An Investigation of Sensory Processing Sensitivity in Thai Undergraduate Students: Exploring Causal Relationships with Positive Psychological Factors

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Abstract

The objectives of this research are as follows: (1) to compare the level of Sensory Processing Sensitivity (SPS) between two groups of late adolescents, including a Highly Sensitive Person (HSP) and a non-Highly Sensitive Person (non-HSP); and (2) to explore the causal models of positive psychological factors, and SPS in late adolescence, included 306 undergraduate students from simple random sampling, majoring in the Faculty of Education from three universities in Bangkok, Thailand, who collaborated with members of the Council of University Presidents of Thailand. The research instruments are the general information (six demographic questions) and three psychological scales for undergraduate students (Highly Sensitive Person, Psychological Capital (Psycap), and Self-Compassion, evaluated in five-rating scales). These three scales were determined with Cronbach's alpha coefficient of 0.925, 0.909, and 0.852, respectively. All the data are calculated in descriptive, and causal model analysis. This research found that the SPS in the samples was normalized t-score at a percentile rank of 3.30-100.00. Furthermore, the Lisrel 12.4.3.0 can explore the causal model of samples with about 37.20% of model consistency to represent the samples. Moreover, the model's Total Effect (TE) of the model was considered as TE = -0.66 between SPS and Self-compassion. In contrast, SPS and Psycap are considered as TE= 0.18. Investigations into the influence of positive psychological factors on Thai undergraduate students are essential to determine how these factors can be leveraged to mitigate potential challenges associated with Sensory Processing Sensitivity (SPS) and ultimately enhance their Psychological Capital (Psycap), thereby promoting academic success.

Keywords: Late Adolescence; Positive Psychological Factors; Sensory Processing Sensitivity

Introduction

Late adolescence is a crucial development stage in the age range of 19-25 years, characterized by developmental across physical, emotional, social, and intellectual domain. Late adolescents are capable as individuals ability to make own decisions and problems solving, using reasonable and analytical thinking, affected by external factors like an affinity relationship with parents, teachers, and friends, to significantly promote, guide, and nurture adolescents to understand themselves, to facilitate their growth as finding identities. This stage can be described as a continuous turning point in life, as it involves critically deciding educational paths and career choices (Koolnaphadol, 2019).

The developmental changes of late adolescence may lead to challenges in adaptation, especially late adolescents who cannot develop strategies for coping mechanisms during facing difficult situations in daily life or important effective events. Late Adolescence can be affected psychologically, emotionally, and behaviourally as a critical period (Koolnaphadol, 2019). In terms of negative psychological impact, it manifests as mental health problems due to un-developing coping strategies and leads to a symptom such as stress, depression, burnout, and anxiety, especially related to a personality trait known as Sensory Processing Sensitivity (SPS) is generally overwhelmed by an uncomfortable situation or external stimuli (Ishibashi et al., 2022).

Sensory Processing Sensitivity is a personality trait characterized by rapid responses to the surroundings in both positive and negative environments. SPS is a trait, affected by genetic and environmental factors. Genetically, SPS can be considered a naturally evolved biological trait that maintains the humans and other living more than a hundred species, approximately 10-35% in total on our earth (Greven et al., 2019). Three components of SPS are (1) Ease of Excitation (EOE), (2) Low Sensory Threshold (LST), and (3) Aesthetic Sensitivity (AES) (Bas et al., 2021). In the definition of HSP, these can be developed by biological factors and external environments to influence sensitivity. Environmental sensitivity is related to the developmental context. It reflects HSP's characteristics, divided into three sub-characteristics, which are 1) General sensitivity, (2) Vulnerability sensitivity, and (3) Vantage sensitivity, influenced by neutral, adverse, and supportive environments, respectively. However, non-HSP can be affected by the external environment as low sensitivity. Moreover, all HSPs are commonly found among late adolescents, and it has been discovered that there is a gene known as 5-HTTLPR located on chromosome 17 (Pluess, 2015).

More studies are needed on the relationship between psychological traits and SPS. The study of psychological Capital (Psycap), which consists of hope, self-efficacy, optimism, and resilience (Boonkerd, 2015), except for a study from Gulla & Golonka (2021) that could find a negative relationship between aesthetic sensitivity as one of the factors in SPS and resilience, which is one of the factors in Psycap, On the other hand, resilience can also have a positive relationship with low sensory threshold, which is also one of the factors in SPS.

Psychological Capital is a positive psychological construct that promotes beneficial traits within HSPs. It encourages the development of a more optimistic mindset and thinking patterns through the self-talking. Thus, it is interesting to study the relationship between SPS and Psycap to explore the relationship, resulting in SPS as it is enhanced by Psycap in late adolescents as skills to face unfavourable situations. The intention was to promote constructive thinking, emotional management, and a sense of well-being to lead a more satisfying life throughout their education (Kantasorn et al., 2018; Luthans & Youssef-Morgan, 2017; Srisawat, 2015).

Moreover, self-compassion, one of the positive personality traits, also influences an individual's perception of their abilities and shortcomings and their ability to control their thoughts and emotions, especially in undesirable situations (Thammarongpreechachai et al., 2020). SPS oppositely relates to self-compassion, whether higher SPS with lower self-compassion, especially for one of the factors of self-compassion, but no study indicates a significantly higher or lower SPS at a lower mindfulness. This study concluded with the recommendation of promoting mindfulness with sensitive people (Bakker & Moulding, 2012). Self-compassion is an essential trait for meaningful living and self-development, and there is another study that has explored the relationship between academic distress and self-compassion, revealing that self-compassion can promote good well-being in undergraduate students by decreasing stress and academic grief (Chan et al., 2022). This is empirical evidence to support the interest in studying self-compassion and SPS, aiming to gain a better understanding of late adolescence for more satisfaction in life and achieve self-satisfaction through the components of self-compassion, including mindfulness, self-kindness, and common humanity, exploring the significant relationship between other components to understand late adolescence (Thammarongpreechachai, 2022).

Thus, it is interesting to explore the relationship between sensory processing sensitivity and two psychological factors, Psycap, and self-compassion, including all their components in late adolescence as a sample group to enlighten all psychological factors as novel information that can encourage late adolescence as an armour to protect each of them during uncomfortable situations and events and stand stronger during studying in university with good mental health.

Methodology

Participants

The population for this study consists of 4,588 undergraduate students from three universities in Bangkok, Thailand, in the faculty of education that is a collaborated member with The Council of University Presidents of Thailand.

The sample in this research is undergraduate students from three universities located in Bangkok, Thailand, in the faculty of education that is a collaborated member with The

Council of University Presidents of Thailand in a total of 367 participants as expected to represent the entire university student population, followed by the rule of thumb theory, as determined by the minimum sample from the ratio of one parameter: 10-20 participants (Schumacker & Lomax, 2010). This research involves a total of 10 parameters and determines the minimum participants of 100 participants by simple random sampling, and lastly derived 306 participants in total (83.38% as an expected sample size). The sampling selection method is as follows.

(1) The population of Thai undergraduate students was divided into subgroups (strata) based on their educational year (freshman, sophomore, junior, and senior). Random samples were then drawn from each stratum (Kantasorn et al., 2018).

(2) Simple Random Sampling was then applied in the method due to the findings insignificantly relationships in this population of different ages, genders (Jagiellowicz et al., 2016), cumulative grade points average (Students as population may refuse to participate.),

The following steps for sampling selection are manipulated in the number of samples increased by at least 5% to prevent data loss from research instruments. The sample size was strategically increased from 200 to a minimum of 250 individuals to ensure sufficient power for both descriptive analysis and causal model estimation.

To collect data, these are provided steps to follow:

(1) To measure students' psychological capital, The researcher contacted developers to request permission to use instruments, including the Thai version of the HSP, Psycap, and self-compassion scales.

(2) The researcher conducted human research ethics approval through the e-ethics system of the Human Research Ethics Committee of Srinakharinwirot University. Ethics Committee Approval Number is SWUEC-G-264/2566X and the Date of Approval is June 30, 2023 (Human Research Ethics Committee, 2021).

(3) The researcher submitted a formal request to the Graduate School of Srinakharinwirot University addressed to the University President to obtain permission for data collection from undergraduate students.

(4) Data collection involved distributing personal questionnaires and three positive psychological scales, accompanied by informed consent forms specifying the research objectives, procedures, anticipated benefits, and data privacy rights. Data collection took place over two months, from August to October 2023, followed by scoring according to the research instrument's criteria.

(5) The data obtained from the research, which was scored using research instruments, will be subjected to data analysis using statistical software.

Data Analysis

1. Data for research instruments

The research instrument consists of personal information and three psychological scales. The Personal Information concluded เพศสภาพ (gender), เพศวิถี (sexuality), อายุ (age), ชั้นปี (year of study), required to fill in the blank, and สาขาวิชา (major) and มหาวิทยาลัย (university) that required to fill from the lists box. On the other hand, psychological scales can be concluded as follows. The data was obtained as the percentage value, total scores, mean scores, and standard deviations using the SPSS Version 29.0.1.0 program for experimental purposes (Try Out) before using again with the actual research sample group.

The HSP scale consists of 27 items, rephrased from the Thai version (Ussanarassamee, 2022), translated from the Highly Sensitive Person test, 27 items, can be categorized as 3 factors: LST, EOE, and AS, and they have α values of 0.75, 0.67, and 0.81, respectively, including the overall α value of whole scale = 0.909, evaluating in a rating scale with 5-level which are not at all, not much, somewhat, very much, exactly (Benham, 2006). The Psycap scale consists of 28 items, rephrased from the Thai version (Srisawat, 2015), consisting of 4 factors: hope, self- efficacy, optimism, and resilience, and they have the overall α value of whole scale = 0.85), evaluating in a rating scale with 5-level which are totally not true, not true, not sure, true, and totally true. Lastly, the Self-Compassion Scale (SCS), a widely used instrument for assessing self-compassion, comprises 13 items that measure three key components: self-kindness, mindfulness, and common humanity, using a 5-point Likert scale ranging from "hardly ever" to "very often." The overall Cronbach's alpha coefficient for the scale was 0.88, indicating good internal consistency (Chompookard, 2017).

2. Descriptive Data Analysis

The descriptive data is aimed to studying the relationship between psychological factors and SPS in HS- and non-HS undergraduate students by collecting 306 raw data. Afterward, two sorts of data are calculated as maximum, minimum, and average scores, standard deviation (S.D.), including normal distribution test by The Statistic Package for the Social Science or SPSS Version 29.0.1.0 program for the two-sample t-test analysis. (Ucharattana et al., 2015; Xu et al., 2017).

2. The causal model analysis

Analyse the causal model by path analysis for the relationship between SPS and positive psychological factors by using the program Lisrel 12.4.3.0 (Srisawat, 2015) by using the standard criterion to investigate the consistency of the model (Angsuchoti et al., 2011).

Results

There are two parts for results, consist of comparing the level of SPS between two different groups of late adolescents which are a highly sensitive person and a non-highly

sensitive person, and exploring the causal models of positive psychological factors and sensory processing sensitivity in late adolescence.

The 306 research instruments that can be analysed for narrative information can be used as empirical data to explore the samples as follows.

The samples can be calculated in measuring of central tendency (mean) and dispersion (standard deviation) for numerical variables and be grouped by gender as male and female and have quantities of 117 and 189. In contrast, the samples grouped by sexuality are male, female, and LGBTQ, with quantities of 84, 180, and 42, respectively. Dividing the sample group into 4 levels of study years, which are year 1, year 2, year 3, and year 4, the sample group has a quantity of 185, 55, 63, and 3, respectively. The samples consist of four age groups, which are 18, 19, 20, 21, and 22, with 100, 105, 57, 35, and 7, respectively.

All 27 items of the highly sensitive person scale will be used to calculate the level of sensory processing sensitivity, including psychological factors, via two research instruments, which are 28 items of the psychological capital and 13 items of the self-compassion scale. In conclusion, 68 items as a research instrument can be used for this study.

Table 1 Result of Univariate Summary Statistics for Continuous Variables (N=306)

Variable	k	M	SD	Max	Min	Sk	Ku	Interpreting
1. SPS	27	3.447	0.502	5.000	1.407	-0.323	1.068	Highly Sensitive
1.1 LST	7	3.176	0.675	5.000	1.000	-0.271	0.316	Highly sensitive
1.2 EOE	13	3.456	0.599	5.000	1.385	-0.238	0.561	Highly Sensitive
1.3 AS	7	3.702	0.528	5.000	1.000	-0.426	1.688	Highly Sensitive
2. Psycap	28	3.972	0.490	5.000	2.214	-0.339	0.545	High level
2.1 HOP	9	4.025	0.531	5.000	1.444	-0.549	1.567	High level
2.2 EFF	9	3.934	0.636	5.000	1.200	-0.585	1.206	High level
2.3 OPT	5	4.018	0.550	5.000	1.778	-0.558	0.403	High level
2.4 RES	5	3.830	0.604	5.000	1.800	-0.114	-0.038	High level
3. Self-compassion	13	3.207	0.621	4.923	1.308	0.015	-0.078	Average level
3.1 MIN	4	3.624	0.595	5.000	1.750	-0.141	-0.074	Average level
3.2 KIN	4	3.117	0.809	5.000	1.000	0.126	-0.384	Average level
3.3 HUM	5	2.901	0.790	5.000	1.000	0.102	-0.168	Average level

Table 1 shows the result of univariate summary statistics for continuous variables. Overall, the samples are highly sensitive, as well as resulting in its factors, which are LST, EOE, and AS, with average scores of 3.176, 3.456, and 4.702, respectively. It also shows the average score of the other two positive psychological factors, as the average score of Psycap is in the high-level, including high level in its factor which are HOP, EFF, OPT, and RES with scores of 4.025, 3.934, 4.018, and 3.830, respectively. In contrast, the samples have the average level in self-compassion average score, which consists of three factors MI: N, KIN, and HUM, and the

average scores are 3.624, 3.117, and 2.901, respectively, as indicated as an average level in the scoring system.

The SPS level was ranked by the percentile of 306 late adolescents referred to as HSP, a percentile of 3.30-100.00. It can be assumed that most late adolescents as samples are HSPs, resulting in the samples as Non-HSP and HSP that are 10 (3.27%) and 296 (96.73%), respectively. The samples grouped by sexuality are male, female, and LGBTQ, with quantities of 84 (27.45%), 180 (58.82%), and 42 (13.73%), respectively. Dividing the sample group into 4 levels of study years, which are year 1, year 2, year 3, and year 4, the sample group has a quantity of 185 (60.46%), 55 (17.97%), 63 (20.59%), and 3 (0.98%), respectively. The samples consist of four age groups: 18, 19, 20, 21, and 22, with 100 (32.68%), 105 (34.31%), 57 (18.63%), 35 (11.44%), and 9 (2.94%), respectively.

The causal analysis by The Structural Equation Model (SEM) of Positive Psychological Factors and Sensory Processing Sensitivity aims to investigate the Pearson correlation coefficient of the model variables as the Pearson correlation in the following table 2.

Table 2 The analysis of the Pearson correlation (N=306)

Variables	SPS	LST	AS	EOE	Psycap	HOP	OPT	EFF	RES	Self-compass	KIN	HUM	MIN
SPS	0.252												
LST	0.285	0.456											
AS	0.169	0.128	0.278										
EOE	0.279	0.279	0.131	0.359									
Psycap	0.008	-0.017	0.057	-0.005	0.240								
HOP	0.013	-0.003	0.050	0.002	0.228	0.281							
OPT	0.023	-0.012	0.074	0.014	0.243	0.201	0.302						
EFF	-0.007	-0.028	0.042	-0.022	0.261	0.221	0.241	0.405					
RES	-0.015	-0.040	0.054	-0.038	0.236	0.187	0.216	0.228	0.365				
Self-compass	-0.125	-0.134	-0.012	-0.180	0.106	0.078	0.095	0.136	0.146	0.386			
KIN	-0.043	-0.044	0.029	-0.082	0.127	0.102	0.119	0.164	0.148	0.270	0.354		
HUM	-0.161	-0.171	-0.029	-0.226	0.107	0.071	0.099	0.124	0.169	0.456	0.255	0.654	
MIN	-0.161	-0.179	-0.031	-0.221	0.083	0.062	0.065	0.122	0.114	0.413	0.206	0.410	0.624

Table 2 show the analysis of Pearson correlation. It is found that the highest score with regression is an internal factor relationship between Common Humanity and Self-compassion (Hum and SCompass), with a score of 0.456, followed by Kindness and Common Humanity (KIN and HUM) and Low Sensory Threshold and Sensory Processing Sensitivity (LST and SPS) with scores of 0.410 and 0.285, respectively.

It also found that the highest score with regression in the relationship between internal and external factors is Resilience and Common humanity (RES and HUM), with a score of 0.169, followed by Kindness and Self-efficacy (KIN and EFF) and Resilience and Kindness (RES and KIN) with scores of 0.164 and 0.148, respectively.

Table 3 The result for the goodness-of-fit measures

Statistical data	Value	Criteria interpreting	Interpretation
χ^2	48.49 (p-value=0.00059)	No significance (p<.05)	-
df	21	-	-
χ^2/ df	2.3090	< 2.00 = Good consistency 2.00-5.00 = Fair consistency	Pass
GFI	0.973	> 0.95 = Good consistency 0.90-0.95 = Fair consistency	Pass
AGFI	0.929	> 0.95 = Good consistency 0.90-0.95 = Fair consistency	Pass
CFI	0.980	> 0.95 = Good consistency 0.90-0.95 = Fair consistency	Pass
SRMR	0.0694	< 0.08 = Good consistency	Pass
RMSEA	0.0655	< 0.05 = Good consistency 0.05-0.08 = Fair consistency 0.08-0.10 = Not so good consistency > 0.10 = Poor consistency	Pass

Table 3 shows the scores by the goodness of fit measures which are χ^2/ df, GFI, AGFI, CFI, SRMR, RMSEA, and Squared Multiple Correlation with scores of 2.3090, 0.973, 0.929, 0.980, 0.0694, 0.0655, and 0.372, and they are interpreted as passing the criteria.

Figure 1 SEM model of SPS and positive psychological factors of late adolescence

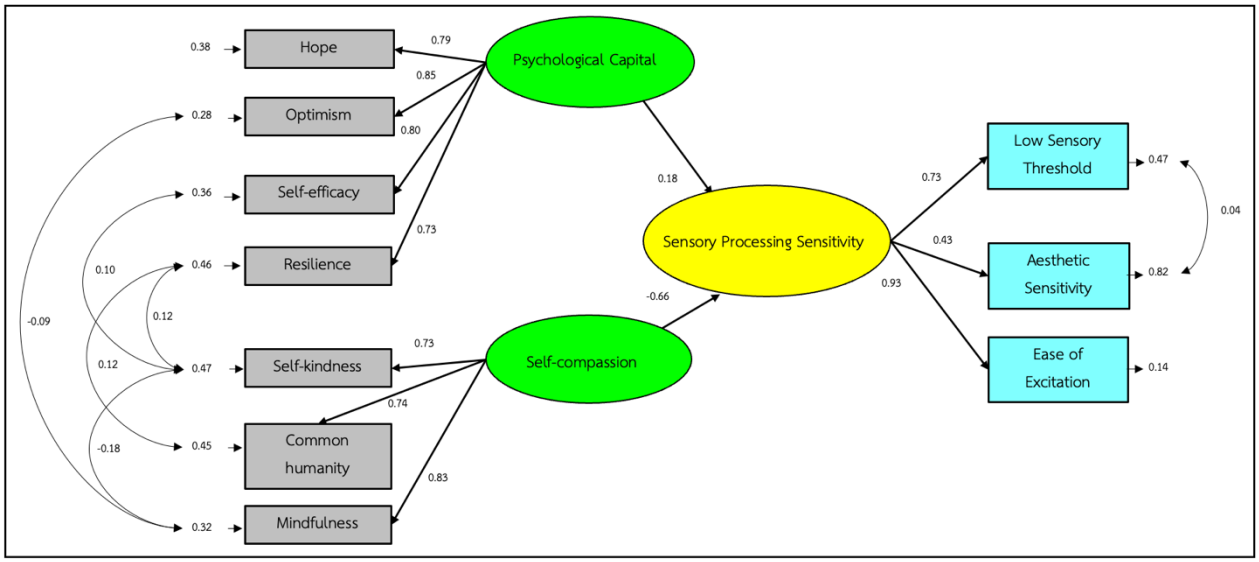

Figure 1 shows the related trains of SPS and Psychological Capital (Psycap) and Self-compassion (SCompass) and their factors as summarized below. There is a positive relationship

between Psycap and its factors: optimism, self-efficacy, hope, and resilience, about 0.85, 0.80, 0.79, and 0.73, respectively. Moreover, there is a positive relationship between SCompass and its factors, which are mindfulness, common humanity, and self-kindness = 0.83, 0.74, and 0.73, respectively, as well as positive relationship between SPS and its factors: ease of excitation, low sensory threshold, and aesthetic sensitivity = 0.93, 0.73, and 0.43, respectively.

Table 4 The direct effect, indirect effect, and total effect of the model variables

Variable	Sensory Processing Sensitivity (SPS)			R^2
	DE	IE	TE	
Psychological Capital	0.18	-	0.18	0.372
Self-compassion	-0.66	-	-0.66	

Table 4 show an influence line describing the significant relationship between SPS and Psycap with a total effect score = 0.18 and a significant relationship between SPS and self-compassion with a total effect score = -0.66. In conclusion, the results from the SEM model shown in Table 4 and Table 5 for this study have a Squared Multiple Correlation (R^2) value of 0.372, which all variables can describe as a variation of about 37.20% in its model. Psychological Capital has a positive significance with SPS, but Self-compassion has a negative relationship with SPS.

Discussion and conclusion

There is a significant direct relationship between SPS and Psycap with a total effect score of about 0.18, and the level of SPS will increase once the level of Psycap increases. As well as other researchers also see a positive relationship between resilience and low sensory threshold, which is also one of the factors in SPS. Moreover, another research indicated that Psycap can encourage sensitive person, being a vantage sensitivity which is a positive trait such as individuals who have a goal setting and are ready to challenge their goals (Gulla & Golonka, 2021; Luthans & Youssef-Morgan, 2017).

Variations in participant characteristics (e.g., age, gender, cultural background) might influence the relationship between SPS and Psycap. The relationship between SPS and Psycap might be influenced by a complex interplay of factors, including other psychological constructs and environmental conditions.

There is also a significantly inverse relationship between SPS and self-compassion, with a total effect score = -0.66, which means the level of SPS will increase once self-compassion decreases. Sensory Processing Sensitivity relates to self-compassion in the opposite way, whether HSP can be more sensitive when a lower self-compassion, especially for mindfulness, is one of the factors of self-compassion. However, no study indicates whether the higher or lower SPS is the lower mindfulness (Bakker & Moulding, 2012). This explanation shows the challenge for HSPs to face uncomfortable situations or events because of the ability of

aesthetic sensitivity to external environments. They are feasible in both positive and negative environments, confirming the difficulty of controlling this ability during an immediate change of mind. HSPs do not need so much time for self-compassion, whether mindfulness, kindness, or common humanity, because they are good at observing their deepening. It can be assumed that undergraduate students have a positive trait, which is a secure attachment style to adjust one's life while studying on campus as the result of a negative relationship between self-compassion and SPS, and they know the purpose of studying in the faculty of education.

However, the relationship between SPS and self-compassion appears more nuanced, with factors like mindfulness and situational context likely playing a role. Future research should explore the underlying mechanisms of these relationships in more detail and investigate how to optimize the benefits of SPS while mitigating potential challenges.

Conflict of Interest

The authors declare that there is no conflict of interest.

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