ORIGINAL ARTICLE

Motivational regulation after an eight-week peer-mentoring programme in Colombian youth swimmers: A pre-post pilot study

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ABSTRACT

Purpose. To estimate regulation-specific pre-post changes after an eight-session peer-mentoring programme in Colombian youth swimmers and assess robustness to missing items, distributional assumptions and participant inclusion. Materials and methods. This single-group pilot study analysed all 29 swimmers aged 10–14 years with paired Sport Motivation Scale (SMS-28) records. Seven four-item regulations were scored on the original 1–7 metric when at least three items were available. Mean changes received bias-corrected and accelerated bootstrap 95% confidence intervals (CIs; 20,000 resamples), paired *t* tests and Cohen's d_z. Monte Carlo sign-flip tests (200,000 resamples), Wilcoxon tests, 20% trimmed-mean tests, Holm correction, reliability estimates and inclusion sensitivities assessed robustness. Results. Five of 1,624 item responses were missing (0.31%). Changes were small and imprecise: intrinsic motivation to know +0.27 (95% CI [−0.11, 0.75]; d_z = 0.22), intrinsic motivation to accomplish +0.29 (95% CI [−0.27, 0.70]; d_z = 0.22), intrinsic motivation to experience stimulation −0.01 (95% CI [−0.26, 0.21]; d_z = −0.02), identified regulation −0.10 (95% CI [−0.54, 0.36]; d_z = −0.08), introjected regulation +0.26 (95% CI [−0.39, 0.82]; d_z = 0.15), external regulation +0.11 (95% CI [−0.47, 0.52]; d_z = 0.08), and amotivation +0.28 (95% CI [−0.43, 0.90]; d_z = 0.15). All Holm-adjusted primary *p* values were 1.00. Omitting two paired records changed intrinsic-accomplishment *p* from .24 (*n* = 29) to .02 (*n* = 27). The age-eligible sensitivity was unchanged. Conclusions. The programme coincided with no clear regulation-specific motivational shift. Complete inclusion and theory-consistent scoring reversed the former favourable conclusion, supporting controlled, fidelity-monitored evaluation rather than causal claims.

Keywords: self-determination theory, adolescent athletes, swimming, programme evaluation, sport psychology, intervention fidelity.

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INTRODUCTION

Motivation in youth sport is not a single quantity. Self-determination theory distinguishes intrinsic motivation, progressively internalised extrinsic regulations, controlled regulations and amotivation; these forms differ in their implications for persistence and well-being (Deci & Ryan, 2000). The original Sport Motivation Scale operationalises three intrinsic regulations, knowledge, accomplishment and stimulation, together with identified, introjected and external regulation and amotivation (Pelletier et al., 1995). Collapsing these regulations into one 'extrinsic' or 'total motivation' score can conceal theoretically important movement along the continuum, a recurring measurement problem in sport research (Clancy et al., 2016).

This distinction matters during adolescence, when withdrawal from organised sport reflects interacting personal, relational and contextual factors rather than a single motivational deficit (Crane & Temple, 2015). More self-determined motivation has been associated prospectively with persistence, whereas amotivation and controlled processes can accompany dropout (García Calvo et al., 2010). Competitive youth swimming may intensify these tensions because high training demands and surveillance can coexist with limited athlete voice (Lang, 2010). Recent swimming research likewise shows that instructional climates differ in how strongly they support autonomy, competence and relatedness (Minkels et al., 2023).

Mentoring is a plausible relational strategy, but benefits are neither automatic nor uniform. Meta-analytic evidence across youth settings suggests modest average effects that depend on programme structure, relationship quality and implementation (DuBois et al., 2011; Raposa et al., 2019). Sport-specific mentoring remains underdeveloped, with calls for clearer conceptualization, reciprocal learning and stronger evaluation (Leeder et al., 2022; Lefebvre et al., 2020). Athletes can also receive simultaneous mentoring from coaches, peers and family members, complicating attribution to one programme (Petersen et al., 2023).

Mechanistically, mentoring may be useful when observable mentor behaviours support autonomy, competence and relatedness. A recent review of self-determination-theory interventions in adolescents found promising but heterogeneous evidence and highlighted the need for stronger designs and implementation reporting (Barbosa Cano & Gomez-Baya, 2025). Reviews in sport and organised physical activity reach a similar conclusion: autonomy-supportive strategies can improve motivation, but effects vary by context, behaviour and delivery (Manninen et al., 2022; Mossman et al., 2024). Coaching models predict that autonomy support operates through psychological-need satisfaction (Mageau & Vallerand, 2003), and longitudinal sport evidence links perceived autonomy support with persistence (Pelletier et al., 2001). Dropout, however, develops over time and cannot be inferred from an immediate questionnaire (Sarrazin et al., 2002).

The present study addressed an underrepresented Latin American club setting after a sixteen-session group peer-mentoring programme had been delivered. The purpose was to estimate pre–post change separately for all seven SMS-28 regulations using every paired record and to test whether conclusions were robust to missing responses, non-normal change distributions, one age-eligibility deviation and two records omitted from a legacy comparison sheet. The expectation was that intrinsic and identified regulations would increase, while controlled regulations and amotivation would not. Given the uncontrolled design, all estimates were interpreted as temporal change coincident with the programme, not as programme effects.

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MATERIALS AND METHODS

Study design and participants

This was a retrospective reanalysis of prospectively collected data from a single-group pre–post pilot intervention. Reporting was informed by Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) for non-randomised evaluations, the Template for Intervention Description and Replication (TIDieR) for intervention description and Strengthening the Reporting of Observational Studies in Epidemiology (STROBE), whose checklist was requested by the target journal (Des Jarlais et al., 2004; Hoffmann et al., 2014; von Elm et al., 2007). The study was not preregistered and had no control group or follow-up assessment.

The source workbook contained 29 swimmers with both pre- and post-intervention questionnaires from one competitive swimming club in Medellín, Colombia. Raw ages ranged from 10 to 14 years (mean [*M*] = 12.69, standard deviation [*SD*] = 1.20; median = 13, interquartile range [IQR] = 12–14): one swimmer was aged 10 despite the original criterion of 11–14 years. The source workbook did not contain a dedicated self-reported sex variable; therefore, sex distribution is not used as an analytic or demographic variable in the present report. All 29 paired records were retained because the reanalysis sought complete accounting and no source-level exclusion rationale was documented. A sensitivity analysis excluding the age-10 record tested the eligibility deviation.

Participants had reportedly completed at least six months of competitive-swimming training and more than 80% of mentoring sessions. Recruitment was intentional and restricted to active club swimmers whose parent or legal guardian provided written consent and who provided written assent. No sample-size calculation preceded this completed pilot dataset; analysis therefore focused on estimation precision and robustness.

Study organisation and intervention

The programme comprised eight weekly group, two per week, sixteen sessions in total of 20–25 minutes integrated into regular training across eight consecutive weeks. An experienced swimmer acted as the peer mentor. Sessions used guided dialogue, practical exercises, mentor narratives, feedback and group reflection. The immediate post-test was administered during the eighth session. Table 1 provides the reproducible content available from the intervention record. Formal session-level fidelity ratings, quantitative attendance by participant, adverse-event monitoring and mentor-training documentation were not available for reanalysis.

Table 1. Eight-week peer-mentoring curriculum. Each week has two sessions lasted 20–25 minutes.

Week	Theme	Core content
1	Introduction and baseline	Introductions, group icebreaker, programme expectations and SMS-28 pretest
2	Effective communication	Non-verbal communication, barriers in swimming and guided reflection
3	Sport stories	Mentor narrative, athlete narratives and identification of shared themes
4	SMART goals	Conversion of a general swimming aim into a specific, measurable goal
5	Competition experiences	Mentor account, structured analysis of challenges and practical advice
6	'Pool of life'	Individual drawing, peer sharing and group reflection
7	Future-self interview	Written questions, paired exchange and group reflection
8	Career timeline and post-test	Progress timeline, small-group sharing, closure and SMS-28 post-test

Outcome measure and scoring

Participants completed the Spanish SMS-28 before the first session and during the final session. Spanish validation research supports the seven-regulation structure, although measurement invariance was not

tested in this small Colombian swimming sample (Núñez et al., 2006). Each regulation comprised four items scored from 1 (*does not correspond at all*) to 7 (*corresponds exactly*): intrinsic motivation to know (items 2, 4, 23, 27), intrinsic motivation to accomplish (8, 12, 15, 20), intrinsic motivation to experience stimulation (1, 13, 18, 25), identified regulation (7, 11, 17, 24), introjected regulation (9, 14, 21, 26), external regulation (6, 10, 16, 22), and amotivation (3, 5, 19, 28). Although the revised Sport Motivation Scale (SMS-II) is available, the historical dataset was collected with the SMS-28 and was scored accordingly (Pelletier et al., 2013).
A regulation score was the mean of its items when at least three of four responses were observed; complete-item scoring was examined as a sensitivity analysis. No 'general motivation' total was calculated because summing qualitatively different regulations lacks a validated interpretation. An intrinsic composite, autonomous and controlled composites, and the conventional self-determination index were treated as exploratory only.

Statistical analysis

For each regulation, pretest, post-test and post-minus-pre change scores were summarised. Mean-change uncertainty was quantified with participant-level bias-corrected and accelerated (BCa) bootstrap 95% confidence intervals using 20,000 resamples (Efron, 1987). Seven regulation-specific paired *t* tests were accompanied by Cohen's d_z and bootstrap intervals. Emphasis was placed on estimates and uncertainty rather than dichotomous thresholds (Cumming, 2014; Funder & Ozer, 2019).

Robustness was assessed using a two-sided Monte Carlo paired sign-flip test with 200,000 resamples, a Wilcoxon signed-rank test (Wilcoxon, 1945) and a one-sample 20% trimmed-mean test following robust-estimation procedures (Wilcox, 2012). Holm correction controlled family-wise error across the seven regulations (Holm, 1979). Shapiro-Wilk tests were applied to change scores only and used diagnostically. Internal consistency was estimated at each assessment with Cronbach's alpha and 5,000 bootstrap resamples, plus approximate standardised one-factor omega; four-item scales and n = 29 make these reliability estimates imprecise (McDonald, 1999; Revelle & Zinbarg, 2009). Diagnostics included floor/ceiling frequencies, leave-one-out dz ranges, the all-29 versus legacy-27 comparison, the age-eligible n = 28 subset, complete-item scoring and a seven-variable Hotelling omnibus test. Analyses used seed 20260805.

RESULTS

All 29 swimmers had paired questionnaires. Five of 1,624 expected item responses were missing (0.31%): two at pretest and three at post-test. The three-of-four rule retained $n = 29$ for six regulations and $n = 28$ for identified regulation because one participant had two identified-regulation items missing at post-test. Pretest alpha ranged from .69 to .86 and post-test alpha from .69 to .88; approximate omega ranged from .70 to .89. Participant-level ceiling frequency was highest for intrinsic stimulation (20.7% at both assessments), indicating reduced upward measurement room for some swimmers.

Table 2 and Figure 1 show that every BCa confidence interval crossed zero. The largest standardised positive estimates were for intrinsic knowledge ($d_z = 0.22$) and intrinsic accomplishment ($d_z = 0.22$); both were small and imprecise. Intrinsic stimulation and identified regulation had near-zero negative estimates. Amotivation increased by 0.28 points, but its interval ranged from −0.43 to 0.90. Every Holm-adjusted primary paired-*t* and sign-flip *p* value was 1.00. The global seven-regulation change profile was also unclear, Hotelling $T^2 = 7.76$, $F(7, 21) = 0.86$, $p = .55$.

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Table 2. Regulation-specific pre-post estimates on the 1-7 SMS-28 scale. Positive values indicate higher post-test scores. Holm adjustment covers seven paired t tests.

Regulation	n	Pre *M* (*SD*)	Post *M* (*SD*)	Mean Δ [BCa 95% CI]	t (*p*; Holm *p*)	*dz* [95% CI]
IM knowledge	29	5.38 (1.43)	5.65 (1.37)	0.27 [−0.11, 0.75]	1.21 (.24; 1.00)	0.22 [−0.15, 0.55]
IM accomplishment	29	5.42 (1.29)	5.71 (1.37)	0.29 [−0.27, 0.70]	1.20 (.24; 1.00)	0.22 [−0.24, 0.64]
IM stimulation	29	5.73 (1.38)	5.72 (1.44)	−0.01 [−0.26, 0.21]	−0.12 (.91; 1.00)	−0.02 [−0.40, 0.36]
Identified	28	5.08 (1.21)	4.98 (1.20)	−0.10 [−0.54, 0.36]	−0.42 (.68; 1.00)	−0.08 [−0.46, 0.32]
Introjected	29	4.04 (1.43)	4.30 (1.57)	0.26 [−0.39, 0.82]	0.83 (.41; 1.00)	0.15 [−0.24, 0.54]
External	29	4.22 (1.36)	4.34 (1.48)	0.11 [−0.47, 0.52]	0.45 (.65; 1.00)	0.08 [−0.31, 0.50]
Amotivation	29	2.78 (1.34)	3.06 (1.41)	0.28 [−0.43, 0.90]	0.83 (.41; 1.00)	0.15 [−0.24, 0.55]

Note. IM = intrinsic motivation; *M* = mean; *SD* = standard deviation; Δ = post-test minus pretest mean change; BCa = bias-corrected and accelerated; CI = confidence interval; *n* = number of paired observations; d_z = Cohen's standardised mean change, calculated using the standard deviation of paired change scores. The *t*-test probabilities are two-sided. Holm-adjusted probabilities account for the seven regulation-specific tests. Degrees of freedom are 28 for regulations with *n* = 29 and 27 for identified regulation with *n* = 28.

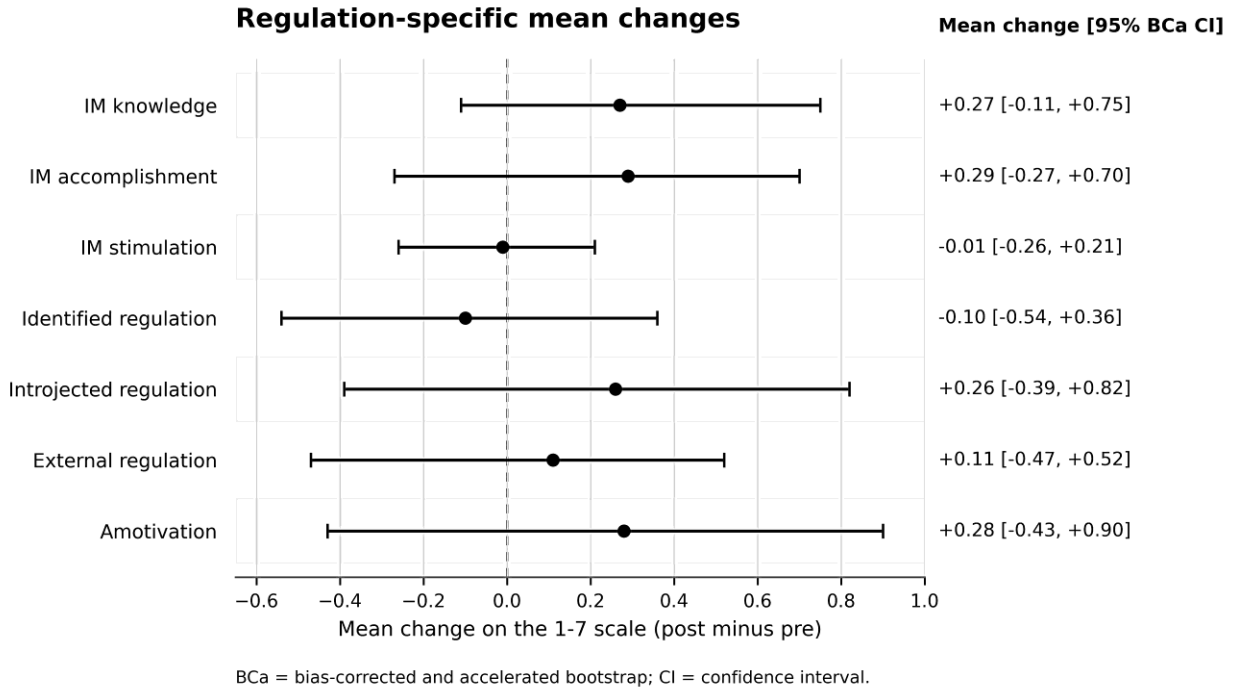

Figure 1. Mean regulation-specific changes with 20,000-resample BCa 95% confidence intervals. The dashed line indicates no change.

Sign-flip and Wilcoxon tests did not identify a regulation-specific change after correction. A 20% trimmed analysis of intrinsic accomplishment yielded an unadjusted $p = .03$ and trimmed change of +0.42, but Holm-adjusted $p = .24$; this isolated result did not alter the primary conclusion. The intrinsic composite changed by +0.18 (95% CI [−0.14, 0.44]; $p = .26$; $d_z = 0.22$), while the self-determination index changed by −0.46 (95% CI [−2.20, 1.22]; $p = .61$; $d_z = -0.10$). Complete-item scoring produced the same interpretation.

Participant inclusion was consequential. With all 29 swimmers, intrinsic accomplishment changed by +0.29 ($p = .24$; $d_z = 0.22$) and the intrinsic composite by +0.18 ($p = .26$; $d_z = 0.22$). Reproducing the legacy 27-case selection yielded +0.48 ($p = .02$; $d_z = 0.46$) and +0.28 ($p = .05$; $d_z = 0.40$), respectively. Excluding the age-10 swimmer gave +0.27 ($p = .28$; $d_z = 0.21$) for intrinsic accomplishment and did not change any conclusion. Leave-one-out d_z ranges otherwise remained small to moderate.

DISCUSSION

The expectation of increased intrinsic and identified regulation was not supported. Across all 29 paired records, mean changes were small, uncertainty intervals crossed zero, and no primary result survived correction. This does not prove that peer mentoring is ineffective. It shows that this dataset did not reveal a clear motivational shift separable from sampling variation, time, regular training, repeated testing or other uncontrolled influences. It also provides no evidence about persistence or dropout, which were not measured.

One explanation is intervention specificity. The curriculum combined communication, sport stories, SMART goals, competition reflection and future-self activities, but the surviving records did not demonstrate a consistent autonomy-supportive behaviour-change protocol. Mentoring programmes generally show more dependable benefits when objectives, mentor preparation, relationship processes and implementation are explicit (DuBois et al., 2011; Raposa et al., 2019). Sport mentoring scholarship similarly emphasises conceptual clarity and reciprocal learning (Leeder et al., 2022; Lefebvre et al., 2020). Without dose and fidelity data, it is impossible to distinguish insufficient potency from variable receipt or delivery.

The programme may also have targeted broad reflection rather than the mechanisms specified by self-determination theory. Reviews indicate that autonomy-supportive interventions can improve motivation, but their effects vary with setting and implementation (Barbosa Cano & Gomez-Baya, 2025; Manninen et al., 2022; Mossman et al., 2024). Future versions should operationalise meaningful choice, rationale provision, non-controlling language, competence-relevant feedback and relatedness support. Psychological-need satisfaction should be measured as a mediator, and mentor influence should be separated from the coach-created climate and other support figures (Mageau & Vallerand, 2003; Petersen et al., 2023).

Measurement sensitivity was limited at the top of the scale. Intrinsic stimulation averaged approximately 5.7 of 7 and 20.7% of swimmers were at the participant-level ceiling at each assessment. Ceiling effects may attenuate detectable improvement, although they cannot explain the unclear identified-regulation estimate or the uncertain rise in amotivation. Future evaluations should retain regulation-specific SMS outcomes while adding need satisfaction, perceived mentor support, enjoyment, intention to continue, session attendance and actual season-to-season retention.

The inclusion audit is the study's strongest methodological contribution. Selecting 27 of 29 paired cases converted two intrinsic estimates from non-significant to nominally significant. Because the omitted cases had less favourable changes and no exclusion reason was documented, the selection was not innocuous. Small pilot studies are especially vulnerable to this instability: one or two records can change the apparent narrative. Transparent flow accounting, participant-level exclusion reasons and analysis of every eligible paired record are therefore essential.

Strengths include recovery of all item responses, theory-consistent seven-regulation scoring, very low missingness, bootstrap confidence intervals, distributionally robust checks, family-wise error control, reliability diagnostics, an omnibus profile test and explicit inclusion sensitivities. These steps correct the legacy approach, which had combined four amotivation items with extrinsic regulation and then summed all 28 items into an uninterpretable total.

The limitations remain substantial. A one-group pre-post design cannot separate programme-associated change from maturation, season phase, coaching, concurrent training, expectancy, social desirability, regression to the mean or questionnaire familiarisation. The convenience sample was small and drawn from

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one club; there was no preregistration, control group, follow-up, verified fidelity or direct measure of feasibility, needs, well-being, performance or retention. One participant was outside the originally stated age range. The SMS-28 version was not validated specifically in Colombian swimmers aged 10–14, and four-item reliability estimates were imprecise. The sex imbalance precluded defensible subgroup inference. These constraints make the findings preliminary and non-causal.

A definitive evaluation should prospectively register one primary regulation or mediator, use a concurrent comparison group, preferably cluster-randomised across training groups or clubs, record attendance and fidelity, and include immediate and season-end follow-up. Sample-size planning should target precision around the smallest effect of practical interest rather than the observed pilot effect. Consistent with pilot-study guidance, nominal statistical significance should not determine progression (Eldridge et al., 2016; Lee et al., 2014). Qualitative process data could clarify how young swimmers interpret mentoring and whether a peer mentor differs meaningfully from coaching or psychological-skills education.

CONCLUSIONS

An eight-session peer-mentoring programme in one Colombian swimming club coincided with no clear change across seven SMS-28 regulations. Adjusted primary tests were non-significant and confidence intervals remained compatible with small improvement and small deterioration. Including all 29 paired records reversed the favourable narrative obtained from a legacy 27-case subset, whereas excluding the single age-10 record did not change interpretation. The defensible contribution is preliminary and methodological: youth-swimming mentoring warrants further evaluation, but future claims require prospectively specified scoring, complete inclusion accounting, verified implementation, behavioural or retention outcomes and a controlled design.

AUTHOR CONTRIBUTIONS

All authors meet the criteria for authorship in accordance with established ethical guidelines. Contributions are specified according to the CRediT (Contributor Roles Taxonomy) as follows:

Conceptualisation: Andrés Ramírez, Camilo Alexander Botero Gaviria, Cristian Andrés Ramírez Pineda, William Arley Salas Suárez, Diego Andrés Tuberquia. Methodology: Andrés Ramírez, Camilo Alexander Botero Gaviria, Cristian Andrés Ramírez Pineda, William Arley Salas Suárez, Diego Andrés Tuberquia. Formal analysis: Andrés Ramírez. Investigation: Camilo Alexander Botero Gaviria, Cristian Andrés Ramírez Pineda, William Arley Salas Suárez, Diego Andrés Tuberquia. Data curation: Andrés Ramírez, Samuel José Gaviria-Alzate. Writing – original draft: Andrés Ramírez, Samuel José Gaviria-Alzate. Writing – review & editing: Andrés Ramírez, Samuel José Gaviria-Alzate. Supervision: Andrés Ramírez: Samuel José Gaviria-Alzate.

All authors have critically reviewed and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

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CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this manuscript.

ETHICS APPROVAL

The study was approved by the Bioethics Committee of Universidad de San Buenaventura, Medellín, Colombia, under Act 9 of 2024 (2 October 2024). Written informed consent was obtained from a parent or legal guardian, and written assent was obtained from every participant before enrolment. Trial registration: This completed study was retrospectively registered on ClinicalTrials.gov NCT07769541, after completion of participant enrolment, data collection and analysis. Registration was undertaken for transparency and should not be interpreted as prospective registration or preregistration.

DATA AVAILABILITY

Aggregate results, analysis code, figures and documentation will be archived in an open Zenodo record (DOI: https://doi.org/10.5281/zenodo.21923975). Participant-level data are not openly deposited because participants are minors from one club and residual re-identification risk remains. Deidentified participant-level data may be considered upon reasonable request, subject to institutional and ethics approval and an appropriate data-access agreement.

AI USE DISCLOSURE

In accordance with current publishing ethics and transparency recommendations, artificial intelligence (AI)-assisted software was used for language editing, code-syntax support, formatting and consistency checks. No AI tools were used in the generation of scientific content, including the study design, data collection, analysis, interpretation of results, or the formulation of conclusions. The authors retain full responsibility for the content of the manuscript and confirm its originality, integrity, and accuracy.

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