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# Academic Procrastination and the Architectural Learning Environment among Students with Hearing Disabilities: A Multidisciplinary Perspective

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## Abstract

The current study aimed to reveal the relationship between the architectural educational environment and academic procrastination among students with hearing impairments enrolled in integration programs in the Najran region, by adopting a multidisciplinary perspective that combines architectural studies with educational and social sciences. The study adopted a descriptive approach and was applied to a sample of 109 students with hearing impairments, with an average age of 13.0 years and a standard deviation of 1.2, enrolled in integration programs in schools. Data were collected using a questionnaire designed to measure students' perceptions of the architectural educational environment and their level of academic procrastination. The results showed a correlation between certain characteristics of the architectural educational environment, such as spatial organization, visual clarity, ease of movement, and the quality of the spatial experience within classrooms, and students' levels of academic procrastination. The results also indicated that architecturally inappropriate educational environments may be associated with higher levels of academic procrastination, while visually supportive educational environments that take into account the needs of students with hearing impairments contribute to enhancing academic engagement and reducing procrastination behaviors. The study emphasizes the importance of considering the architectural dimension of the educational environment when planning and designing inclusive schools, thereby supporting positive academic behavior and achieving the principle of equal educational opportunities.

**Keywords:** *Architectural educational environment; Academic procrastination; Students with hearing impairments; Inclusion programs; Najran region*

## Introduction

In recent decades, education has undergone fundamental changes in its philosophy and practices. The learning process is no longer viewed as a purely cognitive activity, but rather as a comprehensive human experience shaped by complex interactions between individuals and their physical and social environments. This shift has contributed to a growing interest in studying the architectural educational environment as an active element in shaping learners' educational experiences and academic behaviors, given its role in regulating attention, enhancing motivation, supporting self-regulation, and reducing negative behaviors within the educational context (Barrett et al., 2019; Thompson & Hodge, 2019; Woolner, 2015).

Recent literature in the fields of educational architecture and environmental psychology indicates that characteristics of the built environment, such as spatial organization, lighting quality, visual clarity, ease of movement, and accessibility, directly and indirectly influence students' academic behavior (OECD, 2018; Shields & Synnot, 2016). Multiple studies have shown that inappropriate educational environments can lead to increased mental distraction, decreased concentration, and poor commitment to academic tasks, contributing to the emergence of avoidance behaviors that negatively affect learning outcomes (Ellis & Tod, 2018).

In this context, studies of visual perception and instructional design confirm that the quality of the visual experience within educational spaces contributes to directing attention and organizing cognitive processing by reducing distractions and achieving spatial and visual consistency, which positively

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reflects on the continuity of academic task performance (Mayer, 2020). . This dimension is particularly important in inclusive educational environments that include students who rely more heavily on visual channels for learning and communication.

Among the academic behaviors that have received widespread attention in educational and psychological literature is academic procrastination, which is defined as the repeated tendency to delay the performance of academic tasks despite the individual's awareness of the negative consequences of doing so (Steel, 2007). Numerous studies have pointed to the link between academic procrastination and lower academic achievement, higher levels of anxiety and stress, and poor self-regulation and time management skills (Klassen et al., 2010; Steel & Ferrari, 2013; Kim & Seo, 2015). Recent studies have also shown that academic procrastination is a form of avoidance behavior associated with feelings of alienation and weak academic belonging, and that this behavior may be reinforced in educational environments that lack adequate support and organization (Hammad & Awed, 2023).

Despite this accumulation of research, the majority of studies have focused on explaining academic procrastination from an individual psychological perspective, emphasizing personality traits, motivation, and emotionality, while environmental and contextual factors have received relatively less attention. However, recent research trends have begun to reconsider this monolithic approach, emphasizing that academic procrastination cannot be understood in isolation from the context in which an individual learns, and that the educational environment may play a pivotal role in promoting or reducing this behavior (Steel & Klingsieck, 2016). Contemporary theoretical models suggest that poor organization and clarity in the educational environment may increase cognitive load and weaken the ability to initiate and persist in tasks, thereby reinforcing the tendency to procrastinate and avoid (Savalei & Tuerlinckx, 2009).

Studies of executive organization highlight that planning, attention control, and time management are mediating mechanisms that explain the transfer of the educational environment's impact on academic behavior. In environments that lack structural organization and visual support, the efficiency of executive functions declines, which is reflected in task procrastination and difficulties in completion (Diamond, 2013; Zimmerman, 2008; Zimmerman & Schunk, 2011). Applied studies on groups with special needs support this argument, showing that the development of executive organization contributes to reducing avoidance behaviors associated with academic performance (Hammad, 2020).

This issue is particularly important when addressed in the context of inclusive education, especially with regard to students with hearing impairments. This group relies heavily on visual input and clear spatial organization in the learning and communication process, making the architectural learning environment a critical factor in the quality of their educational experience (Luckner & Cooke, 2010). Studies in the field of deaf and hard-of-hearing education have shown that poorly designed classrooms, poor lighting, and unclear lines of sight can lead to increased cognitive load, reduced academic engagement, and poor commitment to educational tasks (Kritzer, 2009).

Some studies also suggest that students with hearing impairments may be more prone to psychological stress and negative behaviors in unsupportive environments, which may be reflected in self-esteem and academic behavior, including a tendency to procrastinate (Hammad & Awed, 2020). In a related context, studies on the development of self-regulation and attention in children with hearing impairments have shown that supportive and structured educational environments contribute to improving task management skills and reducing avoidance behaviors associated with academic performance, thereby enhancing learning engagement and reducing procrastination (Hammad & Shalhoub, 2024).

With the rapid digital transformation, it has become necessary to consider the overlap between digital behaviors and academic behavior within educational environments. Recent studies have shown that unregulated digital use patterns may be associated with poor attention and increased impulsive behaviors, which negatively affect academic task management (Hammad et al., 2024). This overlap suggests that the educational environment, as a physical and organizational space, may play a protective role in regulating academic behavior if it is designed in a way that minimizes distractions and promotes organization.

Despite this accumulation of research addressing the psychological, emotional, and organizational aspects associated with the academic behavior of individuals with hearing impairments, a review of the literature reveals a clear research gap in the scarcity of studies that have addressed the architectural educational environment as an explanatory variable for academic procrastination in this group (Pino & Mortari, 2014), especially in general education and in the context of inclusion programs. Most previous

studies have focused on individual and emotional factors, without linking them to the characteristics of the built environment that forms the daily framework for the learning experience.

In Saudi Arabia, with the increasing expansion of inclusive education programs in line with the objectives of the Kingdom's Vision 2030, there is a need for local field studies based on the actual educational reality, especially in areas that are experiencing a recent expansion of inclusive programs. International reports indicate that transferring study results without taking into account spatial and cultural specificities may limit the effectiveness of educational interventions (UNESCO, 2020; World Health Organization, 2022). This need is even greater in areas such as Najran, where students with hearing impairments enroll in inclusion programs between the ages of 10 and 15, a critical developmental stage in which long-term self-regulation and academic behavior patterns are formed.

Based on this, the current study seeks to examine the relationship between the architectural educational environment and academic procrastination among students with hearing impairments enrolled in inclusion programs in the Najran region, relying on a multidisciplinary perspective that integrates educational architecture with psychological and social sciences. The study seeks to answer the following questions:

What is the level of awareness of students with hearing impairments of the architectural educational environment in inclusive programs in the Najran region?

What is their level of academic procrastination in the 10-15 age group?

Is there a statistically significant relationship between the characteristics of the architectural educational environment and their level of academic procrastination?

Which elements of the architectural environment are most closely related to academic procrastination from the perspective of students with hearing impairments?

## Methodology

### Study Design

The study relied on a descriptive correlational approach, as it was appropriate for the nature of the research, which aimed to describe the level of both the architectural educational environment and academic procrastination among students with hearing impairments, and to reveal the nature of the relationship between them without interfering with or manipulating the variables. This design is one of the most commonly used in educational and psychological research because it provides an accurate scientific understanding of the relationships between variables in their natural context.

### Participants

The study population consisted of students with hearing impairments enrolled in inclusion programs in public schools in the Najran region of Saudi Arabia. A purposive sample of 109 male and female students was selected due to the specificity of the target group and the difficulty of accessing it using traditional random sampling methods, in addition to the need for specific characteristics that are compatible with the study objectives. The average age of the sample was 12.4 years with a standard deviation of 1.6, which reflects acceptable homogeneity of the sample within the targeted educational stage. The inclusion criteria were: that the student be officially diagnosed with a hearing impairment, that they be enrolled in an educational integration program, and that they be able to understand the questionnaire items using visual aids or appropriate educational support. Exclusion criteria included students with multiple disabilities that could affect the interpretation of the results, or those whose parents did not consent to participation.

### Data Collection

After obtaining official approvals from the relevant educational authorities, the study tools were applied during the first semester of the 2025/2026 academic year. Data collection was carried out within schools, with the assistance of inclusion program teachers and special education specialists, using visual and illustrative aids to ensure that students understood the questionnaire items. The researcher emphasized the voluntary nature of participation and explained the study's objectives and procedures in simple language appropriate to the characteristics of the sample. Informed written consent was obtained from the students' parents, as the sample consisted of minors. The researchers also emphasized the confidentiality of the data, which would be used only for scientific research purposes, and the right to withdraw from the study at any time without any consequences.

**Study Instruments**

The study data were collected using a standardized questionnaire prepared specifically to achieve the research objectives, in light of an extensive review of educational and psychological literature and previous studies related to the study variables, and in line with the characteristics of students with hearing impairments enrolled in inclusion programs. The questionnaire was based on a number of theoretical models and applied studies that addressed the educational environment, academic procrastination, and self-regulation among general education and disability groups, such as studies by Barrett et al. (2019), Woolner (2015), and Steel (2007), Kim & Seo (2015), in addition to studies that addressed academic behavior and self-regulation among individuals with hearing impairments (Steel, 2007; Kim & Seo, 2015). Steel, 2007; Kim & Seo, 2015), in addition to studies that addressed academic behavior and self-regulation among individuals with hearing impairments (Luckner & Cooke, 2010; Kritzer, 2009; Hammad, 2020).

The questionnaire consisted of two main parts, as follows:

*First: Architectural Educational Environment Scale*

This scale aims to measure the perceptions of students with hearing impairments regarding the characteristics of the architectural educational environment in inclusive schools. Its items were prepared in light of the literature on educational architecture and environmental psychology, particularly studies that emphasized the role of spatial design and visual clarity in supporting attention and academic behavior (Barrett et al., 2019; OECD, 2018, 2021; Woolner, 2015). The scale consists of 18 items, distributed across a range of dimensions: spatial organization of the classroom, visual clarity and lines of sight, natural and artificial lighting, ease of movement and accessibility, and architectural design suitability for hearing impairment needs. Examples of scale items include: The classroom layout helps me see the teacher and the blackboard clearly; the lighting in the classroom provides a comfortable environment that helps me concentrate; the classroom design allows for easy movement without obstacles.

*Second: Academic Procrastination Scale*

This scale aimed to identify the level of academic procrastination among students with hearing impairments. It was constructed in light of the literature that addressed procrastination as an avoidance behavior associated with poor self-regulation and attention (Steel, 2007; Klassen et al., 2010; Kim & Seo, 2015), as well as recent studies that addressed procrastination and avoidance behaviors among individuals with hearing impairments (Hammad & Awed, 2023; Hammad, 2020). The scale consists of 15 items focusing on multiple behavioral indicators, such as postponing schoolwork, difficulty starting tasks, poor adherence to school schedules, and a tendency to avoid academic activities. Examples of items on this scale include: I procrastinate on my schoolwork until the last minute, I find it difficult to start school tasks, and I postpone some school activities even if they are important. The questionnaire for both scales used a five-point Likert scale, with responses ranging from (Strongly disagree, Disagree, Neutral, Agree, Strongly agree) and scores are given from 1 to 5 depending on the degree of response. The architectural educational environment scale ranges from 18 to 90 points. The academic procrastination scale ranges from 15 to 75 points. High scores on the Architectural Educational Environment Scale indicate a positive perception of the quality of the educational environment, while high scores on the Academic Procrastination Scale indicate a high level of procrastination among students.

The content validity was verified by presenting the questionnaire to a group of expert reviewers specializing in special education, educational architecture, and psychological measurement, and the proposed modifications were made to ensure the clarity of the items and their suitability for the target group. The stability coefficient was calculated using Cronbach's alpha, and the stability values were high, reaching: ($\alpha = 0.91$) for the architectural educational environment scale. ($\alpha = 0.88$) for the academic procrastination scale. These values indicate a high level of internal consistency, confirming the validity of the tools for field application and statistical analysis.

**Statistical Analysis**

The data were entered and analyzed using SPSS version 21, according to the study questions, as follows: To answer the first question regarding students' level of awareness of the architectural educational environment, the following were used: arithmetic means, standard deviations, relative weights, and response level classification (high, medium, low). To answer the second question regarding the level of academic procrastination, the same descriptive statistical methods were used. To

answer the third question regarding the relationship between the architectural educational environment and academic procrastination, the Pearson Correlation Coefficient was used. Before conducting the correlation analysis, the assumptions of normal data distribution were examined and found to be appropriate for the use of parametric statistical tests. The level of statistical significance was set at ($\alpha \leq 0.05$).

**Results**

The category length criterion was adopted to interpret the arithmetic means on the five-point Likert scale, as follows: Category length = (5 − 1) ÷ 3 = 1.33. Thus, the classification is as follows: From 1.00 to 2.33 = low level, from 2.34 to 3.67 = medium level, from 3.68 to 5.00 = high level

**Results of the first question**

What is the level of awareness of students with hearing impairments of the architectural educational environment in integration programs in the Najran region?

To answer this question, the arithmetic means, standard deviations, and relative weights of the sample's responses on the architectural educational environment scale were calculated, as shown in Table (1).

**Table 1. Descriptive Statistics of the Architectural Learning Environment Scale**

| Dimension | Mean | Standard Deviation | Relative Weight | Level |
|---|---|---|---|---|
| Classroom Spatial Organization | 3.12 | 0.94 | 62.4% | Moderate |
| Visual Clarity and Sightlines | 3.05 | 0.89 | 61.0% | Moderate |
| Lighting and Ventilation Quality | 3.21 | 0.91 | 64.2% | Moderate |
| Ease of Movement and Accessibility | 2.98 | 0.96 | 59.6% | Moderate |
| Design Suitability for Hearing Disability Needs | 2.87 | 0.99 | 57.4% | Moderate |
| Overall Scale | 3.05 | 0.93 | 61.0% | Moderate |

The results in Table 1 show that students with hearing impairments had an average level of awareness of the quality of the architectural educational environment, with an overall scale average of 3.05.

**Results of the second question**

What is the level of academic procrastination among students with hearing impairments in inclusive programs in the Najran region? To answer this question, the arithmetic means, standard deviations, and relative weights of the sample's responses on the academic procrastination scale were calculated, as shown in Table 2.

**Table 2 .Arithmetic means and standard deviations for the academic procrastination scale (n = 109)**

| Dimension | Mean | Standard Deviation | Relative Weight | Level |
|---|---|---|---|---|
| Delay in Completing Assignments | 3.42 | 0.88 | 68.4% | Moderate |
| Difficulty Initiating Tasks | 3.35 | 0.91 | 67.0% | Moderate |
| Poor Adherence to Deadlines | 3.28 | 0.93 | 65.6% | Moderate |
| Avoidance of Academic Activities | 3.31 | 0.90 | 66.2% | Moderate |
| Overall Scale | 3.34 | 0.91 | 66.8% | Moderate |

The results in Table 2 indicate that the level of academic procrastination among students with hearing impairments was moderate to high, with a mean score of 3.34 for the scale as a whole.

**Results of the third question**

Is there a statistically significant relationship between the architectural educational environment and academic procrastination among students with hearing impairments? To answer this question,

Pearson's correlation coefficient was used to detect the relationship between the two variables, as shown in Table 3.

**Table 3 .Correlation coefficients between the architectural educational environment and academic procrastination**

| Variables | Correlation Coefficient (r) | Significance Level (p) |
|---|---|---|
| Architectural Learning Environment × Academic Procrastination | -0.46 | 0.01 |

The results in Table 3 show a statistically significant negative correlation at the 0.01 level. According to Cohen's criteria, the correlation coefficient (-0.46) represents a moderately strong negative relationship, indicating that as students' perception of the quality of the architectural educational environment improves, their level of academic procrastination decreases.

**Chi-square ($\chi^2$) test results**

To verify the significance of the sample's responses to the scale items and their non-randomness, the chi-square test was used. The $\chi^2$ values ranged from 11.90 to 200.70, all of which were statistically significant at the $\alpha \leq 0.01$ level, reflecting substantial differences in students' response patterns to the questionnaire items.

Thus, it can be said that the results of the study showed that the level of awareness of students with hearing impairments of the architectural educational environment was moderate, and the level of academic procrastination was moderate, tending to be high. The results showed a statistically significant, moderately strong negative correlation between the two variables, reflecting the link between the quality of the architectural educational environment and lower levels of academic procrastination among students.

**Discussion**

The results of the current study contribute to a deeper understanding of the role of the architectural educational environment in shaping the academic behavior of students with hearing impairments, by providing a balanced reading of the reality of this environment and its relationship to academic procrastination in the context of inclusion programs. The results showed that students' perception of the quality of the architectural educational environment was moderate, while academic procrastination was moderate to high, with a moderately strong negative correlation between the two variables.

This general pattern of results is consistent with previous studies on the impact of the educational environment on academic behavior, which confirmed that supportive school design can contribute to improved attention and engagement in learning (Barrett et al., 2019; Woolner, 2015). However, the results of the current study differ somewhat from some of these studies in terms of the degree of effect, as the perception of the architectural educational environment did not reach a high level. This difference is most likely due to the specificity of the inclusive education context for students with hearing impairments, as the availability of buildings or facilities does not necessarily mean that they are functionally adapted to meet their visual and communication needs.

In this context, the results are consistent with those of studies focusing on the education of deaf and hard-of-hearing students, which have shown that poor visibility or inappropriate classroom layout can increase cognitive load and limit the effectiveness of academic interaction (Kritzer, 2009; Luckner & Cooke, 2010). Compared to studies involving students without disabilities, the impact of the architectural environment on the hearing-impaired group appears to be more sensitive to subtle details in design, which explains why the level of perception remains within the average range.

As for academic procrastination, the moderately high level is consistent with a broad body of literature that has addressed procrastination as an avoidance behavior associated with poor self-regulation and attention (Steel, 2007; Kim & Seo, 2015). This result is consistent with recent studies of groups with special needs, which have suggested that unsupportive educational and environmental pressures may contribute to a tendency to postpone academic tasks (Hammad & Awed, 2023). However, the results of the current study differ from some studies that reported very high levels of procrastination, a difference that may be attributed to differences in age and educational context, as students in middle school integration programs may receive a degree of support that partially limits the exacerbation of this behavior.

The negative correlation between the architectural educational environment and academic procrastination is particularly important in interpreting the results in an integrative manner. The moderate strength of the relationship revealed by the study indicates that improving the quality of the educational environment does not necessarily eliminate academic procrastination, but it does contribute to a significant reduction in it. This is consistent with theoretical propositions that view the educational environment as a facilitator or inhibitor of academic behavior, rather than a direct causal variable (OECD, 2018).

This finding is also supported by studies that have examined the role of executive functioning as a mediating mechanism between the environment and academic behavior. Diamond (2013) has shown that disorganized environments can impair executive functioning, which is reflected in difficulty initiating tasks and procrastination. In the same vein, recent studies have shown that improving self-regulation and attention in children with hearing impairments contributes to reducing avoidance behaviors associated with academic performance (Hammad & Shalhoub, 2024; Hammad, 2020). Taken together, these findings confirm that the impact of the architectural educational environment does not operate in isolation from cognitive psychological processes, but interacts with them dynamically.

When linking the various sections of the results, a coherent picture emerges, namely that the average level of perception of the architectural educational environment is associated with the persistence of academic procrastination at the same average level. This indicates that the current educational environment in inclusive programs provides a minimum level of support, but still needs qualitative development to respond more accurately to the needs of students with hearing impairments, especially with regard to visual aspects and spatial organization.

At the practical level, the study's findings have important implications for practitioners in the field of education. They suggest that improving the architectural educational environment should be seen as a practical approach to supporting positive academic behavior, rather than merely a cosmetic measure. School designers and decision-makers can benefit from these findings when developing inclusive school design standards, while teachers' awareness of the impact of spatial organization, lighting, and classroom layout may contribute to improving students' daily learning experience.

For researchers, the study's findings open the door to future studies that adopt more in-depth methodological designs, such as longitudinal or quasi-experimental studies, to examine the causal impact of the architectural learning environment on academic procrastination. There is also a need to incorporate mediating variables, such as self-regulation or academic motivation, to understand the mechanisms through which environmental effects are transmitted to behavior, a direction that can build on recent studies addressing academic behavior and psychological stress among individuals with hearing impairments (Hammad & Awed, 2020; Hammad et al., 2024).

Despite the importance of the results, it is necessary to point out a number of limitations that may affect their generalization. The first limitation is that the study relies on a descriptive correlational approach, which does not allow for the establishment of direct causal relationships. Furthermore, the use of a questionnaire may make the results susceptible to self-response biases, especially among an age group that is still in the process of cognitive development. In addition, the study did not distinguish between different degrees of hearing impairment, which may affect the level of perception of the educational environment and academic behavior. Furthermore, the fact that the study was limited to the Najran region calls for caution when generalizing the results to other educational contexts with different cultural or organizational characteristics.

Nevertheless, the current study contributes to filling an important research gap by linking the architectural and behavioral dimensions in the context of inclusive education and provides a more comprehensive view of the experience of students with hearing impairment in school, going beyond the traditional focus on purely academic aspects.

**Conclusions**

The current study found that students with hearing impairments' perception of the quality of the architectural educational environment in inclusive programs in the Najran region was moderate, indicating that these environments provide a basic level of support but still need more precise qualitative development, especially in aspects related to visual clarity, spatial organization, and ease of movement within classrooms. In the same context, the results showed that the level of academic procrastination among students was moderate to high, reflecting real challenges related to time management and starting academic tasks.

The study also revealed a moderately strong negative correlation between the quality of the architectural educational environment and the level of academic procrastination, meaning that improving the educational environment is associated with a significant reduction in procrastination levels, although it is not sufficient on its own to eliminate it. This finding confirms that the architectural educational environment is an important supporting factor for positive academic behavior, working in tandem with other psychological and educational factors.

These results highlight the importance of adopting a holistic view of inclusion programs, going beyond the traditional focus on curricula and teaching methods to include the physical environment as an active element in shaping the experience of students with hearing impairments and its direct and indirect impact on their academic behavior and engagement in learning.

**Recommendations**

Based on these findings, a set of practical and research recommendations emerge that can contribute to the development of educational practices and enhance the quality of scientific research in this field. At the level of educational practice: Develop standards for the design of inclusive educational environments that take into account the visual and organizational needs of students with hearing impairments, especially with regard to clarity of sightlines and reduction of visual distractions. Train teachers and school administrators to deal consciously with the classroom environment by training them to reorganize classroom spaces and lighting in a way that supports attention and reduces avoidance behaviors. Incorporate the architectural dimension into individual educational support plans for students with hearing impairments, so that the educational environment is an essential part of the support system. Raise awareness among educational decision-makers of the importance of investing in the architectural educational environment as a gateway to improving academic behavior and not merely a formal element. At the scientific research level: Conducting experimental or quasi-experimental longitudinal studies to examine the causal effect of the architectural educational environment on academic procrastination among students with hearing impairments. Study mediating variables, such as self-regulation, academic motivation, and attention, to understand the mechanisms through which the effects of the educational environment are transmitted to academic behavior. Distinguish in future studies between different degrees of hearing impairment, as this may have an impact on the perception of the educational environment and academic behavior. Expand the scope of research to include multiple educational and geographical contexts within and outside the Kingdom to verify the generality of the results. Combine quantitative and qualitative tools, such as observation and interviews, to gain a deeper understanding of students' experiences within inclusive educational environments.

**Author contributions**

Author Contributions: Conceptualization: N.A and H.A. Data Collection: N.A and H.A.. Data Analysis: N.A and H.A. Resources: N.A and H.A. Writing—Original Draft Preparation: N.A and H.A. Writing—Review & Editing: N.A and H.A. Funding Acquisition: H.A.

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**Institutional Review Board Statement**

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

**Data availability**

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

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