Study on the Relationship Between the Intake of Nutritional Supplements and Doping Knowledge among Female Students of Harbin Sports University in China

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Abstract: This study analyzed the nutrition intake status and doping awareness among female students of Harbin Sports University in China. A total of 295 participants majoring in general events, summer sports, and winter sports were surveyed. The results of the survey were evaluated with frequency analysis (χ^2) and multiple response analysis (multiple response analysis) using SPSS 23.0 statistics program. First, the intake experience, a sub-factor of intake patterns, was found to have no significant difference depending the population background variables. Second, significant differences in intake reasons, which are sub-factors of intake patterns depending on population background variables, resulted in differences in nutritional supplement intake reasons over experience ($\chi^2=19.252$, $p<.05$). thus, Significant differences have been shown. However, there were no significant difference in athletic experience, project, and award-winning experience. Third, according to population background variables, intake motivation, which is a subfactor of an intake form, differs significantly in grade ($\chi^2=10.503$, $p<.01$), and award-winning experience($\chi^2=10.503$, $p<.01$) showed significant differences. However, there has been no significant difference in athletic experience and project. Fourth, according to the demographic variables, the lower factors of doping awareness survey are doping education experience with significant differences ($\chi^2=8.762$, $p<.05$). Whereas, there is no significant difference in grade, project, and award-winning experience. Fifth, the difference in doping items, which is a sub-factor of the doping recognition survey, is shown to have no significant difference depending on demographic background variables. Sixth, the difference in knowledge acquisition regarding doping items, which are sub-factors of doping recognition surveys, was found to have no significant difference depending on demographic background variables. Continuous doping education will be needed to acquire correct nutritional supplement intake patterns and accurate information on doping. In the future, not only coaches, but athletes and parents should take the lead in recommending and prescribing the nutritional supplements suitable for each athlete. Lastly, rather than relying on nutritional supplements, players should continue to acquire skills through physical improvement and scientific training to further improve their performance.

Keywords: Harbin Sports University, Nutritional Supplement Intake, Doping Perception, China

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1. Introduction

Through physical, technical, and spiritual training, the competitive ability of sports will produce good results when the potential sports skills of the players are brought into full play. However, first of all, this emphasizes victory and achievement. Compared with the pure purpose of joy, happiness, and sense of achievement, continuous research on the development of new methods to improve the records and create more champions among players are required. In the case of scientific sports, the skills of athletes have been greatly improved, and the method of injection together with the intake of various nutritional supplements is considered as an effective method.

After the establishment of the World Anti-Doping Agency (WADA), doping has become a worldwide problem. The number of athletes detected for doping did not decrease but rather increased. The reason is that as doping testing techniques were developed, positive doping tests were continuously detected at past events such as the 2008 Beijing Olympics, 2012 London Olympics, and 2014 Sochi Olympics. Many athletes have their medals deprived[1] Doping remains pervasive in the sporting world when it was discovered that a German doctor helped to dope the blood of 21 athletes from eight countries at the 2019 Nordic World Championship ski event hosted by the International Ski Federation (FIS) in Seefeld, Austria.

Therefore, in order to improve the competitiveness of professional athletes, knowledge on nutrition-related health and efficiency is required, but it is necessary to contribute to nutrition to improve exercise function, provide additional energy, supply fuel for training, and recover the body before training Comprehensive information on nutrients is required to improve human health can be cited[2].

The purpose of nutritional supplements is to provide the nutrients that may be insufficient. In foods with different shapes (mainly preparation type) or with component content and nutritional supplements, the original nutrients are high or concentrated (liver oil, yeast, embryo oil, etc.), adding its nutrients to the general food (so-called fortified food), except for the pharmaceutical products with its nutrients as the main component (vitamin C, vitamin E, calcium, protein powder products, etc).

The sports participants in the recent advance research on nutrition supplement intake and doping awareness in South Korea include elite golfers[3], swimmers[4], elite dancers[5], elite shooters[6], and taekwondo players[7]. There were also research on the national representative judo players[8] and other sports events in Singapore[2][9] and Japan[10]. Although Asian athletes have similar tendency to use sports nutrition supplements as Western athletes, the research on elite athletes and student athletes in China is not satisfactory.

However, with the development of modern science and technology, athletes in the world are increasing their investment in prohibited drugs, and their use methods are becoming more and more ingenious[11]. The dispute about the ethical issues of athletes in sports is more serious[12]. In particular, students who specialize in sports will have a fatal impact on their cardiopulmonary function when they do high-intensity exercise. Therefore, the World Hyphenate agreement (WADA), the American Anti Doping-Agreement (USAA), and anti-doping agreements of countries all over the world, such as the International Olympic anti-doping rules, war is going on to eradicate doping.

Therefore, students majoring in sports should understand the inactive parts of these nutritional supplements, so that they can easily overcome the temptation of drugs. Doping awareness is not only for athletes, but also for coaches, parents, teachers, and students who guide them. Colleagues also believe that it is necessary to be interested in developing response plans.

The purpose of this study is to find out the importance of doping education by comparing nutritional supplement intake patterns and doping awareness among female students at Harbin University of Sports, China, and to provide basic data necessary to establish systematic doping education. presented.

Question 1. Are there any differences in the dietary supplement intake patterns of female students at Harbin University of Sports in China?

Question 2. Is there any difference in the perception of doping among female students at Harbin Sports University in Harbin, China?

2. Methodology

2.1 Research Subjects

The initial target subjects of this study were 300 female students of Harbin Sports University in China majoring in general events, summer sports, and winter sports. They were surveyed through questionnaire from January 1, 2021 to March 31, 2021. For the data of the selected subjects, the collection method used is convenience sampling, which is one of the non-probability sampling methods. The purpose and necessity of this study were explained to the subjects directly. The questionnaire was compiled by self-administration method and collected on the spot immediately. Among the 300 questionnaires distributed, 295 responses were used for final analysis, excluding 5 questionnaires which were judged to be dishonest or missing. The general characteristics of the research subjects are shown in [Table 1].

[Table 1] General Characteristics of Research Subjects

Sortation items	Item	Frequency (number)	Ratio (%)
Academic year	Grade 1	21	7.1
	Grade 2	79	26.8
	Grade 3	116	39.3
	Grade 4	79	26.8
Project	General event	99	33.5
	Summer sport	92	31.2
	Winter sport	104	35.3
Athletic experience	less than 3 years of	23	7.8
	3-5 years.	74	25.1
	5-7years.	109	36.9
	7-10years.	74	25.1
	more than 10 years	15	5.1
Aware-winning experience	Yes	94	31.9
	No	201	68.1
Total		295	100

2.2 Research Tool

In order to find out the awareness of nutritional supplements and their intake patterns and knowledge of the doping, a questionnaire was answered by female students (whose major in general events, summer sport, and winter sport) in the Harbin Sports University of China. The questionnaire was developed by Sobal & marquart (1994)[13], Kim and Keen (1999)[11] and Sundgot Borgen (2003)[2]. The questionnaire is also based on a survey conducted by Korean students in 2004 and Cui

Xianzhou in 2015. This questionnaire consists of 10 questions, including 4 questions on general characteristics, 3 questions on intake patterns, and 3 questions on doping awareness. The specific indicators, contents, and the number of questions of the questionnaire used in this study are shown in [Table 2].

[Table 2] Index, Content, and Number of Questions of the Questionnaire

Composition index	Composition	Number of questions
General characteristics	Grade, affiliation, contestant experience, award-winning experience	4
Uptake pattern	Take in experience, take in reason, take in motivation	3
Doping identification	Gain doping education experience, doping program, doping knowledge	3
Total number of questions		10

2.3 Validity and Reliability of Measuring Tools

The evaluation of the degree of representativeness of the test items sampled from the whole collection are related to the representativeness of the whole content examined by content validity. The validity of the questionnaire prepared by drafting the questionnaire used in the previous study was verified to investigate the awareness on patterns of exercise and intake of nutrition supplements among groups according to the presence or absence of doping education. In the next step, after judging the content validity and suitability of the questions for the questionnaire conducted by five experts on sports nutrition, health education majors, and a doctoral degree in physical education, reliability verification and test-retest reliability according to repeated surveys were conducted.

2.4 Data Analysis

After collecting the questionnaire, the data that were not substantial or credible were excluded. All valid responses were analyzed using SPSS 23.0 statistical program.

1) In order to understand the general characteristics of the respondents, frequency analysis was carried out.

2) According to the general characteristics, in order to understand the ingestion experience, ingestion reason, ingestion motivation, identification degree of doping items, and access to doping information, cross-analysis (χ^2) was implemented.

3) Multiple response analysis (MRA) was applied to understand the uptake patterns of sports nutrition supplements and doping knowledge.

3. Results and Discussion

3.1 Investigation on the Intake Form of Sports Nutrition Supplement

3.1.1 Differences in Nutritional Supplement Intake Experience according to Demographic Variables

The difference in nutrition supplement intake experience according to demographic background of the subjects is shown in [Table 3].

Specifically, based on university academic year, there were 102 students in Grade 3, 67 students in Grade 4, 63 students in Grade 2, and 17 students in Grade 1. Based on athletic experience, there were 94 students with athletic experience more than five years and less than seven years, 63 students with

more than seven years and less than ten years, 62 students with more than three years and less than five years, 18 students with less than 3 years, and 12 students with more than 10 years. When focusing on the project, there were 89 students majoring in winter sports, 84 majoring in general events, and 76 majoring in summer sports. According to the survey, 173 students used to achieve awards, and 76 students have not received any award.

The χ^2 verification among the difference of nutrition supplement intake experience caused by demographic background variables showed no significant difference in gender, grade, experience, project, and award-winning experience.

[Table 3] Differences in Nutritional Supplement Intake Experience according to Demographic Background Variables

Sortation items		Yes	No	N	χ^2
Academic year	Grade 1	17	4	21	2.598
	Grade 2	63	16	79	
	Grade 3	102	14	116	
	Grade 4	67	12	79	
	Total	249	46	295	
Athletic experience	Less than 3 years of	18	5	23	1.211
	3-5 years.	62	12	74	
	5-7years.	94	15	109	
	7-10years.	63	11	74	
	more than 10 years	12	3	15	
	Total	249	46	295	
Project	General event	84	15	99	.349
	Summer sport	76	16	92	
	Winter sport	89	15	104	
	Total	249	46	295	
Award-winning experience	Yes	76	18	94	1.325
	No	173	28	201	
	Total	249	46	295	

3.1.2 Differences in the Reasons for the Intake of Nutritional Supplements based on the Demographic Background of Students

The differences in nutrition supplement intake reasons according to the demographic background variables of students in the Harbin Sports University of China are shown in [Table 4].

Specifically, in terms of gender, health promotion was highest for both male and female students, and by grade level, Grade 3 was the highest in health improvement. When focusing on the athletic experience, health promotion was the highest among the students whose athletic experience were less than 3 years, whereas physical fitness improvement was highest among the students whose athletic experience were more than 7 years and less than 10 years as well as with more than 10 years. Based on the project, health promotion was the highest in the order of general events, summer sports, and winter sports, and those with award-winning experience was also highest in health promotion.

The χ^2 verification results based on the reasons for the difference in the intake of nutritional supplements was ($\chi^2= 252$, $P < 0.05$). There was no significant difference in experience, project, and award-winning experience.

[Table 4] Differences in the Reasons for Taking Nutritional Supplements according to Demographic Background Variables

Sortation items		Health promotion	Nutritional supplement	Surrounding recommendations	Physical improvement	N	χ^2
Academic year	Grade 1	7	5	0	5	17	5.631
	Grade 2	23	20	6	15	63	
	Grade 3	40	25	10	27	102	
	Grade 4	28	14	10	15	67	
	total	98	64	26	61	249	
Athletic experience	Less than 3 years of	10	5	1	2	18	19.252*
	3-5 years.	25	21	6	10	62	
	5-7years.	41	18	9	26	94	
	7-10years.	19	17	6	21	63	
	more than 10 years	3	3	4	2	12	
	Total	98	64	26	61	249	
Project	General event	34	19	9	22	84	.486
	Summer sport	34	21	4	17	76	
	Winter sport	30	24	13	22	89	
	total	98	64	26	61	249	
Award-winning experience	Yes	29	15	12	20	76	.195
	No	69	49	14	41	173	
	Total	98	64	26	61	249	

* $P < .05$

3.1.3 Differences in Nutritional Supplement Intake Motives according to Demographic Background Variables

The differences in the motivation of nutrition supplement intake according to demographic background variables is shown in [Table 5].

According to grade level, family advice on Grade 3 and Grade 4 students were very high, whereas on Grade 1, it was not too much. On the influence of newspapers and magazines, it was the highest among Grade 2 students. According to the results of athletic experience, students with athletic experience more than seven years and less than ten years were mostly motivated through family counseling and influenced by newspapers and magazines. Family recommendation was the highest among students taking up general events and winter sports, while the newspaper and magazines were mostly influential among those taking up summer sports. For students taking up winter sports, it was found that there was a higher level of leadership recommendation.

The χ^2 verification results on the difference of motivation of nutrition supplement intake caused by demographic variables for grade was ($\chi^2= 734$, $P < 0.05$) and ($\chi^2= 503$, $P < 0.01$) for award-winning experience. There was no significant difference in experience and project.

[Table 5] Differences in Motivation to Take Nutritional Supplements according to Demographic Background Variables

Sortation items		Family persuasion	Newspaper	Broadcast media	Leader's advice	Advice from doctors, pharmacists, and other experts	N	χ^2
Academic year	Grade 1	5	5	4	3	0	17	18.734*
	Grade 2	12	22	7	16	6	63	
	Grade 3	39	21	8	29	5	102	
	Grade 4	24	18	2	19	4	67	
	Total	80	66	21	67	15	249	
Athletic experience	Less than 3 years of	7	6	0	5	0	18	.672
	3-5 years.	21	16	6	18	1	62	
	5-7years.	29	22	7	26	10	94	
	7-10years.	18	20	6	15	4	63	
	more than 10 years	5	2	2	3	0	12	
	Total	80	66	21	67	15	249	
Project	General event	30	20	7	21	6	84	5.979
	Summer sport	21	27	5	20	3	76	
	Winter sport	29	19	9	26	6	89	
	Total	80	66	21	67	15	249	
Award-winning experience	Yes	21	16	7	30	2	76	10.503**
	No	59	50	14	37	13	173	
	Total	80	66	21	67	15	249	

* $P < .05$, ** $P < .01$

3.2 Harbin Sports University Students' Doping Awareness

3.2.1 Differences in Doping Education Experiences

As shown in [Table 6], as to the difference in the experience of doping education. 'no experience of doping education' according to demographic background variables was the highest.

By grade levels who answered "no", there were 53 responses in Grade 3, 45 in Grade 4, 39 in Grade 2, and 11 in Grade 1. According to experience, there were 48 responses among students with athletic experience within 3-5 years and 5-7 years, 35 responses within 7-10 years, 10 responses on less than 3 years, and 7 responses on more than 10 years. Furthermore, there were 55 students majoring in general sports, 49 in winter sports, and 44 in summer sports.. On award-winning experience, there were 101 students who have not achieved any awards, whereas 47 used to achieve awards.

The χ^2 verification results on the difference of doping education experience based on demographic background was ($\chi^2 = 8.762$, $P < 0.05$) and therefore significant. However, there was no significant difference in grade, project, and winning experience.

[Table 6] Harbin Sports University Students' Experience of Doping Education

Sortation items		Yes	No	N	χ^2
Academic year	Grade 1	10	11	21	2.451
	Grade 2	40	39	79	
	Grade 3	63	53	116	
	Grade 4	34	45	79	
	Total	147	148	295	
Athletic experience	Less than 3 years of	13	10	23	8.762*
	3-5 years.	26	48	74	
	5-7years.	61	48	109	
	7-10years.	39	35	74	
	more than 10 years	8	7	15	
	Total	147	148	295	
Project	General event	44	55	99	1.739
	Summer sport	48	44	92	
	Winter sport	55	49	104	
	Total	147	148	295	
Award-winning experience	Yes	47	47	94	.002
	no	100	101	201	
	total	147	148	295	

* $P < .05$

3.2.2 The Difference between the Presence and Absence of Doping Items

As shown in [Table 7], most of the students answered “I know” on the question of knowing the difference between the presence and absence of doping items.

Based on grade levels, there were 80 responses among Grade 3 students, 49 in Grade 2, 48 in Grade 4, and 15 in Grade 1. Based on athletic experience, there were 76 responses among students with athletic experience within 5-7 years, 48 among 3-5 years, 41 among 7-10 years, 17 on less than 3 years, and 10 on more than 10 years. Furthermore, there were 70 responses among students majoring in winter sports, 67 in the general events, and 55 in summer sports. Lastly, there were 135 responses among those with non-award-winning experience and 57 among those who used to achieve awards.

The χ^2 verification results on the difference between the presence and absence of doping items according to demographic background showed that there was no significant difference in grade, athletic experience, project, and award-winning career.

[Table 7] Presence or Absence of Doping Items for Harbin Sports University Students

Sortation items		Know	Do not know	N	χ^2
Academic year	Grade 1	15	6	21	2.116
	Grade 2	49	30	79	
	Grade 3	80	36	116	
	Grade 4	48	31	79	
	Total	192	103	295	
Athletic experience	Less than 3 years of	17	6	23	.299
	3-5 years.	48	26	74	

	5-7years.	76	33	109	
	7-10years.	41	33	74	
	More than 10 years	10	5	15	
	Total	192	103	295	
Project	General event	67	32	99	1.657
	Summer sport	55	37	92	
	Winter sport	70	34	104	
	Total	192	103	295	
Award-winning experience	Yes	57	37	94	.273
	No	135	66	201	
	Total	192	103	295	

3.2.3 Differences in knowledge acquisition of doping items

As shown in [Table 8], most of the responses on the difference whether the students acquire knowledge about doping items answered 'leader'.

According to grade level, there were 38 responses among Grade 3 students, 29 among Grade 2, 26 among Grade 4, and 8 among Grade 1. According to athletic experience, there were 40 responses among students with athletic experience within 5-7 years, 30 within 3-5 years, 23 within 7-10 years, and 4 with less than 3 years and more than 10 years. Furthermore, there were 37 responses on students majoring in general events and winter projects, and 27 in summer sports. Based on award-winning experience, there were 70 responses among those without awards-winning experience and 31 among those who used to achieve awards.

The χ^2 verification results on the difference in knowledge acquisition or absence of knowledge regarding doping items showed no significant difference in grade, athletic experience, project, and award-winning experience.

[Table 8] Whether or not Harbin Sports University Students Acquire Knowledge about Doping Items

Sortation items		Elder	Parents	Leader	Books	Internet	Anti-Doping Commission	N	χ^2
Academic year	Grade 1	1	0	8	1	7	4	21	8.726
	Grade 2	2	6	29	4	19	19	79	
	Grade 3	8	8	38	6	23	33	116	
	Grade 4	3	9	26	2	19	20	79	
	Total	14	23	101	13	68	76	295	
Athletic experience	Less than 3 years of	1	2	4	1	9	6	23	17.391
	3-5 years.	2	5	30	3	17	17	74	
	5-7years.	6	9	40	2	23	29	109	
	7-10years.	5	5	23	7	16	18	74	
	more than 10 years	0	2	4	0	3	6	15	
	Total	14	23	101	13	68	76	295	
Project	General event	4	9	37	4	21	24	99	6.711
	Summer sport	8	6	27	4	22	25	92	
	Winter sport	2	8	37	5	25	27	104	
	Total	14	23	101	13	68	76	295	

Award-winning experience	Yes	6	8	31	5	24	20	94	2.640
	No	8	15	70	8	44	56	201	
	Total	14	23	101	13	68	76	295	

4. Conclusions

This paper analyzed the intake of nutritional supplements and the understanding of doping education among selected female students of Harbin Sports University in China majoring in general events, summer sports, and winter sports. Among athletes, the choice of nutritional supplements is an important factor to improve competitive ability. In the report of the previous study, according to [13] and [2], the higher the level of athletic ability, the higher the frequency of assistive intake, which helps to improve the exercise performance ability. the higher the level of athletic ability, the higher the frequency of assistive intake, which helps to improve the exercise performance ability. The type of intake also showed the highest frequency of vitamins, similar to the results of this study. This is similar to the results of [3] study on golf players. Most of the athletes take nutritional supplements under the advice of their parents, which indicates that parents should also participate in the intake education of nutritional supplements. According to the previous studies [8][14][15], because the admonishers are family members or parents with a high frequency, it is easy for athletes to have a wrong understanding of doping.

According to a recent report, compared with their own choices, family members, leaders, and teammates are found to be the main persuaders when elite athletes use sports nutrition supplements [2][16]. Therefore, the doping ritual by athletic nutrition supplements has the greatest influence on athletes in China, indicating that more systematic and scientific guidance is being provided than the rule of thumb training, but the overall level of recognition of athletes is still low.

In order to grasp the correct intake of nutritional supplements, management of nutritional supplements, and doping information of nutritional supplements, not only the athletes themselves but also their family members and front-line leaders should participate in systematic and regular education, which aim to select nutritional supplements that match the characteristics of the players as well as give advice and prescriptions[8].

Therefore, it is necessary to develop and disseminate a doping knowledge plan, and direct doping education as the most effective way.

Although the nutrition supplement that athletes take is to improve and maintain their competitive ability. due to lack of knowledge and information, the physical sympathetic nervous system and hormone abnormality that athletes or leaders did not expect will shorten the physical abnormality and the life of the players, and the stimulant drugs with no intention considered as water are subjected to national criticism, thus, sustained. education is needed to get the right information on ingestion and doping.

In addition, this study compared differences in perception of nutritional supplements, intake patterns, and doping perceptions among female students at Harbin University of Sports, China. Based on the results of this study, the following suggestions were made for future research. First, although the current subjects were limited to female students, in a follow-up study, one of the characteristics of majors, such as individual and group sports, is investigated and compared, and it is thought to present more reliable results than now.

Second, based on the results of this study, follow-up studies are conducted on doping worldwide, so it is thought that better research results will be presented if supplemented based on a systematic and in-depth questionnaire.

Third, based on the results of this study, it is considered that continuous doping education, development of teaching materials, and training of leaders and athletes should be actively carried out while conducting comparative research by selecting Korean and Chinese sports colleges as subjects.

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