

The influence of personality traits on physical fitness and physical education course scores among college students

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Abstract:

Given the well-documented decline in physical fitness (PF) levels among college students and the widely acknowledged significance of physical education course scores (PECS) for their holistic well-being. This study systematically investigated the predictive roles of personality traits in physical fitness (PF) and physical education course scores (PECS) among Chinese undergraduates. Methods: A cross-sectional survey was performed among 1,059 junior-year students from three universities. Personality was measured via the Mini-IPIP, PF was evaluated through standardized national fitness tests, and PECS were retrieved from official academic records. Analyses regarding Pearson correlations and hierarchical multiple regression were utilized for data processing with gender incorporated as a covariate for statistical control. Results: The results demonstrated that Extraversion and Conscientiousness served as robust positive predictors of both PF and PECS in both single-dimension and full Big Five models. The sociability and vitality inherent to extraverted individuals, coupled with the self-discipline and goal-oriented mindset of conscientious individuals, collectively facilitate consistent engagement, effective training, and improved performance. Openness showed no significant predictive power, potentially due to the standardized, technique-focused nature of the PE curriculum. While Neuroticism and Agreeableness exhibited significant effects in initial regressions, their predictive power attenuated in the full model, suggesting that Extraversion and Conscientiousness explained a substantial portion of the variance, potentially masking their unique contributions. Conclusions: Extraversion and Conscientiousness emerge as key personality traits associated with superior physical fitness and higher physical education course scores among Chinese college students. These findings highlight the importance of incorporating personality into the design of PE program. Recommendations include implementing differentiated instruction tailored to students' personality profiles, such as promoting teamwork for extraverts and providing goal-setting support for those with lower conscientiousness. Future research should delve into the mediating mechanisms and utilize longitudinal designs to establish causality and broaden generalizability.

Key Words: - Personality Traits, Physical Fitness, Physical Education, Five Factors Personality

Introduction

Physical Education (PE) courses in higher education play a pivotal role in fostering students' Physical Fitness (PF) and cultivating their lifelong healthy habits. The World Health Organization (WHO, 2020) recommends that university students engage in a minimum of 150 minutes of moderate-intensity physical activity per week. The Physical Education Course Score (PECS) encapsulate students' performance and grades in PE, encompassing their theoretical knowledge, proficiency in practical skills, class participation, attitude, and engagement in extracurricular physical activities. PF tests evaluate core physical indicators including endurance, strength, speed, and flexibility, serving as a critical metric for assessing students' fitness levels and athletic potential, as well as overall physical health status (Liu, 2022; Wang, 2021).

Previous research has demonstrated the multifaceted benefits of PE for young people's physical and mental well-being (Roccliffe et al., 2024). College students' PF constitutes a fundamental determinant of their performance in physical education and sports, exerting profound impacts on their health, learning efficiency, academic achievement, and overall quality of life and work (Hong et al., 2024; Wang, Choi, & Lu, 2024). Conversely, declining PF increases the risk of chronic health conditions such as obesity, cardiovascular diseases, thereby diminishing quality of life and work. In China, PF testing is incorporated into the academic assessment system to ensure students maintain vitality and competitiveness. Research indicates that regular PE participation enhances physical health without exerting adverse effects on academic performance (Lambert et al., 2024). Despite overall improvements in PF scores among Chinese college students, a grade-dependent decline in fitness levels has been widely observed. For example, one university reported a 17.53% failure rate on PF tests among students over a two-year period (Chen & Ma, 2023).

This suggests that college students' PF and physical activity are shaped by multiple factors, warranting in-depth investigation. The university years represent a critical developmental stage marked by continued physical maturation and the gradual stabilization of personality traits, while retaining a degree of malleability. Compared with students in primary and secondary education, university students enjoy greater autonomy in course selection and participation in physical activities, rendering their engagement in PE particularly susceptible to individual personality traits and intrinsic motivation. Personality traits figure prominently in shaping participation, persistence, interpersonal interactions, and performance in physical activities and sports (Bühler et al., 2024; Hopwood, 2025; Kang et al., 2023), providing a theoretical foundation for understanding individual differences (Alderotti et al., 2023; Tao et al., 2022). Grounded on the Big Five personality traits model - which conceptualized human personality along five fundamental dimensions: Extraversion, Agreeableness, Conscientiousness, Neuroticism/Emotional Stability, and Openness (collectively abbreviated as OCEAN) - existing research identifies Conscientiousness as a key predictor of academic performance (Mammadov, 2022; Bahçekapılı & Karaman, 2020; Gatzka, 2021; Kuśnierz et al., 2020; Sapanıcı & Güler, 2021). Additionally, Extraversion and Conscientiousness have been identified as predictors of athletic success (Khan et al., 2016; Shuai et al., 2023; Yang et al., 2024).

Existing research on the relationship between personality traits, PF and PECS remains relatively sparse, particularly when distinguished from overall academic performance. The majority of existing literature focus exclusively on elite athletes rather than the general undergraduate population, and variations in sample characteristics, sporting activities, and cultural contexts have contributed to mixed findings (Piepiora, 2021; Zar et al., 2022; Piepiora, 2024). Certain traits may also exhibit complex or contradictory effects depending on the specific context. Consequently, for ordinary undergraduate populations, especially within China, systematic research exploring the direct associations between personality traits, PF, and PECS remains conspicuously scarce. Therefore, the specific relationships between the Big Five personality dimensions and college students' PF and PECS remain incompletely understood.

This study aimed to examine the predictive roles of the Big Five personality dimensions - Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness - on PF and PECS among Chinese college students. By addressing critical research gaps in the existing literature, this research seeks to offer a novel perspective from personality psychology for understanding their PF status. To address these research gaps and achieve this objective, this study adopted a quantitative, cross-sectional approach. Data were collected from Chinese university undergraduates to assess their personality traits, physical fitness, and physical education course scores. Subsequently, statistical analyses, including correlation and regression, were employed to examine the hypothesized associations. By elucidating the specific relationships between personality traits, PF, and PECS, this study offers empirical evidence supporting the application of the Big Five personality framework in the research and practice of personality education.

Material & methods

This study utilized a cross-sectional design with proportional stratified sampling across three universities in Zhengzhou. Standardized instruments were employed to assess personality, PF, and PECS. Detailed procedures and measurement protocols are described in the following sections.

Participants and Data collection

Proportional stratified sampling was employed to initially recruited 1,212 junior-year undergraduate students from three universities in Zhengzhou. Following the exclusion of incomplete or invalid responses, a total of 1,059 valid cases (representing an 87.3% response rate) were retained for analysis. Participants, aged 19 - 21 years, comprised 49.7% female students, were enrolled in mandatory physical education courses, and possessed complete PF records.

Data were gathered via a mixed online and offline approach across three universities. Participants completed the Mini-IPIP questionnaires either through online platforms or during supervised classroom sessions, following informed electronic consent procedures. Students also self-reported their performance on PF and PECS tests, drawing upon standardized university assessments.

Instruments

Personality traits were assessed using the validated Chinese version of the MINI-IPIP, a 20-item short-form instrument designed to measure the Big Five personality traits: Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness (Donnellan et al., 2006). Each trait was assessed using four items, each rated on a 5-point Likert scale, with negatively worded items reverse-scored. The MINI-IPIP has demonstrated acceptable internal consistency and robust convergent validity in prior studies. The Chinese version has also shown satisfactory reliability and validity (He, 2015; Wang et al., 2017).

PF was assessed using standardized national tests, including the standing long jump, 50-meter run, 800/1000-meter run, 1-minute sit-ups/pull-ups, vital capacity, and seated forward bend. All procedures adhered to the Chinese University Student Physical Fitness Test Standards to ensure comparability across participants.

PECS reflected students' academic performance in physical education courses. The evaluation incorporated attendance, theoretical knowledge, practical skill proficiency, and overall performance in physical activities. Scores were obtained from official university records and confirmed through instructor reporting.

Data Analysis

Data were analyzed using IBM SPSS Statistics version 21.0. Descriptive statistics were computed for all study variables, and Pearson correlations were used to examine the associations among the variables. Continuous predictors were standardized, and sex (0 = female, 1 = male) was included as a covariate in all models. Hierarchical multiple regression analyses were conducted with PF and PECS as the dependent variables, personality traits as predictors, and gender entered as a control variable. To examine potential moderating effects, interaction terms between gender and each personality trait (Gender $\times$ Personality) were included in the regression models. Statistical significance was set at the $p < 0.05$ and $p < 0.01$ levels. Effect sizes were evaluated using standardized regression coefficients (β), the coefficient of determination (R^2), and changes in R^2 (ΔR^2).

Ethical considerations

This study received ethical approval from the MSU University Ethics Committee (Approval No. EA-L1-PGC-2025-11-0003) and was conducted in accordance with the Declaration of Helsinki and relevant institutional guidelines. Participation was voluntary, informed consent was obtained, and the confidentiality of all respondent information was strictly maintained.

Results

Despite non-normality indicated in statistical tests, this was likely attributable to the sensitivity of significance testing in large samples. Visual inspection showed that score distributions approximated a bell-shaped curve with slight skewness, common in personality data. Consequently, parametric methods were deemed appropriate for correlation and regression analyses.

Table 1 Descriptive statistics and internal consistency (N = 1059)

Variable	Mean	SD	Min	Max	Skewness	Kurtosis	α
Neuroticism (N)	2.8579	0.4948	1.50	4.75	0.248	0.114	0.697
Extraversion (E)	2.9889	0.5441	1.25	4.75	-0.098	0.115	0.761
Openness (O)	3.6733	0.5302	2.25	5.00	-0.184	-0.419	0.712
Agreeableness (A)	3.3964	0.5597	1.50	4.75	-0.232	-0.176	0.770
Conscientiousness (C)	3.5151	0.5337	2.00	5.00	-0.091	-0.069	0.751
Physical Fitness (PF)	70.7630	11.7316	35.00	97.00	-0.398	0.123	—
Physical Education Course Score (PECS)	80.4300	7.6218	60.00	99.00	-0.110	-0.007	—

As shown in Table 1, the mean scores for the Big Five personality traits in the sample ranged from 2.86 (Neuroticism) to 3.67 (Openness). Despite minor deviations indicated by formal tests, the skewness and kurtosis values were relatively small, suggesting an approximately normal distribution. Internal consistency reliabilities (Cronbach's α) ranged from 0.697 (Neuroticism) to 0.770 (Agreeableness), indicating adequate measurement reliability.

Table 2 Pearson correlations among study variables (N = 1059)

Variable	N	E	O	A	C	PF	PECS
Neuroticism (N)	—	-0.236**	-0.160**	-0.208**	-0.314**	-0.085**	-0.055
Extraversion (E)		—	0.201**	0.317**	0.253**	0.175**	0.259**
Openness (O)			—	0.200**	0.182**	0.045	0.035
Agreeableness (A)				—	0.308**	0.102**	0.206**
Conscientiousness (C)					—	0.179**	0.164**
Physical Fitness (PF)						—	0.581**
Physical Education Course Score (PECS)							—

Note. $p < 0.01$, two-tailed. Correlations without significance markings are not significant.

As shown in Table 2, neuroticism exhibited significant negative correlations with the other four personality traits and PF. Extraversion, agreeableness, and conscientiousness were positively correlated with each other, as well as with PF and PECS. In contrast, openness showed no significant correlation with either fitness or scores. PF was most strongly correlated with course scores, indicating a moderate association between personality traits and sports performance.

Table 3 Single-Variable Regression Results for PF and PECS, Controlling for Gender

Variables	Physical Fitness (PF)					Physical Education Course Score (PECS)				
	B	SE	β	p	R^2	B	SE	β	p	R^2
Neuroticism (N)	-2.487	0.740	-0.105	0.001**	0.01	-1.280	0.480	-0.083	0.008**	0.007
Extraversion (E)	3.668	0.654	0.170	<0.001***	0.028	3.524	0.416	0.252	<0.001***	0.063
Openness (O)	1.070	0.679	0.048	0.115	0.002	0.573	0.439	0.040	0.192	0.002
Agreeableness (A)	1.899	0.655	0.091	0.004**	0.007	2.592	0.418	0.190	<0.001***	0.035
Conscientiousness (C)	3.852	0.665	0.175	<0.001***	0.03	2.248	0.432	0.157	<0.001***	0.025

Note. Each row represents a separate regression model, with one personality trait and gender (male = 0, female = 1) as predictors. Coefficients presented are for the personality trait. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3 indicates that, after controlling for gender, neuroticism was negatively associated with both PF ($\beta = -0.105$, $p = 0.001$) and PECS ($\beta = -0.083$, $p = 0.008$), indicating small effects. In contrast, extraversion (PF: $\beta = 0.170$, $p < 0.001$, $R^2 = 0.028$; PECS: $\beta = 0.252$, $p < 0.001$), agreeableness (PF: $\beta = 0.091$, $p = 0.004$; PECS: $\beta = 0.190$, $p < 0.001$), and conscientiousness (PF: $\beta = 0.175$, $p < 0.001$; PECS: $\beta = 0.157$, $p < 0.001$) were positively associated with both outcomes. The R^2 values generally indicated small to moderate effects, with extraversion explaining the largest proportion of variance, particularly in PECS ($R^2 = 0.063$). Openness was not significantly associated with PF or PECS ($ps > 0.10$; $R^2s = 0.002$), indicating a negligible effect.

Table 4 Multiple Regression Results for PF and PECS

Variables	Physical Fitness (PF)				Physical Education Course Score (PECS)			
	B	SE	β	p	B	SE	β	p
Neuroticism (N)	-0.574	0.796	-0.024	0.471	0.407	0.505	0.026	0.421
Extraversion (E)	2.819	0.706	0.131	<0.001***	2.948	0.448	0.210	<0.001***
Openness (O)	-0.175	0.693	-0.008	0.800	-0.562	0.440	-0.039	0.201
Agreeableness (A)	0.073	0.708	0.003	0.918	1.538	0.450	0.113	0.001**
Conscientiousness (C)	2.971	0.730	0.135	<0.001***	1.251	0.463	0.088	0.007**
Gender (control)	-1.380	0.751	-0.059	0.066	-0.937	0.477	-0.061	0.050*
Model R^2	0.054				0.096			

*Note. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.*

Table 4 indicates that, with all personality traits entered simultaneously and gender controlled, extraversion (PF: $\beta = 0.131$, $p < 0.001$; PECS: $\beta = 0.210$, $p < 0.001$) and conscientiousness (PF: $\beta = 0.135$, $p < 0.001$; PECS: $\beta = 0.088$, $p = 0.007$) remained significant positive predictors of both outcomes. Agreeableness emerged as a significant positive predictor of PECS ($\beta = 0.113$, $p = 0.001$). Neither neuroticism nor openness emerged as significant predictors ($ps > 0.20$). The full models accounted for 5.4% of the variance in PF ($R^2 = 0.054$) and 9.6% of the variance in PECS ($R^2 = 0.096$), indicating small to moderate effect sizes. Extraversion contributed the most substantial unique variance, particularly for PECS.

Discussion

This study revealed that extraversion and conscientiousness exert significantly and positively predictive college students' PF and PECS in both unidimensional regressions and the full Big Five model. This finding aligns with established theoretical frameworks and empirical evidence (Shuai et al., 2023), potentially arising from their multifaceted advantages across various mechanisms. Analogous to physical capabilities shaping athletic success, personality plays an equally crucial role in predicting such success (Piepiora, 2021).

The predictive traits of Extraversion for PF and PECS

Extraversion is characterized by vitality, sociability, and positive affect, encompassing enthusiasm, gregariousness, assertiveness, activity levels, stimulation-seeking behavior, and positive emotions (Watson & Clark, 1997). These attributes are theoretically linked to sport performance and physical education outcomes. In group settings, extraverted individuals are more likely to experience excitement and pleasure through positive emotional feedback due to their motivational and social advantages. Moreover, they tend to exhibit greater adaptability in group activities, facilitating their performance in both testing and competitive situations. Given that physical education courses and most sports necessitate teamwork and interaction, extraverted students benefit from increased practice opportunities and skill consolidation through active collaboration and communication in class, consequently improving their PF test results and promoting sustained participation and skill development. The advantages of extraverts in sport-learning contexts have been corroborated by recent studies (Ayranci & Aydin, 2025). For instance, meta-analytic findings indicate that extraversion is significantly and positively associated with sport performance, interacting with key psychological factors such as motivation and self-efficacy to improve outcomes (Ayranci & Aydin, 2025). Furthermore, research on the relationship between personality and exercise habits suggests that extraverts are more prone to spontaneous and frequent engagement in physical activities, including higher involvement in organized sports (Engels et al., 2022). Extraversion also predicted greater enjoyment of high-intensity activities (Ronca et al., 2025).

The predictive traits of Conscientiousness for PF and PECS

Conscientiousness is widely considered the most critical personality trait for success in sports and other achievement contexts (Allen et al., 2021; Allen & Laborde, 2014). Defined by self-discipline, goal orientation, and a strong sense of responsibility, conscientiousness is associated with effective self-regulation, adherence to plans, persistence, and the avoidance of counterproductive behaviors (Roberts et al., 2005; Wilmot & Ones, 2019). Consequently, highly conscientious students maintain consistent engagement and training intensity in physical activities, demonstrating greater perseverance and reduced dropout rates. These enables them to meet instructors' requirements and complete training plans more effectively. Regarding lifestyle, highly conscientious individuals are more likely to adopt health-promoting behaviors, cultivating healthier lifestyles such as late nights, irregular eating patterns, and prolonged sedentary behavior (Gartland et al., 2021; Tokarek et al., 2023), providing favorable physiological support for training and learning. Conscientiousness also manifests in a sense of social responsibility and team contribution, as individuals high in this trait exhibit greater reliability and task

execution in collective activities. In summary, conscientiousness facilitates superior PF and sport performance among college students through self-regulation, psychological resilience, healthy lifestyle habits, strategic learning, and social responsibility. Overall, conscientiousness is consistently and positively associated with adaptive behaviors and favorable outcomes across diverse contexts (Javaras et al., 2019).

Openness: Non-Significant Predictor

Openness demonstrated no significant predictive effects either PF or PECS. These findings contradict prior research linking Openness to achievement but align with Shuai et al. (2023), who documented its context-dependent effects across varied sports. Openness, characterized by curiosity and cognitive flexibility, is theorized to facilitate the acquisition of novel skills and creative problem-solving, with established links to creativity (Abu Raya et al., 2023). The absence of significant predictive power in this study may stem from the standardized and technique-centric nature of China's college PE curriculum and PF assessments, which prioritize technical proficiency and disciplined training over creative expression. This structured environment favors Conscientiousness and Extraversion, potentially overshadowing Openness's contribution. Engels et al. (2022) found Openness unrelated to sport enjoyment, while other studies report a negative association with high-intensity exercise enjoyment (Ronca et al., 2025). Driven by physical activity, enjoyment may reduce Openness's predictive validity for PF and PECS. Though not associated with performance in this study, Openness, linked to lifelong learning and skill transfer (Ness & Riese, 2015; Sörman et al., 2024), may become more salient in future physical education reforms emphasizing inquiry and innovation. Therefore, Openness warrants further investigation in more open and exploratory sport environments.

Attenuation of Neuroticism and Agreeableness in the Full Model

In separate regressions, Neuroticism and Agreeableness boast significantly predictive effects on PF and PECS. However, in the full Big Five model, their predictive power decreased. Neuroticism ceased to be a significant predictor of either outcome variable, while Agreeableness remained a significant predictor of PECS only. This pattern likely reflects shared variance and interactive effects among personality traits, with Extraversion and Conscientiousness accounting for the majority of variance in physical fitness and course performance, thereby diminishing the unique contributions of Neuroticism and Agreeableness—consistent with findings from prior research (Shuai et al., 2023; Yang et al., 2024). Theoretically, Neuroticism, reflecting emotional instability and stress sensitivity, impairs athletic performance and learning due to anxiety, mood fluctuations, and attentional distraction (Mader et al., 2023; Shin et al., 2023). Conversely, low Neuroticism facilitates effective physical training and skill acquisition.

Agreeableness, defined by cooperation and conflict avoidance, fosters a positive classroom atmosphere and harmonious teacher-student relationships, thereby enhancing student engagement and improving subjective evaluation outcomes (Suwardi et al., 2025; Tobin & Graziano, 2020; Wilmot & Ones, 2022). While Agreeableness significantly predicted both PF and PECS in simple regressions, it only significantly predicted PECS in the full model, indicating its stronger link to social evaluations. In PF tests, performance depends more on individual factors. Therefore, Agreeableness's social advantages may be overshadowed by Extraversion's active participation and Conscientiousness's training persistence. Research shows Agreeableness enhances team effectiveness in team-oriented sports by reducing interpersonal conflict and fostering mutual support (Bradley et al., 2013; Graziano & Tobin, 2017; Han et al., 2024; Rogowska, 2020; Suwardi et al., 2025). Future studies should use team-based activities or context-rich assessments to better elucidate the mechanisms through which Agreeableness influences performance, providing a more complete picture of its role in physical education and team performance.

Limitations, recommendations, and directions for future research

The findings emphasize the imperative of integrating personality assessment into the design of university PE programs. Differentiated instruction, tailored to students' Extraversion, Agreeableness, and Conscientiousness, should be implemented. For example, students high in Extraversion and Agreeableness might benefit from increased teamwork and competition, while those low in Conscientiousness could receive goal-setting and self-monitoring training to improve exercise habits and PECS. However, this study is subjected to several limitations: its cross-sectional design prevents causal inferences. The sample, limited to undergraduates from mainland China, may restrict the generalizability of findings. Furthermore, personality was assessed via self-report questionnaires, and key mediators such as exercise motivation were not analyzed. Future research should expand the sample to diverse settings, examine mediating and moderating mechanisms (e.g., exercise motivation, self-efficacy, health behaviors), and construct a comprehensive "Personality - Psychological Mechanisms - Behavioral Habits - PF/PECS" theoretical model to elucidate the pathways through which personality traits influence physical fitness and PE performance outcomes.

Conclusions

This research investigates the role of the "Big Five" personality traits - Extraversion, Conscientiousness, Agreeableness, Neuroticism, and Openness to Experience - in predicting PF and PECS among Chinese college students. The core findings confirm that personality traits are not merely descriptive psychological constructs but key determinants of students' physical activity engagement, performance outcomes, and overall academic

achievement in PE courses, providing robust empirical evidence for optimizing physical education pedagogical practices. The findings consistently and robustly demonstrate that both Extraversion and Conscientiousness possess significant positive predictive power for physical fitness and physical education course scores. Extraversion, characterized by sociability, high energy, and positive emotions, predicts higher physical capabilities and course grades. Conscientiousness, defined by self-discipline, organization, and goal-orientation, directly correlates with sustained effort, effective self-management, and superior performance in both physical and academic aspects of physical education. Agreeableness (cooperation, empathy) shows a positive association with PECS, likely by fostering positive classroom interactions and teacher-student relationships, but with a weaker direct predictive power on PF. Neuroticism (emotional instability, stress sensitivity) exhibit no significant independent predictive power in the multivariate regression model. Openness to Experience (curiosity and innovation) demonstrated no significant predictive power for PF or PECS, potentially attributable to the characteristics of Chinese university physical education courses, which tend to emphasize skill execution, rule adherence, and structured training over creative exploration, thereby amplifying the importance of Conscientiousness in current educational contexts.

These findings hold substantial practical implications for university physical education. For instance, students high in Extraversion and Conscientiousness can be assigned activities that leverage their inherent energy, social needs, and discipline, such as team-based challenges and structured goal-setting frameworks. Conversely, students lower in Conscientiousness may require targeted interventions such as self-regulation skill training, habit formation guidance, and progress monitoring to enhance their persistence and consequently improve both their physical fitness and course scores. By recognizing and leveraging these personality differences, university physical education can evolve into a more inclusive, effective, and holistic educational endeavor, not only promoting physical health but also enhancing academic achievement and cultivating positive lifelong attitudes towards physical activity. Future research should investigate mediating mechanisms (e.g., motivation, self-efficacy) and moderating factors (e.g., activity types, teaching styles). Longitudinal studies are essential to establish causality and assessing interventions. The ultimate goal is to develop a comprehensive "Personality - Psychological Mechanisms - Behavioral Habits - PF/PECS" model. In summary, this study highlights the crucial role of personality in physical education and advocates for the implementation of tailored teaching strategies to healthier, more engaged, and successful university individuals.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author(s) used ChatGPT in order to check and correct grammar, and to improve sentence fluency and readability. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

Conflicts of interest

The authors declare no conflicts of interest.

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