

Development of an Intervention Model for Sports Injury Prevention Behaviors in Male Bodybuilders: A KAP Theory Perspective

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Abstract: Objective: To explore the current status of knowledge, attitude, and practice (KAP) concerning sports injury prevention among male bodybuilders, analyze the interrelationships among these three dimensions, and develop an intervention model based on the KAP theory. Methods: A mixed sampling approach combining convenience sampling and snowball sampling was employed to recruit 434 male bodybuilders, who were then assessed using a self-designed KAP questionnaire (comprising 10 questions for each dimension: knowledge, attitude, and practice). Results: The mean scores for knowledge, attitude, and practice dimensions were (35.86 ± 7.55), (38.82 ± 7.61), and (37.59 ± 7.02) points, respectively, out of a possible 50. The score rate for practice was lower than that for attitude but higher than that for knowledge. Bodybuilders with a history of injury scored significantly lower in both the knowledge and attitude dimensions compared to those without such a history ($P < 0.05$). Correlation analysis revealed positive correlations among all three dimensions ($r = 0.292 \sim 0.625$, $P < 0.01$). Hierarchical regression analysis demonstrated that attitude significantly predicted practice ($\beta = 0.217$, $P < 0.001$); the Bootstrap mediation effect test indicated that attitude partially mediated the relationship between knowledge and practice (95% CI excluded 0). Conclusion: The sports injury prevention practices of male bodybuilders require enhancement, with attitude serving as a pivotal factor in behavior modification. Therefore, we have developed a four-stage progressive intervention model: "Knowledge Activation, Belief Shift, Practice and Rehearsal, Continuous Reinforcement".

Keywords: Sports injury prevention; Body builders; knowledge and attitudes; practice.

1. Introduction

Bodybuilding is all about shaping muscles and improving athletic performance. In essence, the training is marked by heavy loads, high intensity, frequent sessions, and a high degree of specialization. On top of that, this type of training system forces athletes to endure extreme loads over long periods, maintain strict control of body fat, and execute every movement with extreme precision. As a result, compared to the average gym-goer, bodybuilders run a much higher risk of sports injuries. Siewe et al. [1], Here's the revised version, following the same requirements—restructured sentences, passive-to-active conversion, natural transitions, and more conversational wording: when researchers looked at competitive and elite bodybuilders, they came up with an injury rate of 0.12 injuries per person per year. The shoulders, elbows, lower back, and knees were the spots that got hurt most often. On top of that, quite a few athletes admitted that they simply kept training even when they were in pain. A study by Hetaimish et al. [2] at a gym in Saudi Arabia further supported these results. The study found that fitness-related injuries account for 50.6% of all injuries in the gym. Again, the main problems are the shoulders, knees and lower back. Similarly, Obaidullah et al [3] found a similar pattern in Bangladesh, where researchers examined the general fitness population. They found that the lower back, shoulders and knees were the most frequently injured body parts. All these data show one thing clearly: injuries are very common in the bodybuilding world. In fact, injuries have become a crucial reason why people are unable to train continuously, which often hinders them from exercising. to reach their full sporting potential.

Currently, the prevention of sports injuries focuses mainly on the biomechanical aspects, including corrective measures for sports equipment and load management, while the systematic intervention study on athlete behaviour for injury prevention is relatively limited. The theory of scientific postural practice (KAP) suggests that behavioral changes follow the sequential path of knowledge acquisition. Belief formation → Behavioral development and thus form an effective framework for interventions in health behavior [4]. This includes preventing injuries in military training and the nutritional behaviour of athletes. Soni et al [5] observed that athletes showed a positive attitude towards injury prevention, but usually showed insufficient knowledge and there was a positive relationship between knowledge and attitude. A KAP study on the injury of the half-moon in students of motion sciences found an interesting pattern. It shows that knowledge, attitudes and behaviors are all positively connected and that attitudes actually play a bridge that contributes to Putting knowledge into practice. That is, no one has adopted and applied the KAP theory so far. The field of injury prevention in male bodybuilders is systematically investigated.

This study aims to: (1) examine the current state of knowledge, attitude and practice of male fitness athletes in the prevention of sports injuries; Analysis of the relationships between these three dimensions and their potential dissemination mechanisms; (3) development of targeted intervention models based on empirical research results, provide a theoretical basis for reducing the incidence of physical injuries.

2. Subjects and Methods

2.1. Research Subjects

Through simplified sampling, participants were recruited in 2026 through bodybuilding competitions and online communities. Admission criteria are: (1) Men, age ≥ 18 years; (2) System training ≥ 1 year; Training frequency ≥ 4 times a week; (4) Voluntary participation in the signing of an informed consent. Exceptional criteria are severe trauma or surgery in the last three months. A total of 450 questionnaires were issued, 434 valid questionnaires were collected and the effective response rate was 96.4% after the removal of invalid questionnaires.

2.2. Measurement Instruments

2.2.1. KAP Questionnaire on Sports Injury Prevention

A self-developed 30-item questionnaire based on the KAP framework was used, comprising three dimensions (knowledge, attitude, practice), each with 10 items rated on a 5-point Likert scale. Higher dimension and total scores indicate better KAP levels. The questionnaire includes items such as age, training duration, training frequency, competition level, history of sports injury, injury location, injury type, and sources of injury prevention knowledge.

The overall Cronbach's α coefficient of the scale was 0.93, and the α coefficients for the knowledge, attitude, and practice dimensions were 0.935, 0.939, and 0.918, respectively. For content validity, after two rounds of evaluation by six experts, the item-level content validity index (I-CVI) ranged from 0.83 to 1.00, and the scale-level content validity index (S-CVI/Ave) was 0.94. Exploratory factor analysis extracted three factors, with a cumulative variance contribution rate of 62.7%, and all item factor loadings were above 0.40.

2.3. Statistical Analysis

SPSS 26.0 and AMOS 24.0 were used. Descriptive statistics (mean $\pm$ SD, score rate, frequency percentage); difference tests (independent-sample t-test, one-way ANOVA); Pearson correlation analysis; hierarchical regression analysis (controlling for demographic variables, sequentially entering knowledge and attitude to predict practice); mediation effect test (Bootstrap method with 5,000 resamples). The significance level was set at $\alpha = 0.05$.

3. Results

3.1. Basic Sample Characteristics

A total of 434 valid samples were included, and their demographic characteristics are shown in Table 1. The age distribution was predominantly 18–25 years ($n=146$), followed by 26–30 years ($n=110$), indicating that the sample primarily consisted of young and late-young bodybuilding trainees with good representativeness of sports participation. When it came to training duration, the numbers clustered mostly in the 1–3 year and 3–5 year ranges. That tells us most of these guys were still in the stage of building up experience and getting their technique really dialed in. As for training frequency, it landed heavily on 4 and 5 sessions per week. In other words, the majority had already settled into a steady, consistent routine. In terms of competition level, municipal/district and provincial levels dominated, with relatively fewer high-level participants, reflecting the typical structure of the general bodybuilding population. The dichotomous injury history variable showed that 345 participants (79.5%) had a history of injury, indicating that injuries are common during bodybuilding training, which provides a realistic basis for further analysis of the level of knowledge, attitude, and practice regarding sports injury prevention and their influencing mechanisms.

Table 1. Basic Sample Characteristics (N=434)

Variable	Category	n	Percentage (%)
Age	18–25 years	146	33.6
	26–30 years	110	25.3
	31–35 years	82	18.9
	≥ 36 years	96	22.1
	1–3 years	159	36.6
Training duration	3–5 years	118	27.2
	5–10 years	97	22.4
	>10 years	60	13.8
Training frequency (times/week)	2	36	8.3
	3	79	18.2
	4	128	29.5
	5	104	24.0
	6	67	15.4
	≥ 7	20	4.6
Competition level	Municipal/District	215	49.5
	Provincial	127	29.3
	National	71	16.4
	International	21	4.8
Injury history	No	89	20.5
	Yes	345	79.5

3.2. KAP Dimension Scores

As shown in Table 2, the score rates for knowledge, attitude, and practice were 71.7%, 77.6%, and 75.2%, respectively,

indicating a moderately high level. Attitude scored the highest (77.6%), followed by practice (75.2%), with knowledge the lowest (71.7%). This discrepancy implies that practice behavior is influenced not only by knowledge and attitude but

also by training habits, schedule constraints, competition pressure, and environmental support.

Table 2. Scores of knowledge, attitude, and practice dimensions

Dimension	Maximum Score	M	SD	Score Rate (%)
Knowledge	50	35.86	7.55	71.7
Attitude	50	38.82	7.61	77.6
Practice	50	37.59	7.02	75.2

3.3. Differences in KAP Across Groups with Different Characteristics

As shown in Table 3, independent-sample t-test results indicated that individuals with a history of injury had significantly higher knowledge dimension scores than those without ($P = 0.006$), suggesting that prior injury experience may promote active learning of relevant knowledge. Conversely, attitude scores were significantly lower in those

with injury history compared to those without ($P = 0.013$), indicating that injury experience may lead to negative perceptions of training protection. No statistically significant difference was found in the practice dimension ($P > 0.05$), implying that injury history alone is insufficient to directly drive athletes to adopt standardized preventive behaviors; actual behavioral change still requires systematic training supervision, rehabilitation guidance, and long-term behavioral intervention.

Table 3. KAP scores of individuals with and without injury history

Dimension	No injury history (n=89)	Injury history (n=345)	t	df	P
Knowledge	33.91±8.18	36.37±7.30	-2.756	432.0	0.006
Attitude	40.46±6.69	38.39±7.78	2.513	155.4	0.013
Practice	37.28±6.74	37.68±7.10	-0.472	432.0	0.637

3.4. Correlation Analysis of Knowledge, Attitude, and Practice

As shown in Table 4, There is a significant positive correlation between knowledge, attitude and behavior ($P=0.01$). The coefficient of correlation between knowledge and practice is highest ($r=0.625$). Attitudes and practice are also moderately positive, and positive attitudes contribute to the formation of healthy behavior. Although the knowledge and attitude correlation is weak, it is statistically significant, indicating that knowledge accumulation increases athletes' acceptance of injury prevention. These findings are correlated with KAP (Knowledge-Attitude-Practice) The theoretical framework basically coincides, in which knowledge is an important cognitive foundation for behavior, And attitudes are critical to the transformation of knowledge into behavior.

The knowledge dimension is significantly positively correlated with the behavioral dimension ($r=0.625$, $P<0.01$), which is higher than the common value in previous KAP studies. We wanted to exclude the method bias and therefore performed the single factor Haman test.

The results showed that four common factors with characteristic values greater than 1 were extracted under non-rotational conditions. The first factor explained the variance

by 38.862%, below the 40% threshold, indicating that there was no significant bias in the common approach. Thus, the height of knowledge and behavior The correlation is not primarily due to methodological bias. Further analysis suggests that this may be related to the practicality of fitness. Athletes' injury prevention knowledge such as "warm-up relaxation", "progressive load", "pain management" It is often translated directly into training behavior to enhance the coherence of knowledge and behavior. In addition, some of the knowledge and behavior projects in this study are related to the content of practical training. Such as "Understanding the role of warm-up" and "Practical warm-up" "Understanding the principle of progressive overload" and "gradually increasing load behavior" Both can enhance the correlation. Although knowledge is highly relevant to the behavioral dimension, the theoretical dimension is still a different concept. The scientific dimension reflects the cognitive level of athletes in the prevention of sports injuries, and the behavioral dimension reflects their training. implementation in practice. Therefore, highly relevant results are more likely to indicate that the knowledge of fitness athletes in the prevention of motor injuries has strong behavioral conversion properties.

Table 4. Pearson correlation matrix of knowledge, attitude, and practice

Variable	Knowledge	Attitude	Practice
Knowledge	1	0.292**	0.625**
Attitude	0.292**	1	0.394**
Practice	0.625**	0.394**	1

3.5. Hierarchical Regression Analysis of Factors Influencing Practice

Based on Table 5, in Model 1, which included only demographic and training background variables, the explanatory power was low ($R^2 = 0.037$). After adding knowledge score in Model 2, R^2 significantly increased to 0.411, with knowledge showing a strong standardized

coefficient ($\beta = 0.638$, $P < 0.001$). In Model 3, including attitude further raised R^2 to 0.451, and attitude was also significant ($\beta = 0.217$, $P < 0.001$), while the β value of knowledge decreased slightly, suggesting a partial mediating role of attitude. Overall, knowledge and attitude have more direct and important effects on injury prevention practice than general background factors.

Table 5. Hierarchical Regression Analysis of Factors Influencing the Practice Dimension

Model	Variable	B	SE	β	t	P	R ²	ΔR^2	F
Model1	Age	0.694	0.371	0.114	1.872	0.062	0.037	0.037	3.259**
	Training duration	0.540	0.417	0.082	1.294	0.197			
	frequency	-0.048	0.280	-0.009	-0.172	0.864			
	Competition level	0.342	0.433	0.043	0.789	0.430			
	Injury history	-0.425	0.860	-0.024	-0.494	0.622			
Model2	Age	0.773	0.290	0.127	2.661	0.008	0.411	0.375	49.720**
	Training duration	-0.123	0.329	-0.019	-0.373	0.709			
	frequency	0.271	0.220	0.050	1.234	0.218			
	Competition level	-0.538	0.343	-0.068	-1.568	0.118			
	Injury history	-1.281	0.675	-0.074	-1.896	0.059			
Model3	Total knowledge score	0.594	0.036	0.638	16.484	<0.001			
	Age	0.556	0.283	0.091	1.961	0.051	0.451	0.040	50.038**
	Training duration	-0.173	0.318	-0.026	-0.543	0.588			
	frequency	0.331	0.213	0.061	1.558	0.120			
	Competition level	-0.227	0.336	-0.029	-0.677	0.499			
	Injury history	-0.748	0.660	-0.043	-1.133	0.258			
	Total knowledge score	0.528	0.037	0.568	14.377	<0.001			
	Total attitude score	0.200	0.036	0.217	5.567	<0.001			

3.6. Analysis of Bootstrap Mediation Effect Results

As shown in Table 6, The indirect effect of the setting on the relationship between knowledge and practice was 0.063, and the 95% Bootstrap confidence interval [0.034, 0.097] contained no zero, This indicates a significant mediation effect. This suggests that knowledge about sports injury prevention not only directly helps athletes regulate exercise,

but also indirectly influences exercise. by improving their preventive posture. Knowledge plays a role not only at the cognitive level, but also by strengthening awareness of risk protection in athletes to promote change. These findings confirm the applicability of KAP theory in the prevention of movement injuries and suggest that that future interventions should strike a balance between knowledge building and attitude building to improve the effectiveness of behavioural interventions.

Table 6. Bootstrap Mediation Effect Test of Attitude on the Relationship Between Knowledge and Practice

Mediation Path	Indirect Effect	Boot SE	Boot LLCI	Boot ULCI	Conclusion
K → A → P	0.063	0.016	0.034	0.097	Significant

4. Discussion

4.1. Current Status of KAP Regarding Sports Injury Prevention Among Male Bodybuilders

The results of this study showed that the score rates for knowledge, attitude, and practice regarding sports injury prevention among male bodybuilders were 71.7%, 77.6%, and 75.2%, respectively, indicating an overall moderately high level [7]. The lowest knowledge dimension indicates that athletes do not yet have sufficient understanding of the recognition of sports injury risks, rehabilitation and training monitoring. The posture is best rated, and obviously most athletes understand the importance of injury prevention. But the practice score does not match the attitude, which suggests that the right mindset does not form stable habits.

In the scientific dimension, the "pre-competition injury risk" was the lowest, which reflects a lack of awareness by some athletes of reduced endurance and an increased risk of injury in extreme fat loss. In the setting dimension, the score was lower for "training less rather than injury," suggesting that some athletes still prefer "painful training." In the practical dimension, the "Training Log Record" scored the lowest score, indicating that that the athletes were weaker in terms of training load and recovery management.

The study also found that 79.5 percent of the participants had suffered a movement injury, mainly to the shoulders, waist and knees. chronic overuse injuries were the most

common. This is consistent with the long-term high load characteristics of fitness, suggesting that Recurrent mechanical loads and lack of recovery are the main causes of injuries.

4.2. Intervention Model Based on the KAP Theory

Based on our findings, we have developed a four-stage intervention model. These phases are as follows: knowledge activation, belief change, behavioural tests, and finally maintenance and strengthening. Let's start with the first phase :the activation of knowledge. Here, the main goal is to strengthen training in several key areas: the risks of weight loss before the game, how to properly manage recovery and injury warnings for this sport. This way, athletes can recognize risks more clearly before they become a real problem.[8]. In the "belief transformation" stage, case analyses and risk education are employed to correct misconceptions such as "training through pain" and to strengthen injury prevention awareness [9]. During the behavioral tests, we focus on training basic habits such as warming up, relaxing, recording exercise programs, and managing recovery. To ensure that these principles are truly adhered to, the coach offers supervision and gives colleagues feedback during the process. This helps the athletes finish the game more stably. In the maintenance and fixation phase, we then built a long-term behavior tracking and feedback system. It should prevent people from returning to old forms of

training.

This model is rooted in the KAP theory. At the same time, it's carefully shaped to fit the way bodybuilding training actually works. What it really emphasizes is a clear, step-by-step shift—knowledge gradually turns into attitude, and attitude then drives practice. All in all, it's a framework that proves highly workable in real-life situations.

4.3. Limitations

One thing to keep in mind is that this study used a cross-sectional design. That means we can't draw direct cause-and-effect conclusions from the variables. We also recruited participants through convenience sampling, so selection bias might have crept in. Beyond that, we measured the practice dimension by asking people to self-report their behavior, and this comes with a risk—social desirability bias could have influenced their answers. Looking ahead, future research could take a different route: using longitudinal follow-up designs or running randomized controlled trials to really put the intervention model to the test and see how effective it is.

5. Conclusions and Recommendations

5.1. Conclusions

(1) When it comes to sports injury prevention, the overall KAP level among male bodybuilders turned out to be moderately high. But here's the catch: the knowledge dimension actually had the lowest score, sitting at just 71.7%. That points to some real gaps. In particular, athletes still struggle with recognizing injury risks specific to their sport, managing their recovery, and staying on top of training monitoring.

(2) The injury rate was high—79.5%, to be exact. The shoulders, lower back, and knees turned out to be the most common trouble spots. And when you look at the type of injuries, chronic overuse problems were by far the most frequent. Taken together, this pattern strongly suggests that long-term, heavy resistance training is a major driving force behind these injuries.

(3) There is a significant positive correlation between knowledge, attitude and practice, with the correlation between knowledge and practice being the strongest ($r = 0.625$). The stratified regression analysis shows that both knowledge ($\beta = 0.568$) and attitudes ($\beta = 0.217$) can significantly predict practice.

(4) It has been shown that the attitude partly acts as a bridge. This means that knowledge not only directly contributes to shaping protective behavior. There is also an indirect way: it affects the actual behavior of athletes through an improved perception of risks.

(5) We arrived at a four-stage intervention model: knowledge activation, belief change, behavioural tests, and finally maintenance and reinforcement. Overall, it is both a theoretical basis and a practical roadmap for injury prevention in male bodybuilders.

5.2. Recommendations

(1) For trainers, this is a practical recommendation: to integrate injury prevention training into the daily training system. In particular, they should focus on several key areas - risk management in the weight loss phase before the game, Mastering recreation and ensuring a solid sports technique. In

this way, it is possible to reduce the likelihood of chronic overuse injury.

(2) Athletes should develop the habit of incorporating an exercise program. It's a simple but powerful way to track your workout load, any change in pain, and your recovery in real time. With this constant feedback, they can quickly adjust their plans to avoid long-term overload.

(3) For athletes with injuries, it is not just a physical rehabilitation. They also need subsequent psychological and cognitive support as well as solid risk management. Chronic pain slowly weakens people's protective posture. Therefore, by reinforcing these interventions, we can help stop the slip before it forms.

(4) Future studies should further integrate longitudinal follow-up studies and experimental intervention designs to validate and optimize the Models of intervention.

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