dev Disord. 2019;49(3):819–33. https://doi.org/10.1007/s10803-018-3792-6
39. Nestorowich DL, Lupien SP, Madaus Knapp V. Perceptions of behaviors associated with ASD in others: knowledge of the diagnosis increases empathy and improves perceptions of warmth and competence. Eur J Investig Health Psychol Educ. 2022;12(11):1594–606. https://doi.org/10.3390/ejihpe12110112
40. Dubreucq J, Haesebaert F, Plasse J, Dubreucq M, Franck N. A systematic review and meta-analysis of social skills training for adults with autism spectrum disorder. J Autism Dev Disord. 2022;52(4):1598–609. https://doi.org/10.1007/s10803-021-05058-w
41. Thorkelson G, Laughlin SF, Turner KS, Ober N, Handen BL. Selective serotonin reuptake inhibitor monotherapy for anxiety disorders in children and adolescents with autism spectrum disorder: a chart review. J Child Adolesc Psychopharmacol. 2019;29(9):705–11. https://doi.org/10.1089/cap.2019.0001

42. Storch EA, Arnold EB, Lewin AB, Nadeau JM, Jones AM, De Nadai AS, et al. The effect of cognitive-behavioral therapy versus treatment as usual for anxiety in children with autism spectrum disorders: a randomized, controlled trial. J Am Acad Child Adolesc Psychiatry. 2013;52(2):132–42.e2. https://doi.org/10.1016/j.jaac.2012.11.007
43. Spain D, Blainey SH. Group social skills interventions for adults with high-functioning autism spectrum disorders: a systematic review. Autism. 2015;19(7):874–86. https://doi.org/10.1177/1362361315587659

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