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Aspects of interpersonal sensitivity relate differentially to subclinical social phobia and autistic traits

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Abstract

Background: Social and communication difficulties are a symptom of both social phobia and autism. One form of trait dimension that is extremely relevant to such difficulties is interpersonal sensitivity.

Method: The differential relations that subclinical social phobia and autistic traits have with five facets of interpersonal sensitivity (interpersonal awareness, separation anxiety, timidity, fragile inner self, and need for approval) were studied. The sample consisted of N = 362 undergraduate participants who responded to a survey containing measures of autistic traits, social phobia, interpersonal sensitivity, and the big-five personality traits.

Results: The level of an individual's social phobia was uniquely related to interpersonal awareness, separation anxiety, fragile inner self, and need for approval. Autistic trait level in terms of attention to details was uniquely related to interpersonal awareness (negatively). Autistic trait level in terms of social- and communication-based difficulties was uniquely related to both fragile inner self and need for approval. Interestingly, different sets of items within those two interpersonal sensitivity subscales were related to social phobia and autistic traits, respectively.

Conclusion: The statistical results presented here reveal important conceptual distinctions in the manner in which interpersonal sensitivity is present across individual differences in social phobia and autistic traits.

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1. Introduction

People are social beings. One trait dimension that is extremely relevant to both adaptive and maladaptive social interaction is an individual's level of *interpersonal sensitivity*. Interpersonal sensitivity was defined by Boyce and Parker (1989) as "undue and excessive awareness of, and sensitivity to, the behavior and feelings of others" (p. 342). Personalities high on this trait are preoccupied with interpersonal interactions, attentive to others' moods and behaviors, and also have sensitivity to perceived criticism and rejection. They also try to modify their behavior according to others' expectations (Boyce & Parker, 1989). Such a definition is also consistent with a more recent conceptualization of this construct by Marin and Miller (2013) who regard interpersonal sensitivity as "a stable trait characterized by ongoing concerns about negative social evaluation" (p. 951). On the other hand, an alternative conceptualization can also be found in the literature that restricts it to the perception of the appearance or behavior of others and the appropriateness of the corresponding actions taken towards them (Hall et al., 2009).

Interpersonal sensitivity as operationalized by Boyce and Parker (1989) has been hypothesized and shown empirically to be related to a vulnerability to depression (Boyce et al., 1991; Sakado et al., 1999). Some more recent work has also been performed examining its relation to anxiety disorders, especially with respect to social anxiety (Harb et al., 2002; Kumari et al., 2012; Vidyanidhi & Sudhir, 2009). Indeed, Harb et al. (2002) likened Boyce and Parker`s (1989) construct to "interpersonal rejection sensitivity" (p. 962) which they noted "appears to be a central feature of social anxiety disorder … also known as social phobia" (p. 963). On the other hand, interpersonal sensitivity could also be regarded as being relevant to the social interaction and communication difficulties present in many individuals higher on the autism spectrum, but no work has yet been done in this regard.

To measure interpersonal sensitivity, Boyce and Parker (1989) developed the Interpersonal Sensitivity Measure (IPSM). The ISPM is a self-report research tool that indexes the five facets of interpersonal awareness, need for approval, separation anxiety, timidity, and fragile inner-self (Boyce & Parker, 1989; Luty et al., 2002). The Interpersonal Awareness subscale refers to attention to others' moods and behaviors. Need for Approval refers to the desire to be loved and to make others happy. Separation Anxiety refers to separation from important others. Timidity measures lack confidence for fear of others being upset. Finally, Fragile Inner-Self recognizes a difficulty in disclosing an unlikable inner-self for fear of criticism and rejection.

With respect to *social phobia*, based on the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), "Social Phobia is defined as a fear or anxiety about one or more social situations that the individual is exposed to possible scrutiny by others" (p. 202). For

example, individuals with social phobia have fears about people's evaluations when they have communications, interactions, conversations, etc. (APA, 2013). Previous studies have indeed found there to be a relation between interpersonal sensitivity and social anxiety/social phobia (Harb et al., 2002; Kumari et al., 2012; Vidyanidhi & Sudhir, 2009). For instance, Harb et al. (2002) found significantly higher IPSM scores for a group of 201 patients seeking treatment for a DSM-diagnosed social anxiety disorder in comparison to a demographically matched community sample of 34 participants.

In Vidyanidhi and Sudhir (2009), a clinical group of individuals in India with social phobia and depression scored significantly higher than a nonclinical control group (n = 30 per group) on both the total IPSM score as well as on the subscale scores for interpersonal awareness, separation anxiety, and fragile inner-self. A more recent study by Kumari et al. (2012) also investigated interpersonal sensitivity in Indian individuals with and without social phobia disorder (n = 30 per group). Their findings showed that both the total and subscale IPSM scores (i.e., interpersonal awareness, separation anxiety, timidity, and fragile inner-self) in individuals clinically diagnosed as social phobic were significantly higher than those in the community without such a diagnosis. It should also be noted, though, that in a study with a sample of 170 teacher trainees by Wilhelm and colleagues (2004), no differences in IPSM scores were evident between those in the sample with and without a lifetime diagnosis of social phobia even though IPSM scores did differ across lifetime cases and non-cases of panic disorder, agoraphobia, simple phobia, and generalized anxiety disorder.

With respect to the *autism spectrum*, however, there is no study that has investigated the nature of the individual differences in interpersonal sensitivity present for those individuals either on the autism spectrum or high in autistic-trait levels. However, there are some results suggesting that such an investigation might indeed be fruitful. For example, Kanne and colleagues (2009) compared two groups of undergraduates that had been identified through Social Responsiveness Scale (SRS) scores as being high and low in autistic trait symptoms, respectively, and among a number of variables that significantly differed across the two groups was an enhanced self-reported difficulty with interpersonal relationships. Next, Settipani and colleagues (2012) split a group of 100 youth being treated at an anxiety disorder outpatient clinic into those with and without meaningful autistic symptoms (42 and 58%, respectively) according to the parent version of the SRS. In addition to being more likely to meet the criteria for social phobia, the elevated autistic symptoms group was more likely to report social concerns as a top fear. As well, a recursive partitioning analysis suggested that one of the most predictive indicators of membership in the elevated autistic symptoms group was a parent-rated measure of interpersonal worry regarding the impressions the youths seemed to feel they make on others.

More generally, there has been some work that has served to highlight the fact that the interpersonal needs of individuals either on the autism spectrum or high in autistic-trait levels are actually quite similar to everyone else and what is lacking in such individuals are the social skills or responsiveness needed to fully meet those needs (Jobe & White, 2007; Pollman et al., 2010; and for a recent review related to this point see Umagami et al., 2021).

One important issue of relevance to the work to be performed here is the fact that there can be a great deal of overlap within the social domain in the psychopathology of autism spectrum disorder (ASD) and either social anxiety disorder (SAD; Cholemkery et al., 2014) or social phobia (Tyson & Cruess, 2012). As noted by Capriola et al. (2017), "ASD and SAD share several core symptoms including social avoidance, social withdrawal, and physiological hyperarousal in social situations" (p. 3804). Moreover, "this high degree of symptomatic overlap, along with the lack of measures specifically designed to differentiate between these two conditions, lead to difficulties with disentangling ASD and SAD" (Capriola et al., 2017, p. 3804; see also White et al., 2012; and most recently Capriola-Hall et al., 2021). Such a situation can then lead to ASD symptoms being misinterpreted as social anxiety especially in ASD adults where symptom severity often either decreases or is increasingly compensated for through learning over time (Espelöer et al., 2021; Tyson & Cruess, 2012). Note that similar symptomatology (i.e., social avoidance and withdrawal) can occur in ASD and SAD even in the face of potentially differing underlying bases or starting points for them (i.e., equifinality; Espelöer et al., 2021; Tyson & Cruess, 2012). That is, actual impairments in social interactional abilities in ASD due to a lack of social awareness (i.e., mentalizing or Theory of Mind) versus acquired impairments in social anxiety/social phobia due to a learned or cognitive-bias-induced fear of social evaluation (Espelöer et al., 2021; Tonge et al., 2016; Tyson & Cruess, 2012).

In this vein, there has been some work directed towards determining the types of measures that might serve to disambiguate ASD and SAD. For example, Capriola et al. (2017) examined whether a difference could be found between a group of autism spectrum disorder (ASD) and a group of typically developing adults and adolescents with respect to socio-evaluative fears given that such concerns could be regarded as being quite typical of socially anxious individuals. Indeed, an overall difference between groups with respect to such fears was found by Capriola et al. (2017) that was due mainly to a higher endorsement by the ASD group of the item "*I often worry that I will say or do the wrong thing*" (from the Brief Fear of Negative Evaluation Questionnaire; Leary, 1983). Most recently, Espelöer et al. (2021) observed levels of social anxiety, as measured by the Speaking and Rejection subscales of the Social Anxiety-Social Competence Deficit Scale, that were comparable between ASD and SAD groups. On the other hand, observed levels of

social competence deficit, as measured by the Interaction and Information subscales of this same scale, were elevated for the ASD group. Espelöer et al. (2021) concluded that social competence difficulties represent a more fundamental deficit in ASD than in SAD suggesting that "clinically, the inclusion of deficits in social skills are crucial in order to prevent misinterpretation of autistic symptoms as SAD" (p. 319).

In this same vein, the five facets of Boyce and Parker's (1989) interpersonal sensitivity construct should also be quite useful with respect to identifying some of the more subtle differences associated with social phobia and the autism spectrum. More specifically, the five IPSM facets index different types of underlying beliefs and concerns regarding the nature and quality of the interpersonal interactions that an individual has with others. This fact makes interpersonal sensitivity an especially attractive variable to use to potentially tease apart that which distinguishes social phobia from the autism spectrum.

In the current work, the relation between interpersonal sensitivity and individual differences in the self-reported levels of both social phobia and autistic traits will be examined. Importantly, both social anxiety/social phobia and autistic symptomatology can be assumed to exist on a continuum rather than representing a simple dichotomy (e.g., Freeth et al., 2012; notwithstanding the potential fractionability of the spectrum itself). Hence, subclinical levels of both disorders can be discerned using suitable measurement instruments. One very well-known measure for social phobia is the Social Phobia Scale (SPS) developed by Mattick and Clarke (1998). Furthermore, a very commonly used measure of autistic trait levels has been the Autism-Spectrum Quotient (AQ; Baron-Cohen et al., 2001). Of key importance to the work to be performed here will be the extent to which interpersonal sensitivity *uniquely* predicts levels of social phobia and autistic traits given the afore-mentioned presence of overlapping social-interaction-based behavioral symptoms. Such work will allow for a determination of the aspects of interpersonal sensitivity are most crucial to those who are score higher on each of those dimensions, respectively. These findings will then provide insight into the nature of the differences that underlie the social difficulties manifested by each type of individual.

2. Materials and Methods

2.1. Participants

The participants were 362 (266 females and 96 males) students of introductory psychology (with 119 of the original 481 respondents being dropped for not responding to any of the AQ items). Their ages ranged between 17 and 33 years old (M = 21.81, SD = 5.37). Participants completed an online questionnaire set for course credit that contained the AQ, the SPS, the IPSM, and the Personality Mini-Markers (in addition to a number of other measures of perceptual sensitivity,

fear of negative evaluation, attachment orientation, state-trait anxiety, coping, and behavioral inhibition and activation that are not considered here). A power calculation (https://www.danielsoper.com/statcalc/calculator.aspx?id=1) indicates that for five predictor variables a sample of 370 would yield a power of .80 to observe a significant overall regression effect of $R^2 = .035$ at a p-value of .05, suggesting that a sample size of 362 is more than enough to provide adequate power. This study was pre-approved by the Psychology Department's Research Ethics Board and all participants provided informed consent before commencing the study.

2.2. Measures

2.2.1. Autism Spectrum Quotient (AQ). The AQ is a self-reported measure designed to assess autism traits in typically developing adults with normal intelligence (Baron-Cohen et al., 2001; Wheelwright et al., 2010). The AQ is composed of 50 self-reported items assessing five principal dimensions of autism spectrum conditions, namely social skills, communication, imagination, attention switching, and attention to details. AQ items are responded to using a 4-point scale (i.e., 1-4) which can then be analyzed by either converting them to dichotomous scores or by regarding them as continuous measures (Austin, 2005; with the latter typically presumed to have enhanced measurement properties; Stevenson & Hart, 2017). In the present paper, the concern will be with the AQ scores measured continuously with higher scores on the first four dimensions representing more difficulties with the corresponding traits.

Given a growing consensus that the Attention to Detail subscale is likely measuring something quite distinct from the other four AQ subscales (which is related to the fractionability mentioned earlier; Grove et al., 2015; Leth-Steensen et al., 2021; Palmer et al., 2015), two total scores generated from the 50 items of the AQ will be studied here: the sum of the 10 Attention to Detail items and the sum of the 40 AQ items corresponding to the four remaining subscales (referred to herein as the AQ-40). The internal consistency reliability in the current sample was .67 for the Attention to Detail subscale and .88 for the AQ-40.

2.2.2. The Social Phobia Scale (SPS). The SPS (Mattick & Clarke, 1998) assesses social phobia fears. It is composed of 20 items rated on a 5-point scale (i.e., 1-5) ranging from "not at all" to "extremely". High scores on the SPS indicate increased fear and distress involved with being observed in social situations. The internal consistency reliability of this questionnaire in the current sample was .93.

2.2.3. The Interpersonal Sensitivity Measure (IPSM). The IPSM (Boyce & Parker, 1989) is comprised of 36 items assessing interpersonal awareness, need for approval, separation anxiety, fragile inner-self, and timidity. Items are rated on a 4-point scale (i.e., 1-4) ranging from "very accurate" to "very inaccurate". Here, high scores on the IPSM indicate increased interpersonal sensitivity. The internal consistency reliabilities in the current sample for the Interpersonal Awareness (7 items), Need for Approval (8 items), Separation Anxiety (8 items), Fragile Inner Self (5 items), and Timidity (8 items) subscales were .80, .72, .77, .75, and .74, respectively.

2.2.4. The Personality Mini-Markers (PMM). The PMM (Saucier, 1994) were used to obtain information on the personality characteristics of the study participants in order to control for them in all of the following multiple regression models. This 40-item scale of personality-describing adjectives provides scores on the dimensions of Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness. Alpha reliabilities for the five personality traits for this sample ranged from .82 to .86.

3. Results

Means and standard deviations for each of the key study variables (i.e., IPSM, SPS, and AQ) are reported in Table 1. In order to provide a reference for the upcoming multi-variable regression work, Pearson's product moment correlation coefficients between all of these study variables are presented in Table 2 (where note, especially, the correlational overlap between the AQ-40 and the SPS total scores of $r = .46$). Before running any analyses, missing item-level data (55, 1, 14, and 14 values in total for the AQ, SPS, IPSM, and PMM) were imputed using the Expectation Maximization (EM) routine in SPSS.

Table 1. Means and standard deviations (SDs) for all of the key study variables

Variables	Mean	SD
Interpersonal awareness	19.859	4.212
Need for approval	26.290	3.448
Separation anxiety	20.630	4.554
Timidity	22.000	4.153
Fragile inner-self	10.501	3.167
Social phobia	43.537	15.026
AQ-40	86.370	13.534
Attention to Details	25.553	4.414

Table 2. Zero-order correlations between all key study variables

Variables	1	2	3	4	5	6	7	8
1.Interpersonal awareness	-	.37**	.62**	.49**	.51**	.47**	.21**	-.14**
2.Need for approval		-	.060	.36**	-.16**	-.14**	-.43**	-.02
3.Separation anxiety			-	.38**	.60**	.52**	.34**	-.01
4. Timidity				-	.29**	.22**	.00	-.04
5. Fragile inner-self					-	.53**	.48**	-.04
6. Social phobia						-	.46**	-.01
7. AQ-40							-	-.05
8. Attention to Details								-

**$p < .01$

To examine the relationship of interpersonal sensitivity with the levels of both social phobia and autistic traits, multiple regression analyses were performed. The first of these analyses indicated that Interpersonal Awareness, Need for Approval, Separation Anxiety, and Fragile Inner Self, but not Timidity, were uniquely related to social phobia (see Table 3). On the other hand, Need for Approval and Fragile Inner Self were uniquely related to the AQ-40 (see Table 4) and Interpersonal Awareness was uniquely related to Attention to Detail (see Table 5).

Table 3. Regression model of Social Phobia on the ISPM (with Personality and AQ Controlled)

Model	Variables	Unstandardized Coefficients (95% C. I.)		Std. Error	Standardized Coefficients	T	Sig
1[a]	Intercept	69.739		6.623		10.529	.000
	Extraversion	-.481	(-.613, -.349)	.067	-.346	-7.153	.000
	Agreeableness	-.030	(-.202, .143)	.088	-.018	-.338	.736
	Conscientiousness	-.076	(-.229, .076)	.078	-.053	-.983	.326
	Neuroticism	.317	(.183, .451)	.068	.229	4.636	.000
	Openness	-.232	(-.400, -.064)	.085	-.138	-2.716	.007
2[b]	Intercept	34.286		6.623		4.480	.000
	Extraversion	-.209	(-.340, -.078)	.067	-.151	-3.142	.002
	Agreeableness	.028	(-.166, .223)	.099	.017	.288	.774
	Conscientiousness	.068	(-.074, .221)	.072	.047	.948	.344
	Neuroticism	.074	(-.072, .220)	.074	.053	.999	.319
	Openness	-.125	(-.279, .028)	.078	-.075	-1.609	.108
	Interpersonal awareness	.964	(.495, 1.433)	.238	.270	5.130	.000
	Need for approval	-.918	(-1.445, -.390)	.268	-.211	-3.107	.001
	Separation anxiety	.633	(.225, 1.042)	.208	.192	3.019	.002
	Timidity	.056	(-.343, .456)	.203	.016	.497	.782
	Fragile inner-self	.731	(.153, 1.310)	.294	.154	2.024	.013

3[c]	Intercept	4.910		11.964		.410	.682
	Extraversion	-.123	(-.266, 021)	.073	-.088	-1.667	.094
	Agreeableness	.091	(-.105, .286)	.099	.055	.912	.362
	Conscientiousness	.047	(-.094, .188)	.072	.032	.656	.512
	Neuroticism	.066	(-.078, .210)	.073	.048	.907	.365
	Openness	-.145	(-.305, .014)	.081	-.086	-1.788	.075
	Interpersonal awareness	.970	(.501, 1.439)	.238	.272	4.069	.000
	Need for approval	-.724	(-1.261, -.186)	.273	-.166	-2.650	.008
	Separation anxiety	.584	(.178, .989)	.206	.177	2.833	.005
	Timidity	.047	(-.350, .444)	.202	.013	.232	.817
	Fragile inner-self	.601	(.022, 1.180)	.294	.127	2.041	.042
	AQ-40	.182	(.053, .310)	.065	.164	2.783	.006
	Attention to Details	.248	(-.042, .538)	.148	.073	1.679	.094

[a] $R^2 = .260$, [b] $R^2 = .420$, [c] $R^2 = .437$

Table 4. Regression model of the AQ-40 on the ISPM (with Personality, SPS, and Attention to Details Controlled)

Model	Variables	Unstandardized Coefficients (95% C. I.)		Std. Error	Standardized Coefficients	T	Sig
1[a]	Intercept	145.338		5.031		28.890	.000
	Extraversion	-.588	(-.688, -.487)	.051	-.470	-11.514	.000
	Agreeableness	-.448	(-.579, -.317)	.067	-.304	-6.727	.000
	Conscientiousness	-.038	(-.154, .078)	.059	-.029	-.648	.517
	Neuroticism	.055	(-.047, .157)	.052	.044	1.060	.290
	Openness	-.179	(-.307, -.051)	.065	-.118	-2.756	.006
2[b]	Intercept	135.789		6.186		21.950	.000
	Extraversion	-.488	(-.594, -.382)	.054	-.390	-9.064	.000
	Agreeableness	-.215	(-.372, -.058)	.080	-.146	-2.692	.007
	Conscientiousness	.055	(-.060, .169)	.058	.042	.936	.350
	Neuroticism	.019	(-.099, .137)	.060	.015	.315	.753
	Openness	-.117	(-.241, .007)	.063	-.077	-1.860	.064
	Interpersonal awareness	.270	(-.108, .649)	.193	.084	1.404	.161
	Need for approval	-1.015	(-1.441, -.589)	.217	-.259	-4.684	.000
	Separation anxiety	.124	(-.206, .454)	.168	.042	.738	.461
	Timidity	-.121	(-.444, .202)	.164	-.037	-.738	.461
	Fragile inner-self	.707	(.239, 1.175)	.238	.165	2.972	.003
3[c]	Intercept	131.935		6.668		19.786	.000
	Extraversion	-.463	(-.569, -.356)	.054	-.370	-8.544	.000
	Agreeableness	-.219	(-.377, -.062)	.080	-.149	-2.744	.006
	Conscientiousness	.047	(-.067, .162)	.058	.036	.808	.420
	Neuroticism	.010	(-.107, .127)	.059	.008	.172	.863

	Openness	-.100	(-.230, .030)	.066	-.066	-1.517	.130
	Interpersonal awareness	.152	(-.237, .541)	.198	.047	.770	.442
	Need for approval	-.906	(-1.336, -.476)	.219	-.231	-4.416	.000
	Separation anxiety	.050	(-.283, .382)	.169	.017	.294	.769
	Timidity	-.126	(-.448, .195)	.164	-.039	-.772	.440
	Fragile inner-self	.620	(.152, 1.088)	.238	.145	2.604	.010
	Social phobia	.120	(.035, .204)	.043	.133	2.783	.006
	Attention to Details	-.013	(-.250, .224)	.120	-.004	-.108	.914

[a] $R^2 = .474$, [b] $R^2 = .533$, [c] $R^2 = .543$

Table 5. Regression model of Attention to Details on the ISPM (with Personality, SPS, and AQ-40 Controlled)

Model	Variables	Unstandardized Coefficients (95% C.I.)		Std. Error	Standardized Coefficients	T	Sig
1[a]	Intercept	20.783		2.128		9.768	.000
	Extraversion	.015	(-.028, .057)	.022	.036	.684	.494
	Agreeableness	-.108	(-.164, -.053)	.028	-.226	-3.852	.000
	Conscientiousness	.037	(-.012, .086)	.025	.088	1.500	.135
	Neuroticism	-.006	(-.049, .037)	.022	-.015	-.270	.787
	Openness	.161	(.107, .215)	.027	.326	5.855	.000
2[b]	Intercept	19.042		2.734		6.965	.000
	Extraversion	.008	(-.039, .055)	.024	.019	.325	.746
	Agreeableness	-.094	(-.163, -.025)	.035	-.195	-2.663	.008
	Conscientiousness	.046	(-.004, 097)	.026	.109	1.796	.073
	Neuroticism	.017	(-.035, 069)	.026	.041	.632	.528
	Openness	.165	(.110, .220)	.028	.335	5.935	.000
	Interpersonal awareness	-.221	(-.388, -.053)	.085	-.211	-2.593	.010
	Need for approval	-.040	(-.228, .149)	.096	-.031	-.414	.679
	Separation anxiety	.109	(-.037, .255)	.074	.112	1.466	.144
	Timidity	.127	(-.016. 269)	.073	.119	1.743	.082
	Fragile inner-self	.009	(-.198, .216)	.105	.006	.084	.933
3[c]	Intercept	18.282		4.210		4.343	.000
	Extraversion	.013	(-.039, .065)	.027	.032	.499	.618
	Agreeableness	-.095	(-.165, -.025)	.036	-.198	-2.678	.008
	Conscientiousness	.044	(-.007, .095)	.026	.104	1.714	.087
	Neuroticism	.014	(-.038, .066)	.026	.035	.543	.588
	Openness	.169	(.114, .224)	.028	.342	6.032	.000
	Interpersonal awareness	-.251	(-.423, -.080)	.087	-.240	-2.886	.004
	Need for approval	-.013	(-.208, .183)	.100	-.010	-.126	.900
	Separation anxiety	.089	(-.059, .236)	.075	.091	1.180	.239
	Timidity	.124	(-.018, .267)	.073	.117	1.714	.087

Fragile inner-self	-.013	(-.223, .197)	.107	-.009	-.122	.903
Social phobia	.032	(-.006, .070)	.019	.110	1.679	.094
AQ-40	-.003	(-.049, .044)	.024	-.008	-.108	.914

[a] $R^2 = .116$, [b] $R^2 = .143$, [c] $R^2 = .149$

Although the IPSM subscale Separation Anxiety was uniquely related to social phobia only, the Need for Approval and Fragile Inner Self IPSM subscales were each uniquely related to both social phobia and the AQ-40, and the Interpersonal Awareness was uniquely related to both social phobia and Attention to Detail. Hence, in order to help determine the more specific aspects of interpersonal sensitivity underlying each of those latter three IPSM subscales that are uniquely related to social phobia and autistic traits, respectively, a more fine-grained predictive analysis involving the items in each of those subscales themselves was performed. Namely, separate step-wise regressions of the items in the two Need for Approval and Fragile Inner Self subscales were ran with social phobia and AQ-40 as the outcomes, respectively. As well, separate step-wise regressions of the items in the Interpersonal Awareness subscale were ran with social phobia and Attention to Detail as the outcomes, respectively. Give the post-hoc nature of these six follow-up analyses, a Bonferroni-adjusted *p*-value of .05/6 = .0083 was regarded as the criteria for significance although any coefficients significant at the .05 level have still been mentioned in order to provide a complete perspective on the obtained results.

For the stepwise regressions of the Need for Approval and Fragile Inner Self items on social phobia (controlling for the five personality variables, the AQ-40, and Attention to Detail), the Need for Approval item "*I feel hurt when someone is angry at me*" was retained (B = 4.461, $p < .001$ [adjusted 95% C.I.: 2.049, 6.874]); with the item "*I feel that people generally like me*" not meeting the Bonferroni-adjusted criteria for being significant, B = -2.641, $p < .016$ [95% C.I.: -4.785, -0.498]) along with the Fragile Inner Self items "*My value as a person depends enormously on what others think of me*" and "*If other people knew the real me they would not like me*" (B = 3.803, $p < .001$ [adjusted 95% C.I.: 1.781, 5.824], and B = 3.043, $p < .001$ [adjusted 95% C.I.: 0.788, 5.298], respectively). On the other hand, for the stepwise regressions of the Need for Approval and Fragile Inner Self items on the AQ-40 (controlling for the five personality variables, the SPS, and Attention to Detail), the Need for Approval item "*I can make other people feel happy*" was retained (B = -3.061, $p < .001$ [adjusted 95% C.I.: -5.365, -0.758]; with the items "*I will go out of my way to please someone I am close to*" and "*I feel secure in a close relationship*" not meeting the Bonferroni-adjusted criteria for being significant, B = -1.6771, $p < .023$ [95% C.I.: -3.123, -0.232], and B = -1.440, $p < .030$ [95% C.I.: -2.739, -0.141], respectively) along with the Fragile Inner Self item "*If other people knew*

what I am really like, they would think less of me" (B = 2.240, $p < .002$ [adjusted 95% C.I.: 0.377, 4.103]).

For the stepwise regression of the Interpersonal Awareness items on social phobia (controlling for the five personality variables, the AQ-40, and Attention to Detail), the items "*I worry about what others think of me*" and "*I feel uneasy meeting new people*" were retained (B = 4.165, $p < .001$ [adjusted 95% C.I.: 2.135, 6.196], and B = 2.985, $p < .001$ [adjusted 95% C.I.: 0.843, 5.128]). On the other hand, for the stepwise regression of the Interpersonal Awareness items on Attention to Detail (controlling for the five personality variables, the SPS, and AQ-40), none of the items were retained.

4. Discussion

The aim of the present study was to examine the associations between the five facets of Boyce and Parker's (1989) conceptualization of interpersonal sensitivity (i.e., interpersonal awareness, need for approval, separation anxiety, timidity, and fragile inner self) and levels of both social phobia and autistic traits. Previous investigations have demonstrated the presence of relationships between this interpersonal sensitivity measure and social anxiety/social phobia (Harb et al., 2002; Kumari et al., 2012; Vidyanidhi & Sudhir, 2009) although never subclinically. With respect to this particular measure of interpersonal sensitivity and autistic traits, this is the first work to investigate the presence of such a relationship.

In this study, empirical evidence was provided concerning the extent to which individual differences in social phobia and autistic tendencies could potentially be differentiated with respect to the different facets of interpersonal sensitivity. The findings indicated that increased interpersonal awareness, separation anxiety, fragile inner self, and decreased need for approval were all uniquely related to higher self-reported social phobia. Such results essentially replicate, at the subclinical level, those obtained previously for clinical samples. On the other hand, decreased need for approval and interpersonal awareness along with increased fragile inner self were all uniquely associated with autistic traits. Interestingly, interpersonal awareness was related only to the Attention to Details dimension of the AQ and not the others that involve more social- and communication-based difficulties. Given the presence of simultaneous unique relations of three of the IPSM subscales with both social phobia and autistic traits, a more in-depth, finer-grained analysis of the unique relations between the items in each of those IPSM subscales with both social phobia and autistic traits was performed in order to determine the most useful ones, both theoretically and clinically, for distinguishing between these two conditions.

Taking all of those results together, the Boyce and Parker (1989) interpersonal sensitivity aspects that are unique to those individuals higher in social phobia involve separation anxiety (e.g., "*I feel insecure when I say goodbye to people*"), along with feelings of being hurt when others are angry, of their value as an individual depending on what others think, of others not liking them if they could know their real selves, of worry about what others think of them, and of uneasiness when meeting new people. With respect to these findings, note that being overly sensitive to potential threats to their interpersonal relationships, feeling especially hurt when others are angry, and excessive worrying about what others think could all be regarded as hallmarks of dysfunctional thinking in social phobia but which are not likely to be very relevant to ASD individuals. In this regard, such results suggest that any attempt to tease apart these two conditions might benefit from a consideration of these IPSM aspects.

On the other hand, the interpersonal sensitivity aspects that are unique to those higher in the autistic traits underlying the AQ-40 involve feelings of not being able to make others happy and that people would think less of them if they knew what they were really like. Such findings indicate that these individuals are indeed aware of and sensitive to potential interpersonal limitations which they think they might have. The former aspect reflects a lack of self-efficacy by those high in autistic traits in their ability to positively influence the emotional state of others. The latter aspect somewhat overlaps with the belief of those higher in self-reported social phobia of others not liking "the real me" although "think less of me" is more evaluative than affective. Indeed, not finding at least a bit of evidence for such a link involving social phobia would have been surprising given the notion that a tendency towards more negative self-evaluation is indeed also as a characteristic of social phobia (Kumari et al., 2012). What is really interesting is that analogous feelings also seem evident for those higher in autistic traits (although, to reiterate, note that those higher in social phobia are worried about their real selves resulting in them not being liked whereas those higher in autistic traits are worried about it leading to them being thought less of).

Finally, individuals higher on the Attention to Detail dimension of the AQ tended to self-report lower levels of interpersonal awareness. Given the nature of the items on this subscale (see the Appendix in Boyce & Parker, 1989), this finding indicates that such individuals do not seem worry as much or feel bad about being criticized by others. Importantly, the fact they do not share the same interpersonal concerns as those higher on the AQ-40, certainly provides further support for a fractionability of the autism spectrum at the subclinical level and demonstrates that it is these individuals (as opposed to those higher on the AQ-40) that seem to be less concerned with interpersonal issues. With respect to which Interpersonal Awareness items seem

to be the most negatively related to higher attention to detail, none of them turned out to be uniquely associated with this AQ subscale. Given that this IPSM subscale as a whole was uniquely related to the Attention to Detail scores, it seems that all of the Interpersonal Awareness items were contributing approximately equally to the overall association between this IPSM subscale and levels of Attention to Detail.

5. Conclusion

Links between social anxiety and autism have clearly been demonstrated in the literature with respect to both enhanced comorbidity of social anxiety disorder (SAD) and autism spectrum disorder (ASD; Maddox & White, 2015) and the presence of sizeable correlations in subclinical samples between measures of autistic traits and social anxiety (Freeth et al., 2012; with the latter result being corroborated by the correlation of .46 between social phobia and AQ-40 scores in the present results that remained significant after controlling for the Big-Five personality traits). Indeed, as remarked by Freeth et al. (2012), "It seems that social situations in particular induce anxiety in individuals who have autistic traits" (p. 578) although it is still not clear "whether possessing autistic traits leads to increased social anxiety or whether the autistic traits and social anxiety share a common aetiology" (p. 579). Importantly, the present work has now served to demonstrate that individual differences in self-reported social phobia and autistic traits can be differentiated according to a number of aspects of interpersonal sensitivity being tapped by the IPSM. Hence, this work has helped to delineate the aspects of interpersonal sensitivity that are unique to those reporting higher levels of either social phobia or autistic traits which certainly has key relevance to the study of the links between the two syndromes both theoretically and clinically. Moreover, the present results also provide some evidence for distinct interpersonal sensitivities associated with those individuals higher in the social-communicative difficulties facets of the AQ and those who are higher with respect to the attention to detail facet of the AQ. Importantly, such a result could help in the "struggle to tease apart social disinterest or lack of social motivation from active avoidance of social interactions due to social anxiety" in ASD (Maddox & White, 2015, p. 3956).

6. Limitations

Although this study was performed in order to clarify the unique associations of interpersonal sensitivity with autistic traits and social phobia at the subclinical level, this does not mean that it can immediately be generalized to clinical populations which would require future studies. As well, the findings here are also limited by the cross-sectional as opposed to longitudinal nature of the design, the degree to which using a sample of undergraduate students might then limit

the generalizability of the results to the general population, and the possibility of contamination of the results by shared method variance, response bias, or item-content overlap given the reliance here on self-report measures. With respect to the first limitation note that the traits being studied here represent fairly basic-level, interpersonal-related dimensions of individual differences that could be regarded as being quite ingrained or *stable* in individuals (particularly with respect to autistic traits; Holmboe et al., 2014). As such, although demonstrating co-occurrence of either social phobic or autistic tendencies and specific aspects of interpersonal sensitivity does not then imply causality, such relations are bound to develop over long periods of life experience, making them not very amenable to be studied longitudinally. Nonetheless, there has been some work by researchers such as Klimstra and colleagues (2010; see also Wright et al., 2013) that has indeed demonstrated the presence of *reciprocal* longitudinal relations in panel data between behavioral symptomatology (e.g., depression, aggression) and what would generally be presumed to be quite stable personality traits (e.g., extraversion, agreeableness).

Relatedly, with respect to the second limitation, it is actually not that evident why the *relations* between characteristics such as these might be expected to differ if examined, say, in a community sample as opposed to the present undergraduate student sample (even in the presence of potential overall mean differences across such samples). Nonetheless, in one of the only available studies to examine this issue (Weigold & Weigold, 2021; see also Peterson, 2001), 21 of the 104 intercorrelations between a set of personality and social attitude variables that were measured differed significantly across college student and non-student Mechanical Turk samples of participants. Hence, such results do indeed suggest that there is the potential for generalizability issues when a student sample only is used. In this regard, it can be noted that 16 of the 21 correlations were much weaker for the student sample suggesting that it might be a bit more likely for associations to be missed in college student samples than to be idiosyncratically be "discovered".

With respect to the third limitation, although the potential for shared method variance to artifactually enhance the relations that were observed is necessarily a consideration, given the mono-method nature of the assessment, the highly subjective quality of the characteristics being measured here are not very amenable to being rated by other potential *informants* (e.g., friends). Moreover, the possibility that the results obtained here are simply due to response bias or item-content overlap is somewhat ameliorated by the fact that all of the relations observed here between the IPSM-subscale and social phobia measures (which could be regarded as being the most susceptible to such issues) essentially replicated previous findings showing analogous

differences in the ISPM measures across separate social phobic and control *groups* of individuals (Harb et al., 2002; Kumari et al., 2012; Vidyanidhi & Sudhir, 2009).

Ethics Approval Statement: Ethics Approval for this study has been provided by the Carleton University Psychology Research Ethics Board.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Conflict of Interest Statement

The authors declare that the research was conducted in the absence of any potential conflict of interest.

Contributions:

S.M.M.M.F., S.R K. - Conceptualization
E.G., C.L. - Data curation
S.M.M.M.F., C.L. - Formal analysis:
S.M.M.M.F., S.R K, E.G., C.L. - Methodology
S.M.M.M.F., S.R K - Writing: original draft
E.G., C.L. - Writing: review & editing

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