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Analysis of Cognitive Mechanisms Regulating the Use of Dietary Supplements and Performance-Enhancing Substances in Young Iraqi Weightlifters

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A B S T R A C T

The aim of this study was to analyze the cognitive mechanisms influencing the use of dietary supplements and performance-enhancing substances among young Iraqi weightlifters. This research was descriptive-correlational and conducted using a survey method. The statistical population consisted of 376 active weightlifters across 16 cities in Iraq during the years 2023–2024. A total of 324 individuals were selected through stratified random sampling proportional to the population size. A researcher-designed questionnaire was employed to measure the variables under investigation. This questionnaire was designed to assess attitudes, perceived behavioral control, and subjective norms regarding the consumption of dietary supplements and performance-enhancing substances. The reliability of the questionnaire, confirmed through Cronbach's alpha, was above 0.70, and its validity was verified by experts in the field of sports sciences. Data were analyzed using SPSS software version 25 and Smart PLS. The results indicated positive and significant relationships between attitude ($\beta = 0.653$, $P = 0.001$), subjective norms ($\beta = 0.498$, $P = 0.001$), and perceived behavioral control ($\beta = 0.498$, $P = 0.001$) with the consumption of dietary supplements and performance-enhancing substances among young Iraqi weightlifters. Young Iraqi weightlifters are influenced by a complex array of psychological factors that drive them toward the use of dietary supplements and performance-enhancing substances, increasing the prevalence of such behaviors among these athletes. It is recommended to implement educational and awareness programs addressing the negative consequences of using performance-enhancing substances, ethical considerations, and healthier alternatives to improve the athletic performance of young Iraqi weightlifters. These initiatives aim to shift attitudes, reduce social pressures, and help athletes achieve their sports goals.

Keywords: *Theory of Planned Behavior, perceived behavioral control, attitude, subjective norms, dietary supplements, performance-enhancing substances, weightlifting.*

1. Introduction

The philosophy of winning in professional sports has expanded to such an extent that many athletes and organizations justify the means to achieve it. The use of various sciences in this regard, as well as the production and distribution of energy-enhancing drugs, further delineates the ethical boundaries between professional and amateur sports. Achieving national and global recognition, preserving past accomplishments, and standing on the championship podium compel athletes to resort to any means—ethical or unethical—when they perceive a decline in their physiological power and ability to avoid stagnation. Most male-dominated sports require high levels of strength and power (1).

The effects of specific types of performance-enhancing substances are directly related to their ergogenic properties (enhanced power, greater energy production, and better recovery), anabolic potential (increased protein synthesis, especially in muscles), and/or stimulant characteristics (enhanced focus and decreased fear), providing athletes with a competitive advantage (2). Weightlifting is among the sports typically classified within the realm of elite athletics, and athletes in this discipline are primarily assessed and evaluated based on their performance (3).

In the past decade, a series of studies has indicated a potential relationship between the use of dietary supplements and the consumption of performance-enhancing substances (4, 5). Researchers have reported that users of dietary supplements are more likely to use performance-enhancing substances due to their motivation to win and outperform others (6) and the belief that dietary supplements are effective in improving performance (7, 8). Most research suggests that athletes are more exposed to performance-enhancing substances compared to non-athletes, with higher rates of consumption among strength-based athletes (9).

Weightlifters in Iraq are among the pioneers in the misuse of performance-enhancing substances, which has escalated from a sports issue to a severe health and medical problem today (10). The role of sports in various societies and its ultimate goal—victory and success—is undeniable. Given the expansion of elite sports, the importance of winning in competitions, and achieving desirable results, understanding the factors that contribute to success, behaviors leading to failure, and the misguided strategies of some athletes can aid coaches, athletes, and teams in advancing further or preventing unethical behaviors in sports (11, 12).

Sporting success, as the primary goal of elite sports, has always been a priority for athletes, coaches, and sports researchers (13). Recent studies on elite athletes' motivations for using performance-enhancing substances have indicated that their motivations are linked to maintaining and improving physical performance, coping with psychological and social pressures, and striving to achieve psychological and social goals. Additionally, the use of performance-enhancing substances may increase under the specific conditions of elite sports, where athletes are exposed to high-performance and high-pressure psychological and social environments (14-17).

The concept of attitudes toward the use of performance-enhancing substances is one of the most significant topics discussed in relation to such use (14). Studies emphasize the importance of athletes' attitudes in deviant behaviors related to performance-enhancing substance use. Attitudes toward the use of performance-enhancing substances are defined as an individual's readiness to use such substances and prohibited methods (16), which can be related to the potential for performance-enhancing substance use behaviors and sports orientation (17).

Despite efforts to identify and control the use of performance-enhancing substances, research on the mechanisms behind their use, especially among athletes, is limited (11). Considering the information presented and the limited knowledge about the consumption of dietary and performance-enhancing substances among young Iraqi weightlifters, this study seeks to answer the question: What cognitive mechanisms drive the desire to consume dietary supplements and performance-enhancing substances among young Iraqi weightlifters? Athletes interested in weightlifting in Iraq often require increased muscle mass and strength for participation in intense strength training programs. Due to a lack of appropriate and relevant nutritional knowledge, as well as limited awareness of the side effects of prohibited substances and the regulations governing the use of performance-enhancing substances, they are likely to turn to the misuse of such substances. Therefore, obtaining the necessary information and identifying factors contributing to the intention to use dietary

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and performance-enhancing substances among Iraqi weightlifters can be valuable in planning and implementing interventions by coaches and officials.

In this context, the findings of this study can contribute to the development of knowledge in this field and provide valuable information to athletes, coaches, and officials involved in weightlifting in Iraq. Thus, analyzing the cognitive mechanisms underlying the use of dietary and performance-enhancing substances appears to be necessary.

2. Methods and Materials

2.1. Study Design and Participants

The aim of this study was to analyze the cognitive mechanisms regulating the use of dietary supplements and performance-enhancing substances among young weightlifters in Iraq. This research is a descriptive-correlational study conducted through a survey method. The statistical population included 376 active weightlifters across 17 cities in Iraq during 2023–2024, of whom 324 participants were included in the research process. Twenty-six individuals were excluded due to incomplete or inaccurate data and lack of cooperation.

In this study, attitude, perceived behavioral control, and subjective norms were considered as independent variables, while the tendency to use dietary supplements and performance-enhancing substances was the dependent variable. Based on the objectives and nature of the research, the most appropriate method for data collection was through a questionnaire. The questionnaire was designed in four sections: the first section explained the purpose of data collection and emphasized the necessity of respondents' cooperation in providing the required information. The second section included demographic questions about the respondents, such as age, height, weight, and sports history. The third section focused on the use of dietary supplements and performance-enhancing substances by the target group. The fourth section contained the operational questions of the research.

2.2. Data Collection

Since no standardized questionnaire specific to weightlifters existed for this subject, the researcher designed, developed, and prepared a checklist and questionnaire using previous research tools, expert opinions, and specialists' feedback to analyze cognitive mechanisms related to dietary supplement and performance-enhancing substance use. This self-reported, anonymous, and researcher-made questionnaire was developed based on library studies, a review of theoretical foundations, interviews with experts, and tailored to the cultural and social context of the sports community in Iraq. The questionnaire covered demographic information, three key components of the Theory of Planned Behavior (attitude, subjective norms, and perceived behavioral control), and information on the use of dietary supplements and performance-enhancing substances.

In the study by Alemi et al. (2015), the reliability of the Theory of Planned Behavior questionnaire was estimated with a Cronbach's alpha above 0.70, and its construct validity was above 0.75. For this study, the validity of the questionnaire was assessed by experts, and reliability was evaluated using Cronbach's alpha (18). To determine the consumption rate of dietary supplements and performance-enhancing substances, the dietary supplements and performance-enhancing substances questionnaire developed by Nakhai and Pakrouvan (2012) was used. This questionnaire consists of 20 questions: Questions 1–4 cover background information such as age, gender, sports history, supplement use history, and reasons for use, while Questions 5–20 focus on the consumption of dietary supplements and performance-enhancing substances, measured on a 5-point Likert scale from "Strongly Agree" to "Strongly Disagree." The reliability of this questionnaire was reported as 0.87, with a validity of 0.75 (19).

After the proposal was approved and preliminary data on young weightlifters' performance were collected, the research was explained during a briefing session organized by the Iraqi Weightlifting Federation for coaches. Details of the research process were clarified, and names, contact information, training schedules, and locations of the participants were collected for coordination. Ethical approval was obtained from the university following these preparations.

The questionnaire was translated into Arabic and validated by presenting it to ten faculty members for review. A back-translation approach was employed, ensuring that the culturally specific language was replaced with a

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universally understandable language. This process involved two faculty members at the University of Baghdad who were "blind" to the original text, ensuring cultural relevance and clarity for Iraqi athletes. Technical adjustments were made based on feedback from five active weightlifting coaches in Iraq, and their suggestions were incorporated into the final questionnaire.

To assess content validity, the questionnaire was reviewed by ten sports science faculty members to evaluate the simplicity, clarity, and relevance of the questions to the research objectives. Additionally, the grammatical structure and format of the questions were approved. Before starting the research, potential ambiguities were resolved by consulting experts, and unclear or problematic questions were revised based on their suggestions.

The final questionnaire was distributed to 20 young weightlifters who were not part of the main study to test its reliability. A Cronbach's alpha of 0.84 was obtained, indicating sufficient reliability. All components had a Cronbach's alpha above 0.70, confirming the instrument's reliability for the research.

Following verification of the questionnaire's reliability, the researcher visited participants at their training locations as previously coordinated with their coaches. The importance of the research for athletes in Iraq was explained, emphasizing that all data would remain confidential and shared only with the individual athletes upon request. Written consent was obtained from all participants, who were asked to answer the questions patiently and select responses that reflected their personal conditions and status. Completed questionnaires were collected in the presence of the researcher.

2.3. Data Analysis

Statistical analyses were conducted using SPSS version 25 and Smart PLS software.

3. Findings and Results

The youngest participants in the study were 17 years old, while the most common age group was 18 years. Participants with less than a high school diploma represented the smallest group, while those with a high school diploma were the largest. The average height of the participants, categorized by weightlifting weight classes, was very similar, with the lowest average height belonging to the 61 kg weight category. It was revealed that 52.96% of the participants used dietary supplements and performance-enhancing substances, and 83% were aware of the side effects of these substances.

Table 1

General Description of the Variables Using Descriptive Statistics

Variable	Mean	Standard Deviation	Skewness	Kurtosis
Tendency to use performance-enhancing substances	3.628	0.892	-0.722	0.358
Attitude	3.923	0.876	-0.973	1.355
Subjective norms	3.649	0.976	-0.753	0.417
Perceived behavioral control	3.990	0.877	-0.891	0.782
Intention	3.409	0.922	-0.571	0.157

Based on the values in Table 1:

1. The mean values of the study variables (tendency to use performance-enhancing substances, attitude, subjective norms, perceived behavioral control, and intention) are above the average (3). In other words, the participants rated these variables above average.
2. The standard deviation values indicate moderate variability in the data for the study variables.
3. The negative skewness values indicate that the data for these variables are inclined toward higher-than-average values, while the positive kurtosis values show a relatively flat distribution of the data for these variables. Considering the skewness and kurtosis tests (within the range of -3 to 3), the data are deemed to follow a normal distribution.

To conduct structural equation modeling (SEM), several essential assumptions were considered:

1. **Optimal Sample Size**: In this study, with a sample size of 324 participants and accounting for the ratio of sample size to observed variables, free parameters, model complexity, and maximum

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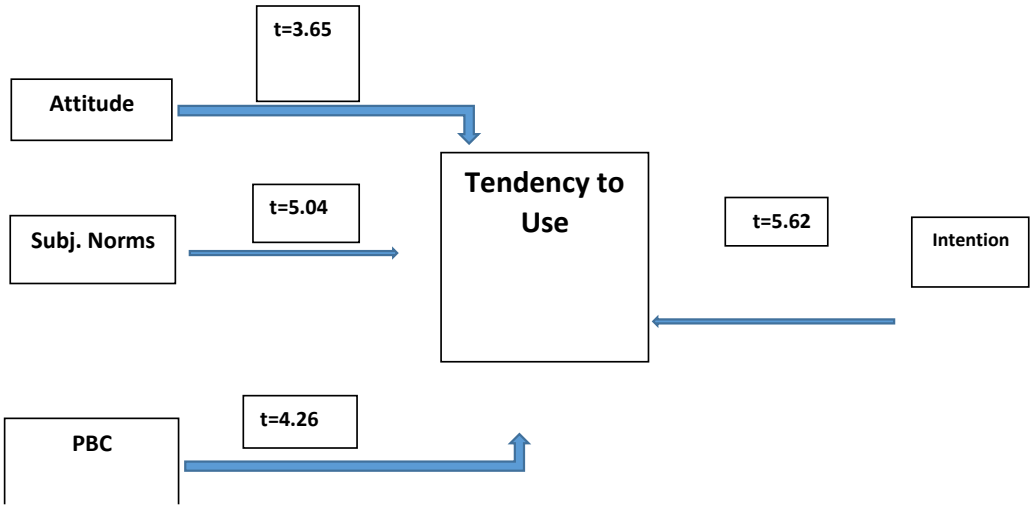
likelihood estimation (which requires a large sample size), the chosen sample size was sufficient for SEM.

2. Multivariate Outliers: Multivariate outliers were identified using the Mahalanobis distance and excluded from the analysis.
3. Multivariate Normality: The Mardia coefficient and its critical ratio were used to test multivariate normality. While normality was confirmed in most cases, for minor violations, bootstrapping was employed alongside maximum likelihood estimation to compensate for dependency on normality assumptions.
4. Multicollinearity: To assess multicollinearity between independent variables in SEM models, the Variance Inflation Factor (VIF) and Tolerance Index were used. With thresholds of Tolerance > 0.40 and VIF < 2.5, the results indicated no multicollinearity, confirming the adequacy of this assumption.

Figure 1

Structural Equation Model in Significance Mode



Based on the output from Smart PLS, the proposed model was validated. The significance values (commonly referred to as t-statistics or z-scores) exceeded the threshold of 1.96, confirming the model's validity without requiring structural modifications.

Table 2

Model Evaluation Metrics

Variable	Average Variance Extracted (AVE)	Composite Reliability	Cronbach's Alpha	Communality	Redundancy
Tendency to use performance-enhancing substances	0.874	0.856	0.852	0.169	-
Attitude	0.896	0.799	0.874	0.159	0.147
Subjective norms	0.874	0.863	0.863	0.158	0.126
Perceived behavioral control	0.856	0.893	0.896	0.198	0.214
Intention	0.850	0.896	0.819	0.199	0.136

The overall model evaluation metrics indicate that the proposed structural equation model is supported by the data. The fit indices suggest that the structural model is well-specified (Table 2).

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Table 3

Fornell-Larcker Discriminant Validity Matrix

Variables	Perceived Behavioral Control	Intention	Tendency to Use	Attitude	Subjective Norms
Perceived Behavioral Control	0.667	-	-	-	-
Intention	0.476	0.696	-	-	-
Tendency to Use	0.541	0.690	0.568	-	-
Attitude	0.645	0.426	0.522	0.701	-
Subjective Norms	0.524	0.547	0.656	0.445	0.667

High correlations among the variables (perceived behavioral control, intention, tendency to use performance-enhancing substances, attitude, and subjective norms) confirm the appropriate discriminant validity and strong model fit.

The coefficient of determination (R^2) for the tendency to use performance-enhancing substances is 0.734, indicating a good structural fit for the model (Table 3).

Table 4

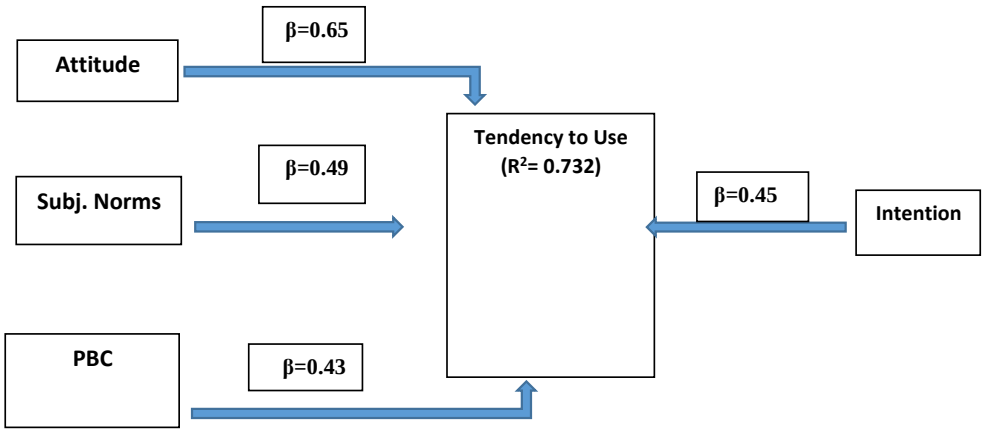
Direct Effects Between Latent Variables

Path	Path Coefficient	t-Value	Significance Level	Result
Perceived behavioral control → Tendency to use performance-enhancing substances	0.436	4.269	0.001	Supported
Intention → Tendency to use performance-enhancing substances	0.457	5.627	0.001	Supported
Attitude → Tendency to use performance-enhancing substances	0.653	3.658	0.001	Supported
Subjective norms → Tendency to use performance-enhancing substances	0.498	5.046	0.001	Supported

The results indicate significant positive correlations between the main variables—attitude, subjective norms, perceived behavioral control, and intention—and the tendency to use dietary supplements and performance-enhancing substances (Table 4).

Figure 2

Structural Equation Model in Standardized Mode



4. Discussion and Conclusion

The aim of this study was to analyze the cognitive mechanisms regulating the use of dietary supplements and performance-enhancing substances among young Iraqi

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weightlifters. The results revealed significant positive relationships between attitude (β = 0.653, P = 0.001), subjective norms (β = 0.498, P = 0.001), and perceived behavioral control (β = 0.436, P = 0.001) with the consumption of dietary supplements and performance-enhancing substances. Athletes, ranging from professionals to high school students, use performance-enhancing substances (2). Most male-dominated sports require high levels of strength and power. The effects of specific performance-enhancing substances are primarily associated with their ergogenic effects (increased power, greater energy production, and improved recovery), anabolic potential (enhanced protein synthesis, particularly in muscles), and/or stimulant properties (increased focus and reduced fear), which provide athletes with a competitive edge (2). Among sports, strength athletes have the highest consumption rates of these substances (9).

The use of dietary supplements is widespread among athletes, including weightlifters (20). In Iraq, weightlifters are pioneers in the misuse of anabolic steroids, turning this issue from a sports problem into a critical health and medical concern (10). Attitudes toward the use of performance-enhancing substances are defined as individuals' readiness to use such substances and prohibited methods (16), which can be linked to the potential for performance-enhancing behaviors and sports orientation (17).

Athletes' motivations for consuming performance-enhancing drugs are related to maintaining and improving physical performance, coping with psychological or social pressures, and striving to achieve psychological and social goals. The use of performance-enhancing substances may also increase under the specific conditions of elite sports, where athletes face high-performance and high-pressure psychological and social environments.

Direct findings matching the results of this study were not found. However, in terms of attitudes, the prior findings (3, 4, 7, 8, 14-17, 21) align with the current study. A meta-analysis of studies assessing dietary supplement use and attitudes toward performance-enhancing substances (4) reported a positive correlation between dietary supplement use and attitudes toward performance-enhancing substances.

In summary, it is likely that dietary supplement use shapes athletes' attitudes toward performance-enhancing substances, subsequently influencing their likelihood of using such substances. Athletes who use dietary supplements often consult close individuals such as friends, family, and coaches regarding their consumption (12), and are likely to discuss and receive encouragement for their use (12). Ali and Ali (2018) examined various behavioral scenarios related to supplement use among Iraqi athletes and identified a significant positive relationship between attitudes and the consumption of dietary and performance-enhancing supplements (3).

Petróczi et al. (2012) reported that athletes' attitudes are a determinant of deviant behaviors associated with performance-enhancing substances. Specifically, attitudes toward performance-enhancing substances are defined as readiness to use prohibited substances and methods (17), which can be linked to potential behaviors of performance-enhancing substance use and sports orientation (15, 17).

Garey and Dipasquale (2016) explored the effect of attitudes and social norms on dietary supplement use among weightlifters, reporting a significant positive relationship between attitudes and the use of dietary and performance-enhancing substances (22). Bagheri Sheikhan Gafsheh et al. (2021) investigated the role of the Dark Triad of personality traits and mental toughness in predicting attitudes toward performance-enhancing substances among male bodybuilders. They found that bodybuilders with Dark Triad traits exhibited more positive attitudes toward the use of banned drugs and performance-enhancing substances. Conversely, athletes with appropriate mental toughness throughout their professional careers were less likely to resort to performance-enhancing substances (21).

In explaining these findings, it can be argued that young Iraqi weightlifters may view supplements as tools to enhance sports performance, boost energy, and accelerate post-training recovery. This attitude is typically influenced by various factors such as scientific information, personal experiences, and the influence of coaches and professional athletes. Many weightlifters may believe that these substances significantly improve their performance. A positive attitude toward these supplements may stem from media information, personal experiences, and beliefs about their benefits.

According to Fishbein and Ajzen, attitudes are influenced by beliefs. In other words, an individual's belief about the outcomes of a behavior and their evaluation of these

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outcomes shape their attitude. If an individual believes that the results of a behavior are positive, they will develop a positive attitude toward that behavior.

Another explanation for the influence of the environment (in interaction with human development) on behavior, in general, and possibly the use of supplements and performance-enhancing substances, in particular, is the Theory of Mind. This theory argues that an individual's mental states (e.g., desires, beliefs, and intentions) are shaped by changes in specific brain structures (23). Structural brain changes are influenced by an individual's interactions with their environment (24, 25). Specific socio-cognitive factors examined by the Theory of Mind include parenting (25), language (26), culture (27), and mental perceptions of social interactions (i.e., social cognition). Certain factors involved in schema development can be directly assessed, while others, such as cultural norms, may dictate behavior to a certain extent.

Subjective norms are evolving and agreed-upon standards and criteria that regulate individual behaviors. They represent a fundamental component of the structure of human groups as they provide direction and motivation, organize social interactions, and make others' responses predictable and meaningful. They may lead an individual to perform or refrain from a specific behavior (28). Subjective norms are influenced by an individual's beliefs about others' expectations and their motivation to meet these expectations. If an individual perceives that people whose expectations they are motivated to meet hold a positive view of a specific behavior, a positive subjective norm may develop. Conversely, if those individuals are perceived as holding a negative view of the behavior, and the individual seeks to meet their expectations, a negative subjective norm is likely to form (29).

Implicit cultural norms and values may also contribute, particularly when individuals attempt to "save themselves" and protect their self-esteem in situations where failure is possible. Similarly, in cultures that place excessive emphasis on an outcome-oriented (ego) approach, individuals may resort to performance-enhancing substances (30). Subjective norms refer to an individual's perception of social pressure to perform or refrain from a target behavior. They are assumed to consist of two interacting components: beliefs about how others important to the individual want them to behave (normative beliefs) and evaluations of those beliefs (outcome evaluations).

The significant positive relationship between subjective norms and the consumption of dietary supplements and performance-enhancing substances aligns with the prior findings (4, 6), but contrasts with the results of one study (31). Backhouse et al. (2017) reported that the use of dietary supplements is associated with subjective norms toward performance-enhancing substances (6). Hurst et al. (2023) found that subjective norms moderate the relationship between dietary supplement use and performance-enhancing substance use (4).

In summary, athletes who use dietary supplements may perceive social group members as endorsing performance-enhancing substances, thereby increasing their likelihood of use. Petróczi and Aidman (2009) noted that performance-enhancing substance use is strongly associated with motivational climates (e.g., expectations from coaches, parents, peers, and fans), which influence athletes' ego or task orientation (16).

Espeno et al. (2024), in their analysis of dietary supplement use among health and fitness enthusiasts, reported significant relationships between behavioral intentions, perceived behavioral control, health motivation, and controlled precursors. However, subjective norms, perceived effectiveness, perceived benefits, and self-efficacy precursors were considered negligible (31).

Athletes who use dietary supplements often consult close individuals such as friends, family, and coaches, who are likely to encourage and endorse their use (Mettler et al., 2021). This finding suggests that Iraqi youth weightlifters may be influenced by those around them, especially considering that approximately 63% use dietary and performance-enhancing substances, and nearly 62% are unaware of their side effects. Social pressures to win, expectations from sports teams and organizations, and the desire of communities to celebrate athletes' victories may increase the use of performance-enhancing substances as a means of achieving competitive superiority (15).

The motivational climate created by coaches and the social approval of accelerated success among Iraqi youth weightlifters could exacerbate this trend. Subjective norms represent an individual's perception of others' opinions about a specific behavior. For instance, if an athlete believes their

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friends or teammates encourage supplement or performance-enhancing substance use, the likelihood of consumption increases. Social norms and beliefs in Iraqi society, particularly among athletes, significantly influence decisions regarding supplement and performance-enhancing substance use.

If athletes feel that their coaches, teammates, and the broader sports community emphasize the use of these substances, their likelihood of consumption rises. The influence of sports authorities and national policies may also play a role. Social pressures in weightlifting are particularly impactful. Competitive environments in weightlifting contests can further heighten the pressure to use these substances. Peer, coach, and societal pressures can significantly influence athletes' decisions. In an environment where the use of these substances is commonplace, athletes may conform to maintain their social status. This normalization of supplement and performance-enhancing substance use appears to have reduced the stigma in the Iraqi youth weightlifting community.

Perceived behavioral control relates not only to intentions but also to the actual execution of the target behavior (32), particularly when it reflects actual control rather than illusory control (Armitage & Conner, 2001). Direct influence is expected when perceived control aligns with actual behavioral control. In other words, behavior is genuinely perceived as under an individual's control.

This construct reflects an individual's belief about the ease or difficulty of performing a behavior, often derived from actual control over the behavior. Perceived behavioral control indicates the extent to which a person feels that performing or not performing the behavior is under their voluntary control. If an individual believes they lack the resources or opportunities to perform a behavior, they are unlikely to develop a strong intention, even if they hold positive attitudes and perceive social approval for the behavior (subjective norms).

Perceived behavioral control can directly and indirectly influence behavior through intentions (Safari et al., 2017). This perception is shaped by beliefs about the presence of facilitating factors, previous experiences, and anticipated outcomes. High perceived behavioral control corresponds to strong beliefs in one's ability to overcome barriers to behavior execution, while low perceived behavioral control inhibits behavior. This perception is also influenced by environmental norms and individual experiences (Safari et al., 2017).

Grist (2023), Campbell et al. (2021), Lucidi et al. (2004), and Lucidi et al. (2008) align with the results of the present study. Grist (2023) measured attitudes, subjective norms, and perceived behavioral control to assess the relationship between sports values and the psychosocial factors of anti-doping beliefs. Grist reported that perceived behavioral control against using performance-enhancing substances was predicted by task orientation and moral identity, while subjective norms against doping were influenced by individuals' entertainment preferences. Campbell et al. (2021) reported a relationship between positive attitudes, social norms, and perceived behavioral control with dietary supplement consumption (33). However, they concluded that perceived behavioral control was not influenced by attitudes or social norms. Lucidi et al. (2004) and Lucidi et al. (2008) demonstrated that attitudes, subjective norms, and perceived behavioral control significantly predicted intentions and behaviors related to dietary supplement and performance-enhancing substance use (34, 35).

To explain these findings, it can be suggested that young Iraqi weightlifters may lack sufficient information about the positive and negative effects of supplements and performance-enhancing substances. This information could include side effects, long-term consequences, and regulations regarding these substances. Additionally, the social and athletic environment of young weightlifters, such as their coaches and teammates, may significantly impact their behaviors. Encouragement or criticism regarding supplement use can play a crucial role in their decision-making processes. Furthermore, young athletes often seek new experiences and take risks. High-risk environments can influence an individual’s thoughts, emotions, and behaviors, while risk-taking itself is a characteristic of performance-enhancing substance use. Risk-taking involves purposeful engagement in behaviors that carry potential negative consequences (social, financial, interpersonal) as well as perceived positive benefits (36), which encompass socio-cognitive concepts. In the presence of peers, reward-related brain regions in adolescents are more active compared to those in adults or children (37), which may have evolutionary implications. Moreover, a supportive social

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environment can provide strong protection for youth against risky behaviors. However, "when an individual decides to engage in risky behavior, the supportive environment may not protect them from harm" (38).

Young weightlifters are often focused on improving their performance. Understanding their behaviors and decisions regarding supplement consumption can either enhance or harm their performance. It appears that young Iraqi weightlifters may lack adequate awareness and insight into their behaviors, making them susceptible to external pressures and temptations, thus limiting their ability to make informed decisions based on self-assessment.

Considering the significant positive relationships between attitudes, subjective norms, and perceived behavioral control with dietary supplement and performance-enhancing substance use among young Iraqi weightlifters, several key conclusions can be drawn. Positive attitudes toward dietary supplements and performance-enhancing substances play a central role in forming intentions and tendencies toward their use. Young Iraqi weightlifters who believe these substances enhance athletic performance, physical ability, or competitive outcomes are more likely to use them. These attitudes are often shaped by information from various sources, including media, coaches, and personal experiences. In environments where high performance is particularly valued, positive attitudes toward supplements can strongly influence consumption intentions. Young athletes may hear only the benefits of these substances while being unaware of potential negative consequences, such as health issues and ethical dilemmas. They may also believe that achieving the highest level of athletic performance is impossible without supplement use.

Subjective norms and social pressures play key roles in the consumption of dietary supplements and performance-enhancing substances. In environments where supplement use is accepted or even encouraged, individuals are strongly influenced. Within the Iraqi weightlifting community, norms that emphasize competitiveness and the need for superior performance may lead young weightlifters to perceive supplement use as essential. Support or pressure from coaches, teammates, or friends also shapes their intentions. In cultures like Iraq’s, where athletic success is highly celebrated, young weightlifters may resort to supplements to achieve success, even at the cost of health risks. In sports like weightlifting, where physical strength and endurance are critical, the belief in supplements' effectiveness can strongly drive consumption behavior.

Perceived behavioral control, or the belief in one's ability to access and consume supplements, significantly influences consumption behavior. Iraqi weightlifters who feel they can easily access and use these substances are more likely to intend to consume them. Dietary supplements are often available in convenient forms, such as pills, powders, or drinks, making their use more accessible for athletes. This ease of use can significantly enhance the intention and behavior toward consumption.

The design and implementation of educational programs in sports clubs that provide comprehensive scientific information about the negative consequences of performance-enhancing substances, their health risks, and healthier alternatives are essential for the target population. Coaches should play a more active role in changing attitudes and reducing dependency on supplements by educating athletes on scientific and ethical principles. Encouraging athletes to adopt natural and healthy methods to improve performance, such as targeted training, balanced nutrition, and improved techniques, can be effective. Psychological and social counseling is also necessary to help athletes cope with social and psychological pressures that might drive them toward performance-enhancing substances. Establishing support groups for young weightlifters where they can share experiences and benefit from the support of teammates and coaches can be beneficial.

Future research is recommended to analyze the "cultural, social, and religious factors influencing attitudes and behaviors regarding dietary supplements and performance-enhancing substances, with the moderating role of socioeconomic class among young Iraqi weightlifters."

Authors’ Contributions

S.M.M.F. conceptualized the study, designed the methodology, and was responsible for the overall direction of the research. He also contributed to data collection and the development of the researcher-designed questionnaire. H.Z. played a key role in the statistical analysis and interpretation of the data, utilizing SPSS and Smart PLS software. A.S.I. assisted in the study design and implementation, providing expertise in survey methodology and ensuring the reliability

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of the data collection process. R.B. contributed to the drafting and revision of the manuscript, ensuring clarity in the presentation of findings. All authors participated in the final approval of the manuscript and take responsibility for the integrity and accuracy of the research.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

The study placed a high emphasis on ethical considerations. Informed consent obtained from all participants, ensuring they are fully aware of the nature of the study and their role in it. Confidentiality strictly maintained, with data anonymized to protect individual privacy. The study adhered to the ethical guidelines for research with human subjects as outlined in the Declaration of Helsinki.

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