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Nutritional Literacy and Knowledge of Bodybuilding Athletes and Coaches in Guilan Province, Iran: A Cross-Sectional Study

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Introduction: Nutritional literacy plays a fundamental role in promoting healthy dietary behaviors and optimizing athletic performance. Despite its importance, limited evidence is available regarding the nutritional literacy of bodybuilding athletes and coaches in Iran. Therefore, this study aimed to assess the nutritional literacy and knowledge of bodybuilding athletes and coaches in Guilan Province, Iran.

Methods: This cross-sectional study included 447 bodybuilding athletes and coaches who completed the Evaluation Instrument of Nutrition Literacy on Adults (EINLA) questionnaire. Descriptive statistics were used to summarize participants' characteristics and nutritional literacy status. Differences between groups were analyzed using the Mann–Whitney U test.

Results: Among the participants, 53.68% were men and 46.32% were women. The mean nutritional literacy scores were 22.35 ± 2.38 and 22.10 ± 1.73 for male and female coaches, respectively, and 21.81 ± 2.47 and 21.97 ± 2.55 for male and female athletes, respectively. Overall, only 32.92% of male coaches, 32.91% of male athletes, 17.80% of female coaches, and 31.34% of female athletes demonstrated adequate nutritional literacy. A significant difference in nutritional knowledge was observed between male and female coaches (P = 0.007). In addition, a significant difference was found between male athletes and male coaches (P = 0.001).

Conclusions: The findings indicate that the majority of bodybuilding athletes and coaches in Guilan Province, Iran, have inadequate nutritional literacy. These results highlight the need for targeted nutrition education programs to improve nutritional knowledge and literacy among members of the sports community, thereby supporting healthier dietary practices and potentially enhancing athletic performance.

Key Words: Nutrition knowledge, Resistance training, Athlete, Literacy, Coaches.

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1. Introduction

Proper nutrition and regular physical activity are among the most important determinants of health. Promoting healthy dietary behaviors alongside regular exercise is therefore considered a major public health priority (1). Adequate intake from all food groups is essential for maintaining optimal body composition, supporting physical performance, and preserving long-term health (2). For athletes, appropriate nutrition before, during, and after training and competition plays a fundamental role in maximizing performance, accelerating recovery, reducing injury risk, and maintaining overall health (2). Although general sports nutrition recommendations are well established, many athletes still rely on coaches, peers, or informal information sources rather than evidence-based nutritional guidance when making dietary decisions (1, 2).

Nutritional literacy plays a central role in shaping dietary behaviors and food choices (3). Higher nutritional literacy has been associated with greater adherence to dietary recommendations and healthier eating habits (4, 5). In athletes, adequate nutritional knowledge is particularly important because nutritional status directly influences training adaptations, recovery, body composition, and competitive performance (6, 7). Sports nutrition knowledge encompasses concepts related to energy requirements, weight management, hydration strategies, nutrient timing, recovery nutrition, and the appropriate use of dietary supplements to optimize athletic performance (8).

Despite the availability of international sports nutrition guidelines, previous studies have consistently reported insufficient nutritional knowledge and suboptimal dietary practices among athletes from different sports disciplines (9-11). Furthermore, nutritional literacy may be influenced by several individual characteristics, including age, sex, educational attainment, coaching experience, and previous participation in nutrition education programs. Identifying these determinants is essential for designing targeted educational interventions and improving athletes' nutritional behaviors (12).

Bodybuilding represents a unique athletic population in which nutritional literacy is particularly important. Compared with many other sports, bodybuilding places considerable emphasis on body composition, strict dietary regimens, rapid weight manipulation, and frequent use of dietary supplements (13). In addition, nutritional decisions in bodybuilding are often influenced by coaches, social media, and non-professional sources, increasing the risk of misinformation and unhealthy dietary practices. Therefore, evaluating nutritional literacy in this population has particular practical and public health importance (14, 15).

Although nutritional knowledge has been investigated among athletes in several countries, few studies have assessed nutritional literacy among Iranian bodybuilding athletes and coaches. Consequently, little is known about the level of nutritional literacy in this population or the demographic and professional factors associated with it. Addressing this knowledge gap is important because coaches substantially influence athletes' dietary behaviors, particularly among younger athletes, and inadequate nutritional literacy may adversely affect both athletic performance and long-term health.

Therefore, the present cross-sectional study aimed to assess the level of nutritional literacy among male and female bodybuilding athletes and coaches in Guilan Province, Iran. In addition, the study aimed to compare the nutritional literacy of bodybuilding athletes and coaches in order to provide baseline evidence for future educational interventions and nutrition promotion programs in this population. We hypothesized that nutritional literacy would differ between athletes and coaches and would be positively associated with previous nutrition-related training.

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2. Materials and methods

2.1. Study design

This cross-sectional descriptive study was conducted to assess the nutritional literacy of athletes and coaches in Guilan Province, Iran, using a standardized online questionnaire. The target population consisted of male and female athletes and coaches affiliated with sports gyms licensed by the Sports and Youth Affairs Organization of Guilan Province. To ensure geographical coverage, Guilan Province was stratified into four regions represented by the cities of Anzali, Lahijan, Fouman, and Rudbar, together with the five municipal districts of Rasht. Licensed sports gyms within these areas were identified, and eligible athletes and coaches were invited to participate in the study.

Because data collection was conducted during the COVID-19 pandemic, the questionnaire was administered exclusively online using the Porsline platform. The survey link was distributed through sports clubs, coaches, and official sports-related communication groups across the selected regions. Therefore, participant recruitment was based on voluntary participation using a non-probability convenience sampling approach.

2.2. Sample size calculation

The required sample size was determined using the Krejcie and Morgan sample size table based on the estimated population of athletes and coaches affiliated with licensed sports gyms in Guilan Province. A target sample of 600 participants (400 athletes and 200 coaches) was considered adequate for the study. A

total of 600 invitations to participate in the online survey were distributed. Of these, 447 completed questionnaires were returned and included in the final analysis (292 athletes and 155 coaches), corresponding to an overall response rate of 74.5%. Participants were eligible if they were athletes or coaches affiliated with a licensed sports gym in Guilan Province, were willing to participate voluntarily, and completed the questionnaire.

2.3. Nutritional literacy and knowledge

Nutritional literacy was assessed using the Evaluation Instrument of Nutrition Literacy on Adults (EINLA) questionnaire (16, 17). The questionnaire consists of two sections. The first section collects demographic information, including age, height, weight, educational level, training history, competitive experience, and injury history. The second section contains 35 items evaluating nutritional literacy across five domains: general nutrition knowledge (10 items), reading and comprehension skills (6 items), knowledge of food groups (10 items), knowledge of food portions (3 items), and nutrition calculations and food-label interpretation (6 items).
Each correct response receives one point, while incorrect responses receive zero points, resulting in a maximum score of 35. According to the questionnaire developers, a total score of 24 or higher indicates adequate nutritional literacy, whereas scores below 24 indicate inadequate nutritional literacy. The EINLA questionnaire was developed and validated in Turkey by Cesur et al. (16) and after translation-retranslation, it was localized and approved for the Iranian community by Hemati et al., and its reliability was reported to be 0.73 (17). Data were collected over a six-week period (October–November 2021). Before completing the questionnaire, participants were provided with information regarding the study objectives and instructions for completing the survey. Explanations of technical or sport-specific terms were included to facilitate accurate responses.

2.4. Statistical analysis

Quantitative data were summarized using descriptive statistics, including frequency, percentage, mean, and standard deviation (SD). The normality of continuous variables was assessed using the Kolmogorov–Smirnov test. Since the distribution of the study variables was not normal, comparisons between independent groups were performed using the Mann–Whitney U test. For ease of interpretation and consistency with previous studies, descriptive results are presented as mean ± standard deviation. All statistical analyses were conducted using SPSS version 26 (IBM Corp., Armonk, NY, USA) and Microsoft Excel 2021. A $P < 0.05$ was considered statistically significant.

3. Results

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Table 1. Participant characteristics (mean and standard deviation).

	Mean ± SD	
	Male	**Female**
Age (years)	27.47 ± 10.47	25.32 ± 7.84
Height (cm)	179.57 ± 9.21	167.31 ± 6.83
Weight (kg)	74.36 ± 11.42	59.63 ± 7.43

3.1. Participant characteristics

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The age, height and weight of the participants are reported in Table 1. The results showed that 53.68% of respondents were male and 46.32% were female. Additionally, 18.34% of the males were coaches and 35.34% were athletes. Likewise, 16.33% of the females served as coaches, and 29.97% as athletes. 39.14 % of the respondents had a bachelor's degree and 28.41 % had more than 5 years of practice experience. (Table 2).

Table 2. Distribution of demographic characteristics of study participants.

	Answer/level		Frequency	Percent
Gender	Male	coaches	82	18.34
		Athletes	158	35.34
	Female	coaches	73	16.33
		Athletes	134	29.97
History of illness or injury	Yes		69	15.43
	No		378	84.56
Education	Under diploma		29	6.48
	Diploma		58	12.97
	Associate degree		46	10.29
	Bachelor's Degree		175	39.14
	Master's Degree		92	20.58
	Doctorate		47	10.51
Practice time of physical exercise	None		30	6.71
	Less than 6 months		84	18.79
	6-12 months		68	15.21
	1-2 years		74	16.55
	2-3 years		27	6.04
	3-4 years		37	8.27
	5 years and more		127	28.41

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3.2. Primary outcomes

Table 3 presents the distribution of participants across nutritional literacy categories. More than two-thirds of male coaches (67.08%) and male athletes (67.09%) had inadequate nutritional literacy. Similarly, 82.20% of female coaches and 68.66% of female athletes demonstrated inadequate nutritional literacy. Only 32.92% of male coaches, 32.91% of male athletes, 17.80% of female coaches, and 31.34% of female athletes had adequate nutritional literacy.

Table 3. The cut-off point and distribution of nutritional literacy mean the percentage of study participants.

Literacy Category	Cut-off point	*n* (%)			
		Male		Female	
		Coaches	Athletes	Coaches	Athletes
Poor	less than 24	55 (67.08 %)	106 (67.09 %)	60 (82.20 %)	92 (68.66 %)
Good	24 and above	27 (32.92 %)	52 (32.91 %)	13 (17.80 %)	42 (31.34 %)

Comparisons between male and female athletes and coaches are presented in Table 4. Among athletes, significant sex differences were observed in understanding of nutritional information (P = 0.02), food group scores (P = 0.02), and food unit scores (P = 0.001). However, nutritional literacy, nutritional knowledge, calculation literacy, and food label scores did not differ significantly between male and female athletes (all P > 0.05).

Among coaches, only the nutritional knowledge subscale differed significantly between males and females (P = 0.007), whereas no significant sex differences were observed for nutrition literacy, understanding of nutritional information, food group scores, food units, calculation literacy, and food label scores (P = 0.06, P = 0.61, P = 0.96, P = 0.43, P = 0.90, P = 0.92, respectively).

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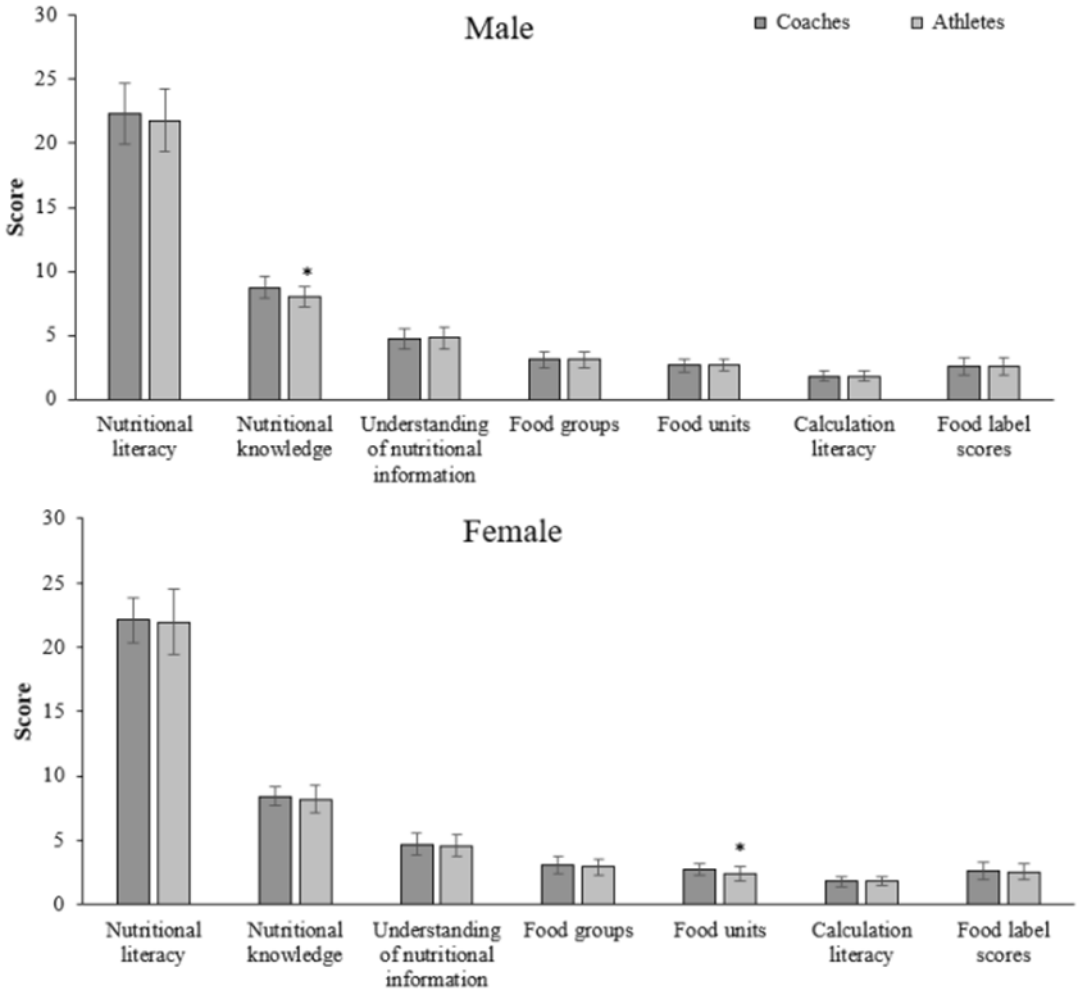
Table 4. Distribution of participants' responses regarding sources of nutritional information.

	Coaches			Athletes		
	Male	**Female**	**P Z**	**Male**	**Female**	**P Z**
Nutritional literacy	22.35±2.38	22.20±1.73	P=0.23 Z=-1.19	21.81±2.47	21.97±2.55	P= 0.46 Z=-0.72
Nutritional knowledge	8.76±0.87	8.42±0.76	**P=0.007*** Z=-2.70	7.99±0.79	8.1±1.07	P=0.11 Z=-1.57
Understanding of nutritional information	4.75±0.79	4.71±0.82	P=0.60 Z=-0.52	4.80±0.87	4.58±0.83	**P=0.02*** Z=-2.30
Food groups	3.10±0.66	3.09±0.67	P=0.89 Z=-0.12	3.11±0.65	2.94±0.62	**P=0.02*** Z=-2.19
Food units	2.64±0.48	2.73±0.44	P=0.21 Z=-1.25	2.69±0.46	2.38±0.58	**P=0.001*** Z=-4.64
Calculation literacy	1.82±0.37	1.82±0.38	P=0.90 Z=-0.12	1.83±0.37	1.82±0.37	P=0.87 Z=-0.16
Food label scores	2.60±0.68	2.64±0.71	P=0.78 Z=-0.27	2.59±0.67	2.57±0.64	P=0.86 Z=-0.17

Figure 1 compares athletes and coaches within each sex. Among males, coaches scored significantly higher than athletes only in the nutritional knowledge subscale (P = 0.001). No significant differences were observed for the remaining dimensions. Among females, a significant difference was observed only for food unit scores (P = 0.001), whereas all other comparisons were not statistically significant (P > 0.05).

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Fig 1. Comparison of the mean scores in nutritional literacy and knowledge between coaches and athletes (male and female). * Means the significant at the 0.05 level.



4. Discussion

The present study demonstrated that nutritional literacy was inadequate among the majority of bodybuilding athletes and coaches in Guilan Province, Iran. More than two-thirds of both male and female participants had insufficient nutritional literacy, with female coaches showing the lowest proportion of adequate nutritional literacy (17.8%). These findings indicate that inadequate nutritional literacy is widespread in the bodybuilding community and suggest that coaches, who are expected to serve as reliable sources of nutrition-related guidance, may themselves lack sufficient nutritional literacy. This issue is particularly important because coaches play a key role in shaping athletes' dietary behaviors, especially among young and less experienced athletes. Several factors may explain the overall low nutritional literacy observed in the present study. Although sports nutrition has received increasing attention in recent years, structured nutrition education is not routinely incorporated into coaching certification programs or athlete development systems in Iran. Consequently, many athletes and coaches may obtain nutrition information from informal sources such as social media, peers, fitness influencers, or commercial supplement advertisements rather than evidence-based educational resources (18). This challenge may be particularly pronounced in bodybuilding, where dietary manipulation, rapid body composition changes, and dietary supplement use are common practices (19). These characteristics increase the importance of adequate nutritional literacy for making informed dietary decisions and avoiding potentially harmful nutritional behaviors (20).

Our findings are consistent with those of Hosseini and Hosseini, who reported inadequate nutritional literacy among male athletes participating in the Iranian University Games and emphasized the need for both theoretical and practical nutrition education regardless of sport discipline or educational level (21). Similarly, Hasanpouri et al. reported poor nutrition-

related knowledge, attitudes, and practices among Iranian professional athletes and recommended implementing comprehensive nutrition education programs for athletes of different ages, sports disciplines, and competitive levels (22). Likewise, Spronk et al. concluded that improving nutrition-related education should be considered a priority for promoting healthy dietary behaviors and optimizing athletic performance, particularly among young athletes (23).

It should be noted that most previous studies have evaluated sports nutrition knowledge rather than nutritional literacy, whereas the present study assessed nutritional literacy using the Evaluation Instrument of Nutrition Literacy on Adults (EINLA) (24, 25). Although these constructs are conceptually distinct, both reflect an individual's ability to obtain, understand, and use nutrition-related information to make informed dietary decisions (26, 27). Therefore, findings from studies assessing nutrition knowledge provide a useful context for interpreting the present results, while direct comparisons should be made with caution.

An interesting finding of the present study was the particularly low proportion of female coaches with adequate nutritional literacy. Although the present study was not designed to determine the reasons for this finding, it may reflect differences in access to continuing professional education, evidence-based nutrition resources, or other contextual factors. Because these variables were not assessed, these explanations remain speculative and should be investigated in future studies. Nevertheless, this finding identifies female coaches as a subgroup that may particularly benefit from targeted nutrition education interventions (28).

Our findings differ from those reported by Hopper et al., who observed greater nutrition-related awareness among female athletes than males (29). Several factors may explain this discrepancy. First, the two studies were conducted in different cultural and educational settings, where access to nutrition education and sports nutrition professionals may differ substantially. Second, Hopper et al. investigated athletes from a broader sporting context, whereas the present study focused specifically on bodybuilding athletes and coaches, a population characterized by unique nutritional demands, extensive supplement use, and strong emphasis on body composition. Finally, differences in the assessment instruments may also contribute to the inconsistent findings, as our study evaluated nutritional literacy using the Evaluation Instrument of Nutrition Literacy on Adults (EINLA), whereas previous studies have often assessed sports nutrition knowledge using different questionnaires.

Adequate nutritional literacy enables athletes and coaches to obtain, understand, evaluate, and appropriately apply nutrition information in everyday dietary decisions. Previous evidence suggests that individuals with higher nutritional literacy are more likely to adopt healthier dietary behaviors and comply with nutritional recommendations, whereas insufficient nutritional literacy may contribute to inappropriate dietary practices, unhealthy weight-control strategies, and excessive reliance on dietary supplements (10, 11, 30). In bodybuilding, where nutrition is closely linked to performance and physique, inadequate nutritional literacy may have important consequences not only for athletic performance but also for long-term health.

Previous studies have also demonstrated the important influence of coaches on athletes' nutritional behaviors. Sung et al. reported that athletes coached by individuals with higher nutrition-related knowledge also demonstrated better nutrition-related knowledge themselves, suggesting that coaches play an important role in transferring nutrition-related information to athletes (31). Furthermore, despite the widespread availability of nutrition information through online platforms, athletes continue to rely primarily on coaches rather than independently seeking evidence-based information (32). Therefore, improving coaches' nutritional literacy may represent an effective strategy for enhancing athletes' nutritional behaviors and promoting healthier dietary practices throughout the sporting community.

The findings of Boucherville Pereira et al. further support the importance of formal nutrition education, showing that recreational athletes without access to nutrition professionals demonstrated lower levels of nutrition-related knowledge (33). Similarly, Lydon et al. reported that many athletes experience difficulties translating nutrition knowledge into practical dietary behaviors, emphasizing the need for educational programs that develop both knowledge and practical skills (34). Trakman et al. also highlighted the importance of using assessment tools that evaluate different dimensions of nutrition literacy and knowledge to better identify educational needs across diverse athletic populations (35).

Overall, the findings of the present study emphasize the need for structured, evidence-based nutrition education programs for both bodybuilding athletes and coaches in Iran. Such programs should focus not only on improving nutritional literacy but also on developing practical skills for applying nutrition information in everyday food choices. Because coaches represent an important source of nutrition information for athletes, incorporating nutrition education into coaching certification and continuing

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education programs may substantially improve the nutritional literacy of the bodybuilding community and ultimately contribute to healthier dietary behaviors and improved athletic performance.

5. Limitations

This study has several limitations that should be considered when interpreting the findings. First, data were collected exclusively through an online questionnaire because of the COVID-19 pandemic, which may have introduced selection bias by limiting participation to individuals with internet access and those willing to complete an online survey. Although the questionnaire link was primarily distributed through bodybuilding clubs, coaches, and sport-related social media groups in the selected regions, participation was voluntary and may not fully represent all bodybuilding athletes and coaches in Guilan Province. Second, because the questionnaire was self-administered online, participants may have consulted external sources or other individuals while completing the survey. Although respondents were instructed to answer the questions independently, compliance could not be verified, and no time limit was imposed for questionnaire completion. Third, as data collection was conducted between October and November 2021 during the COVID-19 pandemic, the recruitment strategy and participation patterns may have been influenced by the public health restrictions in place at that time.

Finally, multiple statistical comparisons were performed without formal adjustment for multiple testing. Therefore, the possibility of type I error cannot be completely excluded, and statistically significant findings should be interpreted with appropriate caution.

6. Conclusion

The results of the present study showed that bodybuilding coaches and athletes (male and female) do not have sufficient nutritional literacy and need to improve their knowledge and awareness of nutritional issues. In general, given that most athletes and coaches in sports gyms do not have sufficient nutritional literacy, it seems necessary to adopt programs and measures to increase awareness among athletes and coaches.

7. Highlights

According to the obtained results, the role of relevant organizations is prominent. It is necessary to take proper and systematic measures by employing sports nutrition specialists in the form of continuous training courses, as well as holding seminars, workshops, and knowledge-enhancing courses for athletes and coaches, expanding information related to nutritional knowledge, nutritional understanding, food groups, food units, computational literacy, and how to read food labels using cyberspace, newsletters, periodicals, etc., to take operational and effective action.

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Statements

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Conflicts of Interest

The authors declare that there is no conflict of interest.

Authors' Contributions

Conceptualization and methodology: H.A. Data collection, Formal analysis, investigation and original draft preparation: E.E. Writing - review and editing: H.A. and E.E. Supervision: H.A. All authors read and approved the final manuscript.

Ethics Approval and Consent to Participate

There was no intervention on participants. They were assured of the confidentiality of their data and participation was entirely voluntary. All collected information was used solely for research purposes, with strict adherence to privacy principle.

Artificial Intelligence

No AI platforms were used in the writing and design of this article.

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