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ORIGINAL RESEARCH ARTICLE

The mediating role of self-esteem in sensory processing sensitivity and affective dependence among adolescents and young adults

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Abstract

Sensory processing sensitivity (SPS) is an innate personality trait that affects approximately 30% of the population. It is characterized by more intense, complex, and rapid cognitive processing of stimuli, along with heightened emotional reactivity. This study examines the influence of SPS on self-esteem and affective dependence in adolescents and emerging adults, a critical developmental period marked by significant physical, psychological, emotional, and social changes. Adolescence is a sensitive developmental period, and self-esteem is strongly correlated with SPS during this period, with low self-esteem acting as a trigger for affective dependence. Hence, we aim to explore the relationship between these three variables. Our hypotheses were tested on 100 adolescents and young adults aged 15 – 20 years who completed an online questionnaire assessing SPS, self-esteem, and affective dependence. The results confirmed the influence of gender on sensitivity and self-esteem ($p<0.01$) and the impact of romantic relationship experience on affective dependence scores ($p<0.05$). The variables were significantly correlated ($p<0.001$). Sensitivity and self-esteem influenced affective dependence ($p<0.001$), and self-esteem played a mediating role between sensitivity and affective dependence. Our findings support the hypothesis that higher SPS is a vulnerability factor in the development of affective dependence. However, this study has some limitations, such as a small sample size, which limits generalizability. Therefore, further studies on a larger cohort can be conducted to validate these findings.

Keywords: High sensory processing sensitivity; Self-esteem; Affective dependence; Adolescents; Young adults

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1. Introduction

Sensory processing sensitivity (SPS) has been a rapidly expanding area of research since the early work of Aron and Aron in 1997.[1] Considered an innate temperamental trait, SPS enables individuals to cope with environmental stressors and is believed to affect between 15%[1] and 30% of the population.[2] Individuals with higher sensory sensitivity

than their peers are often described as highly sensitive. Although high SPS is not a pathology, it is frequently considered a vulnerability factor associated with greater perceived stress and higher levels of depressive affect and anxiety symptoms.[3,4] During adolescence, these somatic symptoms have been well studied, and SPS in adolescents is particularly associated with internalized problems.[5] In general, highly sensitive adolescents are more responsive to environmental stimuli, particularly to stressful events,[5] leading them to report lower socio-emotional well-being when faced with negative life events than less sensitive adolescents.[6] Thus, the environment plays a crucial role in the life of a highly sensitive person, modulating or amplifying their sensitivity to stimuli.

Adolescence is a non-homogeneous period between childhood and adulthood,[7] spanning approximately 14 – 21 years of age. It is a sensitive developmental period consisting of changes, transitions, and vulnerabilities. This period is linked to physical and cerebral maturation, characterized by questioning, especially personality development.[8] Synonymous with empowerment, adolescence implies a certain distance from the family and a rapprochement with peers,[9] leading to the construction of the adolescent's identity. This construction of identity is generally associated with self-esteem, which can be defined as "your overall evaluation of your worth as a person, high or low, based on all the positive and negative self-perceptions that make up your self-concept."[10(p268)] Self-esteem is a stable trait but not a constant one, varying throughout an individual's life according to their life experiences (positive or negative). Self-esteem is associated with children's mental, emotional, behavioral, and social development, and it is a predictor of well-being and success in work, health, and relationships.[11] It is significantly correlated with SPS,[12] especially among highly sensitive adolescents and young adults, who often have low self-esteem and high levels of depression.[13] Crépel[14] stresses the importance of self-esteem in highly sensitive children and adolescents, who have high expectations for their relationships and can easily become dependent on others, making them very sensitive to peer rejection and the need for external approval.[14]

These relationships of highly sensitive individuals can take a particular form, especially when involving dependency. Scantamburlo *et al.*[15(p340)] describe affective dependence as "characterized by emotional distress (insecure attachment) and dependency to another person with a low self-esteem and reassurance need." Many authors have linked affective dependence and self-esteem.[16] As a result, affective dependence is often associated with changes in mental health and quality of life.[17] Individuals with affective dependence show negative moods and feelings when separated from their partner.[18] Highly sensitive individuals, in general, may be dependent on their peer relationships,[19] and they are more likely to experience less satisfaction in their relationships due to their heightened vulnerability to negative emotions and conflict.[20] In addition, affective dependence (excluding romantic relationships), particularly on parents, is correlated with SPS due to marked parental overprotection.[21] Furthermore, SPS is linked to attachment style,[22] especially anxious attachment.[23]

The present research aims to understand the relationship between SPS, self-esteem, and affective dependence. We are also interested in the relationships between the different components of these constructs and the mediating role of self-esteem between high SPS and affective dependence. The following hypotheses will be tested in this study:

(i) Hypothesis 1: SPS and self-esteem are correlated with affective dependence
(ii) Hypothesis 2: Gender influences scores on the different scales
(iii) Hypothesis 3: Self-esteem mediates the relationship between SPS and affective dependence
(iv) Hypothesis 4: Romantic relationship experience influences affective dependence scores.

2. Materials and methods

2.1. Procedure and recruitment

The study and research protocol were approved by the Ethics Committee for Research Involving Human Subjects of the Universities of Tours and Poitiers (CER-TP) (number December 05, 2023). Participants were invited to answer a questionnaire hosted online on the Sphinx platform and were informed that their answers would remain anonymous and confidential. Before completing the questionnaire, participants were informed about the aims of the study and were explicitly asked for their consent to continue. The estimated time to complete the questionnaire was approximately 20 min. The questionnaire was available from February 5, 2024, to March 31, 2024. The link was distributed in discussion groups on social networks (such as Facebook and Instagram), in secondary schools with the agreement of the management, and by word of mouth. The inclusion criteria were as follows: (i) French-speaking individuals, (ii) individuals between 15 and 20 years old, and (iii) those who have a digital device. We used G*Power analysis (Version 3.1.9.6) for multiple linear regression with a desired effect size of <0.02, an alpha threshold of 0.05, and a power of 0.95 for the two predictors (SPS and self-esteem). The minimum number of participants expected in this configuration was 70.

2.2. Participants

The study involved 100 adolescents and young adults. The cohort consisted of 53% females and 47% males; 16% are in middle school and 87% in high school. The mean age was 16.16 years (standard deviation [SD] = 1.22), and ages ranged from 15 to 20 years. Regarding their relationship experience, 18% were currently in a relationship, 59% had been in a relationship, and 41% had never been in a relationship.

2.3. Measures

The questionnaire consisted of three validated scales (presented below) along with two questions designed to categorize participants based on their relationship status: whether they were currently in a relationship or had at least been in one in the past. The questions were as follows: (i) "Have you ever been in a relationship?" (Yes/No) and (ii) "Are you currently in a relationship?" (Yes/No), followed by instructions. Participants who answered "No" to both questions were instructed to answer as though they were invested in a hypothetical romantic relationship to complete the scale. Given that the questions specifically addressed couple relationships, it was important to distinguish responses based on these criteria. In addition, three sociodemographic questions were asked (gender, age, and education level).

2.3.1. SPS

The French version of the Highly Sensitive Person Scale in French (HSPS-FR),[24] adapted from Aron and Aron,[1] was used to assess sensitivity. It consisted of 27 items that measure individuals' cognitive and emotional responses to various environmental stimuli. Responses are scored on a seven-point Likert scale. We used the model highlighted in the French adaptation, which proposes four dimensions: (i) ease of excitation, (ii) low sensory threshold, (iii) aesthetic sensitivity (AES), and (iv) controlled harm avoidance (CHA).

2.3.2. Self-esteem

We used the French version of the Rosenberg self-esteem scale (RSES).[25] The RSES is a 10-item self-report questionnaire that measures self-esteem according to two criteria, each divided into five items: self-competence (the first five items) and self-liking (the last five items). Responses are scored on a four-point Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). The final score is obtained by summing the responses to each item. The highest level of self-esteem is 40, and the lowest is 10. The French version of the RSES has an acceptable level of internal consistency, as well as psychometric properties, with a very adequate test-retest correlation (r = 0.84), equivalent to that of the English version.

2.3.3. Affective dependence

Affective dependence was measured using the affective dependency scale (ADS-9).[26] The ADS-9 is a nine-item self-report questionnaire that measures affective dependence according to two criteria: craving and submission. Responses are scored on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The higher the final score, the greater the emotional dependence of the subject. This scale has very satisfactory psychometric properties, with conceptual and clinical validity, as well as configurational, metric, and scalar invariance in different sample groups (clinical, comparison, and general population). The reliability measured reached satisfactory levels both for the total scale (clinical = 0.892, comparison = 0.880, general population = 0.867) and for each of the factors.

2.4. Statistical analysis

The data were analyzed using Jeffreys's Amazing Statistics Program version 0.19.3. The internal reliability of the scales was measured using Cronbach's alpha (α). Values are given for each scale (HSPS-FR: $\alpha = 0.91$, RSES: $\alpha = 0.89$, and ADS-9: $\alpha = 0.87$). Descriptive analyses are presented with mean and SD for HSPS-FR and median and interquartile range (IQR) for RSES and ADS-9. Mann–Whitney tests, Kruskal–Wallis tests, and Spearman's correlations were conducted. In addition, linear regressions and mediation analyses were also performed. Statistical significance was determined at $p = 0.05$.

3. Results

3.1. Descriptive results

The minimum and maximum SPS scores were 57 and 182, respectively, with a mean score of 112.050 (SD = 25.592). From a categorical perspective based on the classification of Lionetti *et al*.,[2] 53% of participants had an overall score strictly below 113, which corresponded to a low level of SPS (low-SPS). In comparison, 30% of participants had a score between 113 and 137, corresponding to a moderate level of SPS (moderate-SPS), and 17% of participants had a score strictly above 137, corresponding to a high level of SPS (high-SPS). In the sample, the minimum self-esteem score was 10, and the maximum was 40, with a mean score of 28.530 (SD = 7.107). The minimum and maximum scores for affective dependence were nine and 45, respectively, with a mean score of 20.750 (SD = 7.402).

The Shapiro–Wilk analyses showed that the data for RSES (W = 0.965, p=0.009) and ADS-9 (W = 0.957, p=0.003) do not follow a normal distribution, while the data for HSPS-FR follows a normal distribution (W = 0.993, p=0.895). Means and SDs for the HSPS-FR and medians

Table 1. Descriptive statistics for the entire sample

Variables	Mean	SD	Min	Max
HSPS-overall	112.050	25.592	57.000	182.000
HSPS-EOE	47.330	12.527	11.000	75.000
HSPS-LST	27.680	9.985	10.000	53.000
HSPS-AES	22.250	4.711	12.000	34.000
HSPS-CHA	14.220	3.186	5.000	21.000
Variables	Median	IQR	Min	Max
RSES-overall	28.000	11.250	10.000	40.000
RSES-self-competence	16.000	6.000	5.000	20.000
RSES-self-liking	12.000	7.000	5.000	20.000
ADS-overall	20.500	9.500	9.000	45.000
ADS-craving	13.000	6.250	5.000	25.000
ADS-submission	7.000	4.000	4.000	20.000

Abbreviations: ADS: Affective dependency scale; AES: Aesthetic sensitivity; CHA: Controlled harm avoidance; EOE: Ease of excitation; HSPS: Highly sensitive person scale; IQR: Interquartile range; LST: Low sensory threshold; RSES: Rosenberg self-esteem scale; SD: Standard deviation.

and IQRs for the RSES and ADS-9 are shown in Table 1. These values are broken down by gender and relationship experience in Table 2.

Regarding the influence of socio-demographic characteristics, gender influenced the scores of both the highly sensitive person scale (HSPS) ($p<0.001$) and RSES ($p=0.003$), as well as some of their components (Table 3). Women reported higher SPS scores and lower self-esteem scores. However, gender did not influence affective dependence. Relationship experience did affect the affective dependence score ($p=0.028$) and its craving component, with those currently in or having been in a relationship reporting lower scores. Age, however, did not influence the scores on any of the variables.

3.2. Correlational analysis

The results showed positive correlations between the total scores of the HSPS-FR and those of the ADS-9 (r = 0.390,

Table 2. Descriptive statistics according to gender and relationship experience

Variables	Gender					Previous or actual relationship experience				
	Modality	Mean	SD	Min	Max	Modality	Mean	SD	Min	Max
HSPS-overall	Male	99.021	22.611	57.000	151.000	Yes	111.805	23.537	57.000	155.000
HSPS-overall	Female	123.604	22.477	78.000	182.000	No	112.220	27.126	60.000	182.000
HSPS-EOE	Male	40.553	11.487	11.000	67.000	Yes	47.000	10.486	21.000	67.000
HSPS-EOE	Female	53.340	10.185	34.000	75.000	No	47.559	13.853	11.000	75.000
HSPS-LST	Male	23.319	8.866	10.000	40.000	Yes	27.829	9.447	10.000	45.000
HSPS-LST	Female	31.547	9.372	13.000	53.000	No	27.576	10.421	11.000	53.000
HSPS-AES	Male	21.128	4.475	13.000	33.000	Yes	21.805	4.611	13.000	32.000
HSPS-AES	Female	23.245	4.731	12.000	34.000	No	22.559	4.793	12.000	34.000
HSPS-CHA	Male	13.574	3.222	8.000	21.000	Yes	14.366	3.144	8.000	20.000
HSPS-CHA	Female	14.792	3.072	5.000	21.000	No	14.119	3.238	5.000	21.000
Variables	Modality	Median	IQR	Min	Max	Modality	Median	IQR	Min	Max
RSES-overall	Male	32.000	11.500	10.000	40.000	Yes	28.000	9.000	19.000	40.000
RSES-overall	Female	27.000	12.000	14.000	39.000	No	28.000	13.500	10.000	40.000
RSES-self-competence	Male	17.000	5.500	5.000	20.000	Yes	16.000	5.000	11.000	20.000
RSES-self-competence	Female	15.000	6.000	7.000	20.000	No	16.000	6.000	5.000	20.000
RSES-self-liking	Male	14.000	6.500	5.000	20.000	Yes	13.000	5.000	6.000	20.000
RSES-self-liking	Female	11.000	6.000	5.000	19.000	No	11.000	8.000	5.000	20.000
ADS-overall	Male	20.000	9.000	9.000	45.000	Yes	19.000	10.000	9.000	31.000
ADS-overall	Female	21.000	10.000	10.000	36.000	No	21.000	10.500	9.000	45.000
ADS-craving	Male	13.000	6.500	5.000	25.000	Yes	12.000	7.000	5.000	22.000
ADS-craving	Female	14.000	6.000	5.000	21.000	No	14.000	6.000	5.000	25.000
ADS-submission	Male	7.000	4.000	4.000	20.000	Yes	6.000	5.000	4.000	14.000
ADS-submission	Female	7.000	4.000	4.000	16.000	No	7.000	5.000	4.000	20.000

Abbreviations: ADS: Affective dependency scale; AES: Aesthetic sensitivity; CHA: Controlled harm avoidance; EOE: Ease of excitation; HSPS: Highly sensitive person scale; IQR: Interquartile range; LST: Low sensory threshold; RSES: Rosenberg self-esteem scale; SD: Standard deviation.

p<0.001) and negative correlations between the HSPS-FR and the RSES (r = −0.485, p<0.001) and between the RSES and the ADS-9 (r = −0.395, p<0.001) (Table 4). All components of the HSPS are positively correlated with each other (p<0.005). The components of the RSES are positively correlated with each other (p<0.001), as are the components of the ADS-9 (p<0.001). The components of the different constructs were also correlated with each other, except for the AES component, which was not correlated with any of the components of affective dependence, nor with the self-competence component of self-esteem, which was not correlated with the CHA component.

3.3. Predicting affective dependence and self-esteem

SPS positively predicts affective dependence. The model is significant, explaining approximately 14% of the variance (r^2 = 0.0143, F [1, 98] = 16.336, p<0.001). Conversely, SPS negatively predicts self-esteem, in which the model is significant, explaining approximately 25% of the variance (r^2 = 0.254, F [1, 98] = 33.390, p<0.001) (Table 5). In addition, self-esteem negatively predicts affective dependence, where the model is significant and explains approximately 15% of the variance (r^2 = 0.145, F [1, 98] = 16.667, p<0.001) (Table 6).

3.4. Mediation effect of the RSES between the HSPS and the affective dependence scale

The overall model shows that both SPS and self-esteem influence affective dependence (p<0.001). The standardized indirect effect of HSPS-FR on ADS-9 though RSES is significant (z = 4.083, p<0.001) (Table 7). In other words, SPS increases affective dependence through a double negative effect: first, HSPS negatively impacts self-esteem, and second, self-esteem negatively affects affective dependence (Figure 1). The effect size is substantial (kappa² = 0.68), meaning that RSES mediates 68.8% of the total effect of HSPS-FR on ADS-9.

4. Discussion

This study aimed to investigate the relationship between SPS and affective dependence through self-esteem. We formulated our hypotheses, some of which were confirmed by our results. There is a correlation between these different

Table 3. Mann–Whitney tests according to gender and relationship experience

	Gender				Previous or actual relationship experience			
	W	p	RBC	SE RBC	W	p	RBC	SE RBC
HSPS-overall	553.000	**<0.001**	−0.556	0.116	1,226.500	0.908	0.014	0.117
HSPS-EOE	495.000	**<0.001**	−0.603	0.116	1,170.000	0.784	−0.033	0.117
HSPS-LST	660.500	**<0.001**	−0.470	0.116	1,240.000	0.833	0.025	0.117
HSPS-AES	894.000	**0.015**	−0.282	0.116	1,099.500	0.442	−0.091	0.117
HSPS-CHA	984.500	0.070	−0.210	0.116	1,266.500	0.691	0.047	0.117
RSES-overall	1,678.500	**0.003**	0.348	0.116	1,339.000	0.365	0.107	0.117
RSES-self-competence	1,518.500	0.058	0.219	0.116	1,359.000	0.293	0.124	0.117
RSES-self-liking	1,776.000	**<0.001**	0.426	0.116	1,320.500	0.438	0.092	0.117
ADS-overall	1,221.000	0.868	−0.020	0.116	895.000	**0.028**	−0.260	0.117
ADS-craving	1,180.000	0.652	−0.053	0.116	857.000	**0.013**	−0.291	0.117
ADS-submission	1,293.500	0.741	0.039	0.116	969.000	0.090	−0.199	0.117

Note: p-values showing significant differences are in bold.
Abbreviations: ADS: Affective dependency scale; AES: Aesthetic sensitivity; CHA: Controlled harm avoidance; EOE: Ease of excitation; HSPS: Highly sensitive person scale; IQR: Interquartile range; LST: Low sensory threshold; RBC: Rank-biserial correlation; RSES: Rosenberg self-esteem scale; SE RBC: Standard error rank-biserial correlation.

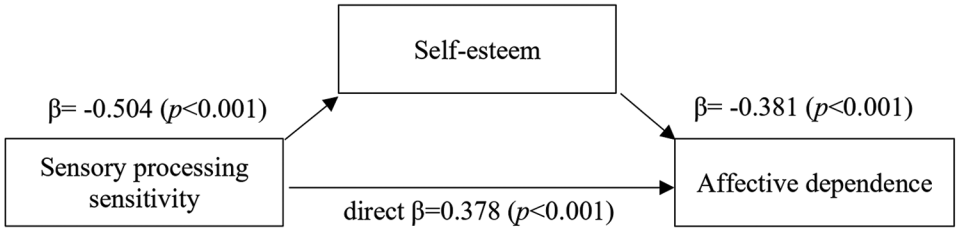

Figure 1. Mediation model of the relationship between sensory processing sensitivity and affective dependence through self-esteem

Table 4. Spearman's correlations

Variable	1	2	3	4	5	6	7	8	9	10	11
1. HSPS-overall											
Spearman's rho	—										
p-value	—										
2. HSPS-EOE											
Spearman's rho	0.899	—									
p-value	**<0.001**	—									
3. HSPS-LST											
Spearman's rho	0.902	0.730	—								
p-value	**<0.001**	**<0.001**	—								
4. HSPS-AES											
Spearman's rho	0.590	0.445	0.403	—							
p-value	**<0.001**	**<0.001**	**<0.001**	—							
5. HSPS-CHA											
Spearman's rho	0.573	0.433	0.435	0.288	—						
p-value	**<0.001**	**<0.001**	**<0.001**	**0.004**	—						
6. RSES-overall											
Spearman's rho	−0.485	−0.566	−0.400	−0.172	−0.251	—					
p-value	**<0.001**	**<0.001**	**<0.001**	0.087	**0.012**	—					
7. RSES-self-competence											
Spearman's rho	−0.327	−0.413	−0.271	−0.027	−0.176	0.891	—				
p-value	**<0.001**	**<0.001**	**0.006**	0.792	0.080	**<0.001**	—				
8. RSES-self-liking											
Spearman's rho	−0.556	−0.608	−0.451	−0.290	−0.311	0.938	0.697	—			
p-value	**<0.001**	**<0.001**	**<0.001**	**0.003**	**0.002**	**<0.001**	**<0.001**	—			
9. ADS-overall											
Spearman's rho	0.390	0.438	0.315	0.055	0.287	−0.395	−0.438	−0.308	—		
p-value	**<0.001**	**<0.001**	**0.001**	0.590	**0.004**	**<0.001**	**<0.001**	**0.002**	—		
10. ADS-craving											
Spearman's rho	0.406	0.447	0.331	0.067	0.279	−0.403	−0.427	−0.332	0.943	—	
p-value	**<0.001**	**<0.001**	**<0.001**	0.508	**0.005**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	—	
11. ADS-submission											
Spearman's rho	0.270	0.311	0.232	0.001	0.228	−0.331	−0.394	−0.231	0.867	0.668	—
p-value	**0.007**	**0.002**	**0.020**	0.991	**0.022**	**<0.001**	**<0.001**	**0.021**	**<0.001**	**<0.001**	—

Note: *p*-values showing significant differences are in bold.
Abbreviations: ADS: Affective dependency scale; AES: Aesthetic sensitivity; CHA: Controlled harm avoidance; EOE: Ease of excitation; HSPS: Highly sensitive person scale; LST: Low sensory threshold; RSES: Rosenberg self-esteem scale.

constructs, confirming our first hypothesis. Affective dependence was found to be positively correlated with SPS and negatively correlated with self-esteem. The results indicate that individuals with higher sensitivity have higher affective dependence, while those with higher self-esteem show lower affective dependence. These results align with previous studies, which have shown that highly sensitive individuals tend to be more dependent on their partners.[19] This was also confirmed by our linear regression analyses, which support the vulnerability hypothesis of SPS, which is widely reported in the literature. These results are particularly intriguing as they prompt further exploration of how high sensitivity may play a role in the various components of Stenberg's triangular theory of love, namely, intimacy, passion, and commitment.[27] This presents an avenue for further investigation, as well as the

Table 5. Linear regression in predicting affective dependence with sensory processing sensitivity

Affective dependence		Unstandardized	Standard error	Standardized	*t*	*p*
H_0	(Intercept)	20.750	0.740		28.031	<0.001
H_1	(Intercept)	8.499	3.108		2.734	0.007
	HSPS	0.109	0.027	0.378	4.042	<0.001
Self-esteem		**Unstandardized**	**Standard error**	**Standardized**	***t***	***P***
H_0	(Intercept)	28.530	0.711		40.142	<0.001
H_1	(Intercept)	44.217	2.784		15.883	<0.001
	HSPS	−0.140	0.024	−0.504	−5.778	<0.001

Abbreviation: HSPS: Highly sensitive person scale.

Table 6. Linear regression in predicting affective dependence with self-esteem

Affective dependence		Unstandardized	Standard error	Standardized	*t*	*p*
H0	(Intercept)	20.750	0.740		28.031	<0.001
H_1	(Intercept)	32.079	2.859		11.221	<0.001
	RSES	−0.397	0.097	−0.381	−4.083	<0.001

Abbreviation: RSES: Rosenberg self-esteem scale.

Table 7. Mediation analysis

Direct effects	Estimate	Standard error	*z*-value	*p*	95% confidence interval	
					Lower	Upper
HSPS-FR→ADS-9	0.072	0.030	2.393	0.017	0.013	0.131
Indirect effects						
HSPS-FR→RSES→ADS-9	0.037	0.016	2.264	0.024	0.005	0.070
Total effects						
HSPS-FR→ADS-9	0.109	0.027	4.083	<0.001	0.057	0.162
Path coefficients						
RSES→ADS-9	−0.266	0.108	−2.456	0.014	−0.479	−0.054
HSPS-FR→ADS-9	0.072	0.030	2.393	0.017	0.013	0.131
HSPS-FR→RSES	−0.140	0.024	−5.837	< 0.001	−0.187	−0.093

Abbreviations: ADS-9: Affective dependency scale; HSPS-FR: Highly sensitive person scale in French; RSES: Rosenberg self-esteem scale.

influence of high sensitivity on the three diagnostic criteria developed by Sirvent-Ruiz in the clinical approach of affective dependence: addictive criteria (extreme affective need, emotional emptiness, and intense desire), attachment criteria (pathological relationship, impairment of autonomy, and pathological attachment), and cognitive-affective criteria (negative feelings, denial, and self-deception).[26]

Our second hypothesis examined the influence of gender on the scores of the different scales. This was evident for SPS and self-esteem. In the case of SPS, women reported higher scores than men. Our results aligned with findings by Engel-Yeger,[28] in which females aged 11 – 17 were more sensitive than males of the same age. However, these results are not universally supported in the literature, as other studies[29] found no significant gender differences in SPS. Although no studies suggested a higher prevalence in men, this could be attributed to gender stereotypes that often associate sensitivity more with women. In the case of self-esteem, women reported lower scores than men. Several explanations have been proposed for this gender difference in self-esteem.[30] For example, men and women do not have the same presumed roles in society, and self-esteem is presented in society as a predominantly masculine characteristic. Furthermore, peer interactions and socialization reinforce gender stereotypes and create gender differences in self-esteem. However, the literature on this topic is inconsistent.[31] In this study, we did not find significant effects for age and level of education, probably due to the young age of

the respondents (15 – 20 years). However, the literature shows that SPS changes with age.[32]

Our third hypothesis analyzed the mediating role of self-esteem in the relationship between SPS and affective dependence. The results support this hypothesis. In summary, SPS has a positive influence on affective dependence but a negative influence on self-esteem, which, in turn, has a negative influence on affective dependence. In other words, higher SPS tends to increase affective dependence and decrease self-esteem. Conversely, higher self-esteem tends to reduce affective dependence. The influence of SPS on affective dependence can thus be partly explained by self-esteem. This mediational relationship confirms several key points. First, regarding the relationship between sensitivity and self-esteem, our results align with existing literature that adolescents and young adults with high sensitivity tend to have lower self-esteem.[12,13] Second, with respect to the relationship between self-esteem and affective dependence, linear regression analysis confirms the negative influence of self-esteem on affective dependence, consistent with previous research highlighting that low self-esteem is a trigger for affective dependence.[14]

Our fourth hypothesis explored the influence of the experience of a romantic relationship on affective dependence scores. The results confirmed this hypothesis, showing that individuals who were or had been in a relationship reported lower scores than others, particularly for the "craving" component. Relationship craving can be defined as the imperative need for the other in response to distressing emotional states. Interestingly, the experience of being in a relationship seems to reduce overall affective dependence, suggesting that the perception of relationships may be idealized or distorted before the experience. This finding opens up avenues of research into the social representation of couple relationships and love in adolescence and the possible socio-cognitive consequences (such as stereotypes and behaviors) or health consequences, such as anxiety. For instance, Galliher *et al*.[33] found that two people in a dependent romantic relationship had lower self-esteem. Notably, existing literature suggests a more complex relationship between self-esteem and affective dependence, which is thought to operate bilaterally.[34] The role of high SPS in affective dependence, particularly through self-esteem, also warrants further investigation. While some studies suggest no gender differences in terms of sensitivity, others highlight its prevalence in women, raising the question of whether this is viewed as socially desirable or undesirable. Given its largely negative impact on the health of those affected, it is essential to continue questioning the initially perceived benefits of high sensitivity. Moreover, there is a need to critically examine the growing tendency to frame high sensitivity as a resource, particularly in the context of a capitalist and productivist society. In such a society, individual traits are increasingly studied to enable better adaptation to the living environment as well as to cope with the increasingly difficult working conditions.

5. Limitations

Regarding the limitations of our study, we believe that it is particularly important to highlight the emotional instability that exists during adolescence,[35] which may have influenced SPS and self-esteem scores. Hence, our results cannot be generalized to other demographic groups. In terms of the questionnaire and the scales used, some feedback indicated that certain words were difficult for adolescents to understand (e.g., "stimuli"), prompting some to seek help from an adult for clarification. We also noted that the questions on the ADS-9 scale were considered to be inappropriate for young people aged 15 – 18 years, with many finding them complex. Another limitation of the ADS-9 scale is that the responses of participants who had never been in a relationship were considered less reliable, as those individuals might have based their answers on a hypothetical romantic relationship, making it unlikely for them to engage in an affective dependence relationship voluntarily. Out of the 100 participants, 41 participants had never been in a relationship. This figure should not be overlooked as it is not representative of the whole sample. As a result, the generalizability of the findings is limited. However, given the size of the sample, we have decided to retain this data for statistical analysis, although we are aware that using a hypothetical relationship to infer the existence of a dependency introduces a significant bias. Furthermore, while our sample size may be considered too small for broader generalization to all adolescents, this study was exploratory, and it successfully confirmed the relationship between the examined constructs.

6. Conclusion

First, we suggest that future studies be conducted under more favorable conditions to obtain a larger sample. In addition, it would be valuable to use a more appropriate scale to measure affective dependence (such as the Perrotta Affective Dependence Questionnaire or the Emotional Dependence in Dating of Young People and Adolescents), as we encountered significant difficulties with the existing scales in this study. Another potential avenue for research would be to conduct a similar study with the same variables but analyze sensitivity on a categorical basis, as proposed by Lionetti *et al*.[2]

As demonstrated in this study, high SPS is a vulnerability factor in the development of affective dependence, with higher sensitivity associated with higher dependence scores. At the same time, indirect links between these two variables have been established in the literature, mainly through various factors. Among these, attachment style stands out as particularly relevant. Branjerdporn *et al*.[22] have shown a correlation between SPS and attachment style, especially with anxious and avoidant attachment. Petruccelli *et al*.[34] confirmed the influence of attachment style (secure, fearful, dismissive, and ambivalent/disorganized) on affective dependence and have shown that insecure attachment (anxious, avoidant, or ambivalent/disorganized) contributes to the development of affective dependence. These three variables – SPS, attachment style, and affective dependence – appear to interact, forming a triangular relationship. This raises an intriguing new hypothesis: Could the effect of SPS on affective dependence found in our study be partially explained, or possibly moderated, by the attachment style of the respondents? Testing this hypothesis in future research would be an important next step.

In addition, a qualitative approach, such as interviews, could provide deeper insights into how individuals perceive their sensitivity to sensory processing. Rather than focusing solely on the direct influence of sensitivity on specific variables, it would be useful to ask individuals directly whether they view their sensitivity as an asset, strength, or weakness in various aspects of their lives, including their relationships, romantic or otherwise, and academic or work life. This would shed light on the experience of these individuals with high SPS, regardless of its impact on specific constructs.

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Conflict of interest

The authors declare that they have no competing interests.

Author contributions

Conceptualization: Jimmy Bordarie, Anais Seite, Caroline Giraudeau
Formal analysis: Jimmy Bordarie, Anais Seite
Investigation: Anais Seite
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Writing – original draft: Jimmy Bordarie, Anais Seite
Writing – review & editing: All authors

Ethics approval and consent to participate

The study and research protocol was approved by the Ethics Committee for Research Involving Human Subjects of the Universities of Tours and Poitiers (CER-TP) (number December 05, 2023). Participants were invited to answer a questionnaire hosted online on the Sphinx platform and were informed that their answers would remain anonymous and confidential. Participants were informed of the aims of the study and consented to participate.

Consent for publication

The elements relating to publication were set out in the Information Notice. Participants provided their consent for the data to be published.

Availability of data

Data are available on request to the corresponding author.

References

1. Aron A, Aron EN. Self-expansion motivation and including other in the self. In: Duck S, editor. *Handbook of Personal Relationships: Theory, Research and Interventions*. New York: John Wiley & Sons; 1997. p. 251-270.
2. Lionetti F, Aron A, Aron EN, Burns GL, Jagiellowicz J, Pluess M. Dandelions, tulips and orchids: Evidence for the existence of low-sensitive, medium-sensitive and high-sensitive individuals. *Transl Psychiatry*. 2018;8(1):1-11.
   doi: 10.1038/s41398-017-0090-6
3. Bordarie J, Aguerre C, Bolteau L. A longitudinal approach of lockdown effects on quality of life and the expression of anxiety-depressive disorders according to sensory processing sensitivity. *Psychol Health Med*. 2021;27(10):2288-2299.
   doi: 10.1080/13548506.2021.1968012
4. Brindle K, Moulding R, Bakker K, Nedeljkovic M. Is the relationship between sensory-processing sensitivity and negative affect mediated by emotional regulation? *Aust J Psychol*. 2015;67(4):214-221.
   doi: 10.1111/ajpy.12084
5. Burgard SSC, Liber JM, Geurts SM, Koning IM. Youth sensitivity in a pandemic: The relationship between sensory processing sensitivity, internalizing problems, COVID-19 and parenting. *J Child Fam Stud*. 2022;31(6):1501-1510.
   doi: 10.1007/s10826-022-02243-y
6. Iimura S. Highly sensitive adolescents: The relationship between weekly life events and weekly socioemotional well-being. *Br J Psychol*. 2021;112(4):1103-1129.
   doi: 10.1111/bjop.12505
7. Arnett JJ. Emerging adulthood: What is it, and what is it good for? *Child Dev Perspect*. 2007;1(2):68-73.

doi: 10.1111/j.1750-8606.2007.00016.x

8. Schwartz SJ, Donnellan MB, Ravert RD, Luyckx K, Zamboanga BL. Identity development, personality, and well-being in adolescence and emerging adulthood. In: Shaver PR, Mikulincer M, editors. *Handbook of Psychology*. 2nd ed. New York: Wiley; 2012. p. 206-228.

   doi: 10.1002/9781118133880.hop206014

9. Laursen B. Closeness and conflict in adolescent peer relationships: Interdependence with friends and romantic partners. In: Adams GR, Berzonsky MD, editors. *The Company they Keep: Friendship in Childhood and Adolescence*. New York: Cambridge University Press; 1996. p. 186-210.

10. Sigelman CK. *Life Span Human Development*. 3rd ed. New York: Brooks/Cole Publishing Co.; 1999. p. 268.

11. Orth U, Robins RW. The development of self-esteem. *Curr Dir Psychol Sci*. 2014;23(5):381-387.

    doi: 10.1177/0963721414547414

12. Baryła-Matejczuk M, Bieniek J, Ślusarczyk A. Link between sensory-processing sensitivity and self-esteem using the example of a group of Polish adolescents. *J Commun Behav Sci*. 2021;2(2):5-18.

13. Kibe C, Suzuki M, Hirano M, Boniwell I. Sensory processing sensitivity and culturally modified resilience education: Differential susceptibility in Japanese adolescents. *PLoS One*. 2020;15(9):e0239002.

    doi: 10.1371/journal.pone.0239002

14. Crépel E. *L'enfant Hypersensible: L'accompagner de la Naissance à L'Adolescence*. Paris: Hatier Grand Public; 2022.

15. Scantamburlo G, Pitchot W, Ansseau M. La dépendance affective. *Rev Med Liege*. 2013;68(5-6):239-245.

16. Iancu I, Bodner E, Ben-Zion I. Self-esteem, dependency, self-efficacy and self-criticism in social anxiety disorder. *Compr Psychiatry*. 2015;58:165-171.

    doi: 10.1016/j.comppsych.2014.11.018

17. Arbinaga F, Sierra MIM, Caraballo-Aguilar BM, *et al*. Jealousy, violence, and sexual ambivalence in adolescent students according to emotional dependency in the couple relationship. *Children* (*Basel*). 2021;8:993.

    doi: 10.3390/children8110993

18. Pugliese E, Saliani AM, Mosca O, Maricchiolo F, Mancini F. When the war is in your room: A cognitive model of pathological affective dependence (PAD) and intimate partner violence (IPV). *Sustainability*. 2023;15(2):1624.

    doi: 10.3390/su15021624

19. Jerome EM, Liss M. Relationships between sensory processing style, adult attachment, and coping. *Pers Individ Differ*. 2005;38(6):1341-1352.

    doi: 10.1016/j.paid.2004.08.016

20. Zorlular M, Uzer T. Investigating the relationship between sensory processing sensitivity and relationship satisfaction: Mediating roles of negative affectivity and conflict resolution style. *Curr Psychol*. 2022;42(30):26504-26513.

    doi: 10.1007/s12144-022-03796-3

21. Liss M, Timmel L, Baxley K, Killingsworth P. Sensory processing sensitivity and its relation to parental bonding, anxiety, and depression. *Pers Individ Differ*. 2005;39(8):1429-1439.

    doi: 10.1016/j.paid.2005.05.007

22. Branjerdporn G, Meredith P, Strong J, Green M. Sensory sensitivity and its relationship with adult attachment and parenting styles. *PLoS One*. 2019;14(1):e0209555.

    doi: 10.1371/journal.pone.0209555

23. Salem D. *No Pain, no Gain? Attachment Anxiety, Sensory Processing Sensitivity, and Empathy in a Therapist Sample. [Dissertation]*. Brooklyn: Long Island University; 2021.

24. Bordarie J, Aguerre C, Bolteau L. Validation and study of psychometric properties of a French version of the Sensory-Processing Sensitivity scale (HSPS-27). *Eur Rev Appl Psychol*. 2022;72:100781.

    doi: 10.1016/j.erap.2022.100781

25. Vallieres EF, Vallerand RJ. Traduction et validation canadienne-française de l'échelle de l'estime de soi de Rosenberg. *Int J Psychol*. 1990;25(3):305-316.

    doi: 10.1080/00207599008247865

26. Sirvent-Ruiz CM, De La Villa Moral Jiménez M, Herrero J, Miranda-Rovés M, Díaz FJR. Concept of affective dependence and validation of an affective dependence scale. *Psychol Res Behav Manag*. 2022;15:3875-3888.

    doi: 10.2147/prbm.s385807

27. Sternberg RJ. A triangular theory of love. *Psychol Rev*. 1986;93(2):119-135.

    doi: 10.1037/0033-295X.93.2.119

28. Engel-Yeger B. Validating the adolescent/adult sensory profile and examining its ability to screen sensory processing difficulties among Israeli people. *Br J Occup Ther*. 2012;75(7):321-329.

    doi: 10.4276/030802212x13418284515839

29. Machingura T, Kaur G, Lloyd C, *et al*. An exploration of sensory processing patterns and their association with demographic factors in healthy adults. *Ir J Occup Ther*. 2019;48(1):3-16.

    doi: 10.1108/ijot-12-2018-0025

30. Kling KC, Hyde JS, Showers CJ, Buswell BN. Gender differences in self-esteem: A meta-analysis. *Psychol Bull*. 1999;125(4):470-500.

    doi: 10.1037/0033-2909.125.4.470

31. Greene AL, Wheatley SM. I've got a lot to do and I don't think I'll have the time: Gender differences in late adolescents' narratives of the future. *J Youth Adolesc*. 1992;21(6):667-686.

doi: 10.1007/BF01538738

32. Ueno Y, Takahashi A, Oshio A. Relationship between sensory-processing sensitivity and age in a large cross-sectional Japanese sample. *Heliyon*. 2019;5(10):e02508.

doi: 10.1016/j.heliyon.2019.e02508

33. Galliher RV, Rostosky SS, Welsh DP, Kawaguchi MC. Power and psychological well-being in late adolescent romantic relationships. *Sex Roles*. 1999;40(9-10):689-710.

doi: 10.1023/A:1018804617443

34. Petruccelli F, Diotaiuti P, Verrastro V, *et al*. Affective dependence and aggression: An exploratory study. *Biomed Res Int*. 2014;2014:805469.

doi: 10.1155/2014/805469

35. Bariaud F. Introduction: The rise of adolescent psychology. *Enfance*. 2012;3:251-266.

doi: 10.4074/S0013754512003023