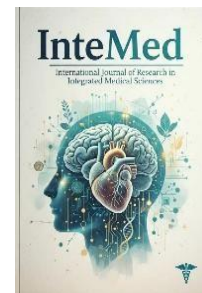




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Research Article

Association of Stress with *Rasavaha Srotas Dushti* and *Rasa Dhatu* Changes among Undergraduate Students: An Observational Study Using the Student Stress Scale.

Dr. Dipak S.Pandit¹, Dr. Ravindra S. Dhimdime², Dr. Shukra S. Wankhade³, Dr. Prajakta V. Ople⁴, Dr. Pooja B. Baddu⁵, Dr. Shilpa Vaibhav Nayakawadi⁶

1.BAMS, MD (Kriya Sharir) Medical officer,District hospital, Solapur.Maharashtra,India -413004

Email : vddspandit@gmail.com

2.M.D. Ph.D Kriya Sharir, Professor and HOD, Department of Kriya Sharir, Government Ayurvedic College, Dharashiv, Maharashtra,India – 413501

Email : rutusama1964@gmail.com

3.Assistant Professor,Department Of Kriya Sharir,Takshashila Ayurveda college and research centre, Kherda, washim, Maharashtra, India-444105.

Email : shukrawankhade1997@gmail.com

4.Assistant Professor,Department Of Kriya Sharir,Dhanwantari ayurveda Medical College and charitable Hospital, Udgir, Maharashtra, India -413517

Email : prajaktaople857@gmail.com

5.Assistant Professor,Department Of Kriya Sharir, Dhanwantari Ayurveda medical college and charitable Hospital, Udgir,Maharashtra, India 413517

Email : poojabaddu@gmail.com

6.Assistant Professor, Dept Of Rachana Sharir, Hon. Shri Annasaheb Dange Ayurved Medical College & Post Graduate Research Center, A/P - Ashta, Tal - Walwa, Dist-Sangli,416301.

Email : nayakawadishilpa@gmail.com

Abstract:

Background: Stress is a common psychosocial challenge among undergraduate students and may influence physical as well as mental functioning. Ayurveda does not describe “stress” as a single named disorder, but concepts such as Chinta (excessive worry), Udvega and Vishada provide a framework for understanding mental disturbances and their effects on Sharira. Rasavaha Srotas is concerned with the formation, transport and nourishment associated with Rasa Dhatu. The present study explored the association between stress measured by the Student Stress Scale (SSS) and

Ayurvedic parameters of Rasavaha Srotas in undergraduate students.

Aim: To assess the association of stress on Rasavaha Srotas in undergraduate students with special reference to the Student Stress Scale.

Methods: An observational cross-sectional study was conducted among 222 apparently healthy undergraduate students aged 18–26 years. Participants were selected by simple random sampling after written consent. Stress was assessed using the Student Stress Scale; Rasavaha Srotas

status was assessed using questionnaires based on Rasavaha Srotas Dushti, Rasa Dhatu Vriddhi and Rasa Dhatu Kshaya Lakshanas. Data were summarized using descriptive statistics. Association between categorical stress and Ayurvedic outcome grades was assessed by the chi-square test at a 5% level of significance.

Results: Of 222 students, 57 (26%) had slight stress, 144 (65%) had a lot of stress and 21 (9%) had extreme stress; none fell in the no-stress category. Rasavaha Srotas Dushti was mild in 76 (34%), moderate in 114 (51%) and severe in 32 (15%). Rasa Dhatu Vriddhi Lakshanas were mild in 133 (60%), moderate in 75 (34%) and severe in 14 (6%). Rasa Dhatu Kshaya Lakshanas were mild in 82 (37%), moderate in 100 (45%) and severe in 40 (18%). A significant association was observed between SSS category and Rasavaha Srotas Dushti ($\chi^2=17.129$, $df=4$, $p=0.001825$) and between SSS category and Rasa Dhatu Kshaya Lakshanas ($\chi^2=45.1809$, $df=4$, $p<0.00001$). No significant association was observed between SSS category and Rasa Dhatu Vriddhi Lakshanas ($\chi^2=0.1485$, $df=4$, $p=0.997375$).

Conclusion: In this sample, higher stress categories were associated with greater severity of Rasavaha Srotas Dushti and Rasa Dhatu Kshaya Lakshanas, whereas Rasa Dhatu Vriddhi did not show a significant categorical association with stress. The findings provide observational support for an Ayurvedic mind-body interpretation of stress and Rasa/Rasavaha Srotas disturbance, while causality cannot be established from the cross-sectional design.

Keywords: Stress; Student Stress Scale; Rasavaha Srotas; Rasa Dhatu; Rasavaha Srotodushti; Rasa Dhatu Kshaya; Ayurveda; undergraduate students.

1. INTRODUCTION

Ayurveda is a holistic system of health in which maintenance of equilibrium among Dosha, Dhatu and Mala is central to physiological well-being. The classical objective of Ayurveda is expressed as preservation of the health of the healthy and alleviation of disease in the diseased. The concept of Srotas provides an important physiological framework for understanding transport, nourishment and tissue-related processes within the body. Charaka describes thirteen principals internal Srotas, among which Rasavaha Srotas is associated with Rasa Dhatu and its distribution throughout the body.^[1-4]

Rasavaha Srotas is described in relation to Hridaya and the vessels that convey Rasa. Charaka identifies Hridaya and the Dashadhamani as the Mula of Rasavaha Srotas, while Sushruta describes Hridaya and Rasa-vahini Dhamani. Rasa Dhatu is regarded as the essence of properly digested food and is responsible for nourishment of subsequent Dhatus. Vyana Vayu is described as having an important role in continuous circulation of Rasa. These classical descriptions provide a conceptual basis for linking nutrition, circulation, vitality and mental well-being.^[3-8]

Charaka identifies heavy, cold and excessively unctuous food, excessive intake and Chinta/Atichintana among factors associated with Rasavaha Srotas disturbance. The

classical list of Rasa-pradoshaja manifestations includes symptoms such as Asraddha, Aruchi/Asyavairasya, Hrilasa, Gaurava, Tandra, Angamarda, Pandutwa, Srotorodha, Sada and Krushangata.^[9-11] Thus, psychological factors are not entirely separate from somatic physiology in the Ayurvedic framework.

In contemporary student life, academic workload, examinations, uncertainty about future career, peer competition, family expectations, financial concerns, adaptation to living arrangements and lifestyle irregularities may act as stressors. Stress responses involve coordinated nervous and endocrine mechanisms, and sustained stress may be accompanied by changes in sleep, appetite, cardiovascular activity, gastrointestinal function and subjective energy. The dissertation underlying this manuscript therefore attempted to examine stress using a modern psychometric scale while assessing Rasavaha Srotas through Ayurvedic symptom-based parameters.

The research gap identified in the dissertation was the limited integration of Student Stress Scale assessment with specific Ayurvedic indicators of Rasavaha Srotas and Rasa Dhatu. Earlier work cited in the dissertation had examined Rasavaha Srotas, student stress, or Ayurvedic stress concepts separately, but the present study was designed to examine their association in the same undergraduate population.^[12-17]

The study is therefore relevant to Kriya Sharir because it explores the relationship between Manasika factors and a Dhatu/Srotas-based physiological construct. It also provides a preliminary framework for future interdisciplinary studies that can combine validated psychological instruments, Ayurvedic assessments and objective physiological or biochemical markers.

2. AIM AND OBJECTIVES

Aim: To assess the effect/association of stress on Rasavaha Srotas in undergraduate students.

Objectives:

- To study Rasavaha Srotas in detail.
- To study stress in detail.
- To assess Rasavaha Srotas in students using Rasavaha Srotas, Rasa Dhatu Kshaya and Rasa Dhatu Vriddhi questionnaires.
- To assess stress using the Student Stress Scale questionnaire.
- To study the association between Rasavaha Srotas parameters and student stress.

3. LITERATURE REVIEW

3.1 Ayurvedic perspective of Rasavaha Srotas

The word Srotas is derived from the root “sru” conveying the idea of flow or movement. Classical

Ayurvedic descriptions include Srotas, Sira, Dhamani, Nadi and other terms for pathways or spaces, while emphasizing that their functions and contexts are not identical. Srotas are involved in transport and tissue nourishment and are also described as sites through which transformation and movement of Dhatu-related material occur. [3,4]

Rasavaha Srotas is rooted in Hridaya and the vessels carrying Rasa. Rasa Dhatu is the nutritive essence formed after digestion and is predominantly associated with Apa Mahabhuta. It continuously circulates and supports nourishment, growth, maintenance, satisfaction, strength and other physiological functions. Vyana Vayu facilitates its circulation, while the integrity of Agni and Srotas is important for proper formation and distribution of Rasa. [5-8]

Srotodushti is classically described through Atipravritti, Sanga, Sira-granthi and Vimarga-gamana. The present study operationalized Rasavaha Srotas disturbance through the symptom-based questionnaire used in the dissertation rather than attempting to equate Srotas directly with a single modern anatomical structure. This distinction is important when interpreting Ayurvedic constructs in contemporary research.

3.2 Ayurvedic perspective of stress

The dissertation notes that the word “stress” is not used as a single modern clinical term in the classical Samhitas. However, Chinta, Bhaya, Krodha, Shoka, Udvega and related mental states are described in different contexts. Chinta/Atichintana is particularly relevant to Rasavaha Srotas because it is explicitly included among causative factors of Rasavaha Srotas Dushti in the classical material reviewed for the dissertation. [9,18-21]

From an Ayurvedic interpretive perspective, persistent mental strain may disturb Manasika equilibrium and subsequently influence Dosha, Agni, circulation and Dhatu nourishment. In this manuscript, such statements are treated as a conceptual interpretation rather than proof of a direct biomedical mechanism.

3.3 Modern perspective of stress

Modern physiology describes stress as a response to challenging or threatening conditions involving neural, autonomic and endocrine pathways. Acute activation may increase alertness and cardiovascular activity, while prolonged or repeated activation can be associated with sleep disturbance, altered appetite, fatigue, impaired concentration and other stress-related symptoms. The dissertation reviewed the relationship of stress with cardiovascular, gastrointestinal, metabolic and psychological functions. [22-25]

For student populations, the Student Stress Scale offers a structured way to quantify the frequency with which a range of academic, social, financial and environmental situations are perceived as stressors. In the present dissertation, 52 items were included from the source questionnaire and responses were graded from Never to

Frequently. The resulting total score was categorized into no stress, slight stress, a lot stress and extreme stress.

4. MATERIALS AND METHODS

4.1 Study design and setting

The study was an observational cross-sectional study conducted over 18 months. The study population comprised undergraduate students from institutions in and around the study centre. Total 222 volunteers were included, with no dropouts.

4.2 Sample size and sampling

A total of 222 students was studied. The prevalence-based sample-size calculation was not applied and simple random sampling was used.

4.3 Participants

Inclusion criteria were: apparently healthy college-going students; age 18–26 years; and participation irrespective of gender, caste, religion or economic status. Exclusion criteria were systemic illness, disorientation, age below 18 or above 26 years, and use of sedatives. Participants could withdraw at any stage if they were unwilling to continue. Written consent was obtained.

4.4 Assessment tools

Stress was assessed using the Student Stress Scale (SSS). The dissertation states that the questionnaire contained 57 items in the source material, of which 52 items were used for the study. Each item had four response categories: Never, Rarely, Sometimes and Frequently. The total score was categorized as: 1–52, no stress; 53–104, slight stress; 105–156, a lot stress; and 157–208, extreme stress.

Rasavaha Srotas was assessed through a questionnaire based on classical Rasavaha Srotas Parikshana and the Lakshanas of Rasa Dhatu Vriddhi and Rasa Dhatu Kshaya. Symptoms were recorded using graded frequency/severity categories. There are three principal outcome constructs: Rasavaha Srotas Dushti Lakshanas, Rasa Dhatu Vriddhi Lakshanas and Rasa Dhatu Kshaya Lakshanas.

4.5 Data collection procedure

After selection according to the eligibility criteria and written consent, each participant was assessed using the study questionnaires. Demographic and selected physiological variables including age, sex, height, weight, BMI, blood pressure, pulse, diet and sleep were recorded. Data were compiled, classified and analyzed statistically.

4.6 Statistical analysis

Categorical data were summarized as frequencies and percentages. To evaluate the association between SSS categories and the three Ayurvedic outcome categories, the chi-square test of association was applied. The significance level was set at 5% with a 95% confidence limit. A p value <0.05 was considered statistically significant. Because the design was cross-sectional, statistically significant

association was interpreted as association rather than proof of causation.

5. RESULTS AND OBSERVATIONS

All 222 selected students completed the study. The principal demographic and physiological observations are summarized below.

Variable	Category	n	%
Age	18–20 years	32	14
	21–22 years	81	37
	23–24 years	60	27
	25–26 years	49	22
	27–28 years	2	1
Sex	Male	94	42
	Female	128	58
BMI	Underweight (<18.5)	131	59
	Normal (18.5–24.9)	31	14
	Overweight (25.0–29.9)	60	27
Diet	Vegetarian	95	43
	Mixed	127	57
Sleep	Deep	131	59
	Light	91	41
BP	<120/80 mmHg	130	59
	≥120/80 mmHg	92	41
Pulse	70–80/min	41	18.47
	81–90/min	90	40.54
	>90/min	91	40.99

5.1 Student Stress Scale

Stress category	Score range	n	%
No stress at all	1–52	0	0
Slight stress	53–104	57	26
A lot stress	105–156	144	65
Extreme stress	157–208	21	9
Total		222	100

The largest group was the “a lot stress” category (144; 65%), followed by slight stress (57; 26%) and extreme stress (21; 9%). No participant was classified in the no-stress category.

5.2 Rasavaha Srotas Dushti

Severity	Score range	n	%
Mild	1–15	76	34
Moderate	16–30	114	51
Severe	31–45	32	15
Total		222	100

Moderate Rasavaha Srotas Dushti was the most frequent category (114; 51%), followed by mild (76; 34%) and severe (32; 15%).

5.3 Rasa Dhatu Vriddhi Lakshanas

Severity	Score range	n	%
Mild	1–9	133	60
Moderate	10–18	75	34
Severe	19–27	14	6
Total		222	100

Mild Rasa Dhatu Vriddhi Lakshanas predominated (133; 60%); 75 (34%) were moderate and 14 (6%) were severe.

5.4 Rasa Dhatu Kshaya Lakshanas

Severity	Score range	n	%
Mild	1–8	82	37
Moderate	9–16	100	45
Severe	17–24	40	18
Total		222	100

Moderate Rasa Dhatu Kshaya Lakshanas were most common (100; 45%), followed by mild (82; 37%) and severe (40; 18%).

5.5 Selected symptom-level observations

The Rasavaha Srotas questionnaire showed variable prevalence across individual Lakshanas. For example, the dissertation recorded Asraddha in 95.05% as mild/occasional, while Agninasha was recorded predominantly in the moderate category (94.14%). Asyavairasya was reported as absent in 49.10%, moderate in 20.27% and severe in 22.07%. Gaurava and Tandra also showed notable moderate/severe reporting. Among Rasa Dhatu Kshaya Lakshanas, Rukshata, Shrama and Glani

were prominent findings, with severe Shrama reported in 28.83% and severe Glani in 24.32%. These symptom-level findings should be interpreted as questionnaire observations and not as independent clinical diagnoses.

5.6 Association between stress and Rasavaha Srotas outcomes

SSS category	Rasavaha Dushti Mild	Moderate	Severe	Total
Slight stress	30	25	2	57
A lot stress	40	80	24	144
Extreme stress	6	9	6	21
Total	76	114	32	222

The chi-square test showed a statistically significant association between SSS category and Rasavaha Srotas Dushti Lakshanas ($\chi^2=17.129$, $df=4$, $p=0.001825$). The distribution showed a larger proportion of moderate/severe Rasavaha Srotas Dushti among participants in the higher stress categories.

SSS category	Rasa Dhatu Vriddhi Mild	Moderate	Severe	Total
Slight stress	34	19	4	57
A lot stress	86	49	9	144
Extreme stress	13	7	1	21
Total	133	75	14	222

There was no statistically significant association between SSS category and Rasa Dhatu Vriddhi Lakshanas ($\chi^2=0.1485$, $df=4$, $p=0.997375$).

SSS category	Rasa Dhatu Kshaya Mild	Moderate	Severe	Total
Slight stress	30	25	2	57
A lot stress	50	70	24	144

Extreme stress	2	5	14	21
Total	82	100	40	222

A statistically significant association was observed between SSS category and Rasa Dhatu Kshaya Lakshanas ($\chi^2=45.1809$, $df=4$, $p<0.00001$). Notably, 14 of the 21 students in the extreme-stress group were classified as having severe Rasa Dhatu Kshaya Lakshanas, whereas only 2 were classified as mild.

6. DISCUSSION

The present study was undertaken to examine the relationship between psychological stress and Ayurvedic indicators related to Rasavaha Srotas among undergraduate students. The central finding was that SSS stress category was significantly associated with Rasavaha Srotas Dushti and Rasa Dhatu Kshaya, while no significant association was observed with Rasa Dhatu Vriddhi.

6.1 Student stress profile

In the present sample, 65% of students were classified as having “a lot stress” and 9% as having extreme stress. Thus, 74% of participants were in the two higher stress categories used by the study instrument. This does not represent prevalence of clinical stress in all undergraduate students because the sample was drawn from the study population using the dissertation’s inclusion criteria and the SSS categorization used in the research. Nevertheless, the distribution indicates a substantial burden of perceived academic, social and environmental stress within the studied group.

The individual SSS item analysis also illustrates the multifactorial nature of student stress. Examination pressure, concern about future career, lack of concentration, fear of disappointing parents, poor hostel/facility-related conditions, financial constraints and fear of competitive examination were among the items frequently endorsed as sometimes or frequently stressful. Such findings support the need to consider academic and non-academic determinants together rather than attributing student stress to examinations alone.

6.2 Rasavaha Srotas Dushti and stress

More than half of the participants (51%) were classified with moderate Rasavaha Srotas Dushti and 15% with severe Dushti. The significant chi-square association with SSS category suggests that the severity distribution of Rasavaha Srotas-related symptoms differed across stress categories. In particular, the extreme-stress group contained 6 severe cases among 21 students, compared with 2 severe cases among 57 students with slight stress.

The Ayurvedic interpretation is consistent with the classical inclusion of Chinta/Atichintana among factors capable of disturbing Rasavaha Srotas. Rasavaha Srotas is conceptually linked to Hridaya, Rasa circulation and

nourishment. Mental strain may therefore be interpreted within Ayurveda as a factor capable of disturbing the functional equilibrium supporting Rasa Dhatu. This interpretation is consistent with the conceptual literature reviewed in the dissertation. [9,18–21]

From a modern physiological viewpoint, psychological stress can alter autonomic activity, cardiovascular responses, sleep and eating behavior. These changes may influence subjective symptoms such as fatigue, appetite disturbance, altered concentration and perceived physical discomfort. The present study did not measure cortisol, autonomic indices, lipid profile or other biomarkers; therefore, these mechanisms remain explanatory possibilities rather than outcomes directly demonstrated by the study.

6.3 Rasa Dhatu Kshaya and stress

The strongest statistical association in the study was between SSS category and Rasa Dhatu Kshaya Lakshanas. The extreme-stress group showed 14 severe, 5 moderate and 2 mild cases. By comparison, the slight-stress group had 2 severe, 25 moderate and 30 mild cases. This graded distribution is compatible with the study's Ayurvedic hypothesis that persistent mental strain may be associated with symptoms interpreted as depletion or impaired quality of Rasa Dhatu.

Rasa Dhatu is described as the nutritive essence derived from properly digested food and as the first Dhatu that nourishes subsequent tissues. Classical descriptions emphasize the importance of Agni, Srotas and Vyana Vayu in its formation and circulation. [5–8] In the present dataset, symptoms such as Rukshata, Shrama and Gmani were frequent among the Rasa Kshaya indicators. These are nonspecific symptoms in modern medicine, but within the study's operational Ayurvedic framework they contribute to the Rasa Dhatu Kshaya score.

6.4 Rasa Dhatu Vriddhi and stress

The absence of a significant association between SSS category and Rasa Dhatu Vriddhi is an important negative finding. Although Rasa Dhatu Vriddhi Lakshanas were present in the sample, their severity distribution did not differ meaningfully across stress categories ($p=0.997375$). Therefore, the present data do not support a categorical relationship between the measured stress levels and Rasa Dhatu Vriddhi.

This finding also demonstrates the value of examining both increase and depletion constructs separately rather than assuming that every stress-related disturbance must produce the same type of Rasa pathology. Further studies should explore whether stress interacts with diet, sleep, Prakriti, Agni, activity level or other determinants to influence the direction of Rasa-related changes.

6.5 Integrative interpretation

The study supports an integrative model in which psychological stress is considered alongside nutrition,

digestion, circulation and subjective vitality. Ayurveda conceptualizes the body and mind as interconnected, and the present findings provide observational evidence that stress categories and selected Rasavaha/Rasa-related symptom categories can occur together. However, an Ayurvedic construct such as Rasavaha Srotas should not be equated uncritically with a single modern anatomical system. The study is better understood as examining a classical functional construct using operationalized symptom scores.

6.6 Comparison with previous work and research gap

The dissertation reviewed previous studies on Rasavaha Srotas, stress among undergraduate students, and Ayurvedic approaches to stress. The cited works include studies of Rasavaha Srotas, assessment of student stress with Deha-Manas Prakriti, reviews of stress management through Ayurveda, and reviews of stress as a Hetu in disease. [12–17,26–28] The distinctive feature of the present work is the simultaneous use of a Student Stress Scale and three Ayurvedic outcome domains related to Rasavaha Srotas/Rasa Dhatu.

6.7 Strengths

- A relatively substantial sample of 222 undergraduate students was assessed using the same protocol.
- Stress and three distinct Ayurvedic outcome domains were assessed in the same participants.
- The study used a predefined categorical stress scale and explicit severity ranges for Ayurvedic scores.
- The primary associations were tested statistically rather than being based only on descriptive observations.
- The study provides a practical framework for future interdisciplinary research in Kriya Sharir.

6.8 Limitations

- The cross-sectional design prevents determination of temporal sequence and causality.
- The sample was limited to undergraduate students and therefore may not represent other age groups or populations.
- The study relied substantially on questionnaire-based and subjective symptom assessment.
- No biochemical or objective stress biomarkers such as serum cortisol, heart-rate variability or inflammatory markers were included.
- Potential confounders such as diet, sleep, BMI, academic year and family history were recorded but the primary analysis presented in the dissertation did not use multivariable adjustment.
- The Student Stress Scale source and its item selection should be clearly documented and appropriately referenced in the final journal submission.

• *Ethics committee approval/registration details were not stated in the accessible methodology section of the dissertation and should be inserted in the manuscript if available.*

7. CONCLUSION

Among the 222 undergraduate students studied, perceived stress was common according to the Student Stress Scale, with 65% classified as having a lot stress and 9% as having extreme stress. Moderate Rasavaha Srotas Dushti and moderate Rasa Dhatu Kshaya Lakshanas were the predominant severity categories.

A statistically significant association was observed between SSS category and Rasavaha Srotas Dushti Lakshanas ($\chi^2=17.129$, $p=0.001825$), as well as between SSS category and Rasa Dhatu Kshaya Lakshanas ($\chi^2=45.1809$, $p<0.00001$). No significant association was found between SSS category and Rasa Dhatu Vriddhi Lakshanas ($\chi^2=0.1485$, $p=0.997375$).

Within the limits of the cross-sectional design, these findings support an association between higher perceived stress and greater severity of selected Rasavaha Srotas and Rasa Dhatu Kshaya symptoms. The results are compatible with the Ayurvedic concept that mental factors such as Chinta may influence Rasavaha Srotas and Rasa Dhatu. They should not, however, be interpreted as proof that stress directly causes Rasavaha Srotas dysfunction.

8. IMPLICATIONS AND FUTURE SCOPE

Routine screening for perceived stress may be considered in undergraduate student health programmes. The dissertation proposes health-promoting approaches such as Dinacharya, Pranayama, meditation, adequate sleep, Sattvika Ahara, Abhyanga, counseling and appropriate Rasayana-oriented support. These measures may be investigated prospectively rather than assumed to be effective on the basis of the present observational findings.

Future studies should use larger and more diverse samples, longitudinal designs, validated psychometric instruments, standardized Ayurvedic assessment protocols, inter-rater reliability testing and objective physiological markers. A prospective study could examine whether reduction in stress scores is followed by reduction in Rasavaha Srotas/Rasa Kshaya symptom scores. Multivariable analysis should also be used to evaluate the influence of sleep, diet, BMI, academic stage and other potential confounders.

9. DECLARATIONS

Ethics approval: The dissertation records written consent for participation. Ethics committee approval/IEC number was not identifiable in the accessible methodology and should be added here before journal submission if such approval was obtained.

Consent for publication: Not applicable to identifiable individual data in this manuscript.

Conflict of interest: To be declared by the authors.

Funding: No external funding was reported in the dissertation; this should be confirmed by the authors before submission.

Data availability: The underlying dissertation contains the master chart. Availability of participant-level data should be stated according to institutional and ethical requirements.

Author contribution: To be completed according to the target journal's authorship policy.

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