

Knowledge and Attitude of Dietary Supplements among Arab Olympic Athletes and Coaches in Preparation Program for Tokyo 2020 Olympic Games

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Abstract Nutrition plays an important role as a key factor in the performance of athletes and their coaches, so good and proper nutrition is essential for improving athletic performance and physical fitness. The lack of nutritional knowledge of athletes may affect their performance, and the most important of these issues is nutritional knowledge of food and dietary supplements. Aim: To assess the nutritional knowledge, attitude, and practice of athletes and their coaches at the Arab Olympic Preparation Center about the dietary supplements, the Knowledge, Attitude and Practice Strategy has been used to assess this. Method: A questionnaire-based study was applied to a convenient sample of 111 elite athletes and coaches in the Arab Olympic preparation programs during the period between January and March 2020 from different sports types. The questionnaire contained two-parts (personal information and nutritional supplement knowledge, attitude, and practice questionnaire) to meet the purpose of the study. Results: The total percentage of athletes' knowledge about nutritional supplements is only

46.94 %, indicating that this important group of society does not have sufficient knowledge of nutritional supplements. While the percentage of use of dietary supplements among elite athletes was approximately 41.6%, which is relatively high. Also, our study showed that coaches had a positive impact on the elite athletes due to good coaches' knowledge, 84.2% of elite athletes indicated that they had taken information from their coaches about dietary supplements, and 53.5% of elite athletes indicated that they had participated in nutritional supplement workshops. Conclusion: Based on our study, there was a relatively high prevalence of dietary supplements use among elite athletes and coaches at the Arab Olympic Preparation Program due to a lack of knowledge about dietary supplements.

Keywords KAP, Nutritional, Knowledge, Olympic Elite, Athletes, Supplements, Dietary

1. Introduction

Dietary supplements (DS) are any product taken orally. It is intended to promote health and energy, strengthen immunity, reduce the risk of disease occurrence, correct a nutrient deficiency, or improve performance [1]. The usage of DS can be necessary according to the intensity and duration of the physical exercise or when the individual is not having sufficient food intake for any reason, although an athlete need to have a well-balanced diet to comply with the energy demands [2]. Recently, the demand and usage of these DS products have raised [3]. And dietary supplementation has become a common part of the training strategy for performance achievements [4]. A Canadian study among 440 elite male and female athletes found that 87 percent used DS regularly, showing that the majority of those elite athletes are using some form of performance-enhancing DS as they believe that these supplements are essential for sport achievements [5]. Another Canadian study showed that 98 per cent of young athletes aged 11–25 years also used DS [6]. The most common types of DS taken by athletes are multivitamins, then carbohydrate/energy supplements, protein supplements, creatine, and caffeine. Hence, Ephedrine, glutamine and HMB are also most common among bodybuilders and strength athletes [7]. Dietary supplements are consumed without proper instruction from health care professionals [8]. Of course, the correct use of these DS will positively affect the performance of the athletes, on the other hand, the random use could cause harm to their health and performance [9]. In addition, some supplements contain harmful substances or even doping agents [10]. Lack of knowledge about DS consumption and ignorance about side effects associated with inappropriate use among elite athletes and coaches may put their lives at risk. The consumption of supplements among elite athletes can be influenced and controlled by increasing their knowledge. Therefore, awareness about DS and its usage must be incorporated into an athlete's practical life.

Many elite athletes use DS to meet these nutritional needs without knowing how to take them and the appropriate amounts to meet their needs, and whether these supplements are harmful to their bodies. They believe that DS is an important nutritional factor to enhance their performance [11], [12].

The main objective of this study was to investigate the correlation of the DS consumption among elite athletes and coaches and their characteristics. in addition to the investigation of the level of awareness of DS using the KAP procedure and to compare the opinions of elite athletes and coaches on the attitude towards DS. Furthermore, this research aimed to reduce possible misuse and overconsumption of DS.

2. Materials and Methods

A cross-sectional study was carried out among elite

athletes and coaches in Jordanian Olympic preparation programs during the period between January and March 2020 [13]. The Ethical approval was obtained from the Deanship of Academic Research and International Review Board number (2020-5) and conducted in the guidelines of the Declaration of Helsinki. Written consent was obtained from the participants after which they were informed of the purpose, and procedure of participating in the study.

2.1. Participants

Total of 101 elite athletes and coaches (males/females). The participants recruited from 7 federations divided into 2 groups: individual sport federations (i.e., karate, taekwondo, boxing, and judo, and muay thai), and groups sport federations (i.e., basketball, football) at the Jordanian Olympic Preparation Program for TOKYO2020 Olympic Games.

2.2. Questionnaire

Knowledge, Attitudes, and Practices (KAP) questionnaire was used to assess the awareness of the elite athletes and coaches about DS intake. The questionnaire sections and questions were adopted from Alhomoud et al. (2016) study and modified according to the research needs and the intended category of this research (i.e., elite athletes and coaches). It was validated by qualitative adaptive questions and three experts checked the questionnaire questions to accommodate them to the Jordanian elite athletes and coaches' community, so, some modifications in KAP questionnaire were done [5]. Two packages of questions (personal information questions and knowledge, attitudes, and practices questions) were used to collect data for the purpose of the study. These packages included questions related to elite athletes and coach's characteristics and 15 questions assessing consumers' KAP related to DS, the questions were (yes/no) type questions.

2.3. Statistical Analysis

The data was coded and entered into the computer, where statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) program (version 22.0). It was applied to detect the relationship between the elite athletes and coaches and the corresponding KAP toward DS. Results for categorical variables are shown as numbers (N) and percentages (%). The Chi-square test examined the relationship between demographic, lifestyle characteristics of athletes, and KAP of elite athletes and coaches.

3. Result

Differences in knowledge, attitudes, and practices due

to demographic variables (gender, sports, BMI, education level, age of coaches, experience coaches, sleeping hours, and income categories) can be seen in tables 1, 2, 3, 4.

The Knowledge, Attitudes and Practices questionnaire and demographic variables were calculated to detect differences in KAP due to demographic variables, frequencies, and percentages. The statistical analysis was presented in table 2 where the table provides a brief explanation of each group and the percentage of success. Table 2 also sets out the statistical significance of the gender influence on the overall outcome of the questions in terms of the use of any dietary supplements, given that the p-value was 0.028. Alternatively, the knowledge group has a significance of 0.335, while the practice and attitude have been 0.49 and 0.006, respectively. On the other hand, there were no numerical differences between the two gender responses as can be seen in Tables 2 and 3.

Tables 2 and 3 show the difference in the Sports Knowledge, Attitudes, and Practices questionnaire (karate, boxing, Muaythai, basketball, football, taekwondo, judo). The table shows the percentages of athletes who have responded correctly. There was variance in the answers in this table, for example, the highest knowledge scores were mostly from Muaythai, but both boxing and karate scores were superior in the practice and attitude of the questionnaire. The table also presented statistical significance in the three groups, as the differences were quite evident in both Knowledge 0.002 and Attitude 0.001 but were not significant in the practice of athletes (0.161).

The body mass index was also an important factor that participated in the research as four groups of BMIs were known to be underweight, normal weight, overweight and obese. Each group was statistically analyzed as knowledge, practice, and attitude compared to the question groups as shown in Tables 2 and 3. There were no large differences in any question group in this table, as well as the same thing appears in the significance test for the three Knowledge, Practice and Attitude groups as 0.323, 0.623, 0.070. In addition, the overall score for questions was so close for all four categories, but the highest score was mostly in the underweight group.

Tables 2 and 3 also show the differences between knowledge, attitudes and practice questionnaires based on the education level category and the level of education; secondary, diploma, bachelor, master, and Ph.D. The results of each category were compared in terms of the KPA question groups and their performance. Of the five levels of education, only three were present, because there were no athletes with a master's or PhD degree. However, the diploma had the highest degree of knowledge, and the holders of the diploma were also more involved in practice and attitude. Overall, for all the questions in the significance test (0.010), it was shown that there was a relationship between the categories and the question as a

single group, while if we consider them to be smaller groups of KPA, knowledge only showed the required significance as (0.006) and the other two groups were not significant with values of 0.160, 0.499 for both practice and attitude respect.

The age of elite athletes has also been categorized and analyzed. The four age divisions corresponded to the median of the overall age and were given as shown in tables 2 and 3 (younger than 24 years, aged 25 to 30 years, aged 31 to 36 years older than 37 years). As expected, older athletes had more knowledge, and higher levels of practice and attitude. The significance test result was noteworthy for the overall question as it was significant for both the overall (0.031) and the attitude (0.036), but the knowledge and practice category was not significant as can be seen in table 2.

The differences between the Knowledge, Attitudes, and Practices questionnaire based on the coach's experience categories are illustrated in table 4. It is also a crucial part of the study, where this will influence the KAP groups of the coaches. The table provided both numerical and statistical analyses. The numbers represent the trainers who had the correct answers, and the percentage is their ratio and the number of fractions out of all trainers. In general, coaches with more than 10 years of experience scored 75% of almost all questions correctly, followed by 5 to 10 years of experience with 68.75% of correct answers. There was no relevance in any of the question groups and the overall questionnaire. The differences in the Knowledge, Attitudes and Practices questionnaire based on the sleeping hours categories were considered in tables 2 and 3. The three main groups were short sleepers, average sleepers, and long sleepers [14]. Sleep differences can be a good factor that affects the consumption of DS. There were slight differences in response in the table, which shows that sleeping hours do not significantly affect knowledge, practice, or attitude.

Income was also part of the research, as income may indicate the financial condition of the participant and the purchasing power of the participant. Some DSs are expensive to purchase. There were, however, some differences in the practice group as the home category had higher results and showed some significance (0.011) in the statistical analysis, but the other two groups had no meanings and the responses were almost the same, as can be seen in Tables 2 and 3

In this section, the coaches' knowledge of the DSs and their attitudes were studied and then compared to the exercise of the athletes. It was noted that 84.2% of the elite athletes had taken the coaches' opinion on the DS, indicating that the coaches had a great influence on the athletes. The results also indicated that the coaches had good knowledge of the DS, thus about 66.36% of the coaches had good knowledge of the DS.

Table 1. Characteristics of the study sample (Categorical variables)

Categories		Variable	N¹	%²
Gender		Male	94	93
		Female	7	7
		Total	101	100
BMI (Kg\m²)³		Underweight	4	3.96
		Average	89	88.12
		Overweight	8	7.92
		Obese	0	0
		Total	101	100%
Age (year)		Less than 25	66	65.35
		25-30	27	26.73
		31-36	8	7.92
		More than 37	0	0
		Total	101	100%
Sport type	Team	Football	31	30.69
		Basketball	18	17.82
	Individual	Tackwondo	2	1.98
		Judo	11	10.89
		Boxing	10	9.90
		Karate	22	21.78
		Muaythai	7	6.93
		Total	101	100%
Education level		Secondary	48	47.52
		Diploma	7	6.93
		Bachelor	46	45.54
		Master	0	0
		PhD	0	0
		Total	101	100%

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Table 2. Differences in knowledge, attitudes, and practices of elite athletes based on different categories

Questions	Gender				Sport								BMI					
	Male		Female		Karate	Boxing	Muaythai	basket	footballer	taekwondo	Judo	Under Weight		Normal		Overweight		
	N ¹	% ²	N	%	%	%	%	%	%	%	%	N ¹	%	N	%	N	%	
1	81	86	6	86	86	80	100	89	84	100	82	3	75	76	85	8	100	
2	50	53	4	57	64	60	43	56	42	0	73	3	75	45	51	6	75	
3	40	43	0	0	32	70	71	17	35	0	64	1	25	37	42	2	25	
4	33	35	4	57	36	40	57	44	35	100	0	3	75	31	35	3	38	
5	37	39	3	43	45	50	71	33	32	100	18	1	25	35	39	4	50	
6	53	56	5	71	55	60	57	100	35	100	45	1	25	52	58	5	63	
7	14	15	2	29	14	50	14	0	23	0	0	0	0	16	18	0	0	
8	54	57	5	71	77	80	71	61	42	0	45	2	50	52	58	5	63	
9	76	81	5	71	86	90	71	94	65	100	82	2	50	71	80	8	100	
10	71	76	7	100	91	100	71	33	84	100	82	4	100	66	74	8	100	
11	45	48	7	100	55	80	43	6	71	50	45	4	100	44	49	4	50	
12	69	73	7	100	82	100	100	28	77	50	100	4	100	66	74	6	75	
13	58	62	7	100	91	60	86	28	61	50	73	3	75	58	65	4	50	
14	29	31	1	14	36	10	43	11	48	0	9	3	75	27	30	0	0	
15	49	52	5	71	64	40	57	78	45	100	18	2	50	49	55	3	38	
P value (gender)				P value (sport)								P value (BMI)						
*. The P value is significant at the 0.05 level.				*. The P value is significant at the 0.05 level.								*. The P value is significant at the 0.05 level.						
Knowledge		0.335		Knowledge				0.002*				Knowledge		0.323				
Practice		0.49		Practice				0.168				Practice		0.623				
Attitude		0.006*		Attitude				0.000*				Attitude		0.07				

1: N= number of participants where answered questions correctly.

1: % = percentage of the participants where answered questions correctly.

2: % = percentage of the participants where answered questions correctly.

Table 3. Differences in knowledge, attitudes, and practices of elite athletes based on different categories (Education, Age, sleeping hours, and Income)

Questions	Education level			Age					Sleeping hours						Income				
	Secondary	Diploma	Bachelor	-24		25-30		31-36	short sleepers		average sleepers		long sleepers		Work		Home		
	%	%	%	N ¹	%	N	%	N	%	N	%	N	%	N	%	N ¹	%	N	%
1	75	100	96	56	85	23	85	8	100	9	100	48	89	30	79	64	91	23	74
2	46	43	63	32	48	17	63	5	63	4	44	32	59	18	47	38	54	16	52
3	44	57	33	25	38	11	41	4	50	2	22	23	43	15	39	27	39	13	42
4	27	71	41	23	35	10	37	4	50	3	33	19	35	15	39	27	39	10	32
5	35	71	39	31	47	7	26	2	25	5	56	17	31	18	47	25	36	15	48
6	48	14	74	30	45	21	78	7	88	4	44	28	52	26	68	44	63	14	45
7	21	29	9	12	18	3	11	1	13	2	22	10	19	4	11	15	21	1	3
8	58	86	60	38	58	17	63	4	50	5	56	27	50	27	71	37	53	22	71
9	77	86	90	50	76	23	85	8	100	6	67	42	78	33	87	59	84	22	71
10	81	86	72	55	83	16	59	7	88	8	89	47	87	23	61	52	74	26	84
11	56	43	48	38	58	8	30	6	75	5	56	30	56	17	45	34	49	18	58
12	77	71	74	52	79	18	67	6	75	8	89	43	80	25	66	50	71	26	84
13	69	57	61	47	71	14	52	4	50	6	67	30	56	29	76	39	56	26	84
14	27	57	28	22	33	5	19	3	38	3	33	16	30	11	29	20	29	10	32
15	48	86	54	34	52	16	59	4	50	3	33	25	46	26	68	36	51	18	58
P value (educational level)			P value (age)					P value (sleeping hours)						P value (income)					
*. The P value is significant at the 0.05 level.			*. The P value is significant at the 0.05 level.					*. The P value is significant at the 0.05 level.						*. The P value is significant at the 0.05 level.					
Knowledge		0.006*		Knowledge		0.121		Knowledge		0.309		Knowledge		0.076					
Practice		0.16		Practice		0.581		Practice		0.595		Practice		0.011*					
Attitude		0.499		Attitude		0.036*		Attitude		0.061		Attitude		0.06					

1: N= number of participants where answered questions correctly.

1: % = percentage of the participants where answered questions correctly.

2: % = percentage of the participants where answered questions correctly.

Table 4. Differences in knowledge, attitudes, and practices of elite athletes based on different categories.

Questions		Experience					
		less than 5		5 to 10		more than 10	
		N ¹	% ²	N	%	N	%
Knowledge	1	5	100.0	4	100.0	1	100.0
	2	5	100.0	2	50.0	1	100.0
	3	0	0.0	4	100.0	1	100.0
	4	5	100.0	1	25.0	1	100.0
	5	2	40.0	2	50.0	1	100.0
	6	4	80.0	2	50.0	0	0.0
Attitude	10	4	80.0	4	100.0	1	100.0
	11	2	40.0	2	50.0	1	100.0
	12	4	80.0	4	100.0	1	100.0
	13	1	20.0	3	75.0	0	0.0
	14	1	20.0	2	50.0	1	100.0
	15	4	80.0	3	75.0	0	0.0
P value (Experience)							
*. P value is significant at the 0.05 level.							
Sig.				0.055			

Table 5. Coaches influence on the athletes about dietary supplements

Question		N ¹	Yes% ²	No% ³
couch knowledge	1	10	100.0	0.0
	2	8	80.0	20.0
	3	5	50.0	50.0
	4	7	30.0	70.0
	5	5	50.0	50.0
couch attitude	10	9	10.0	90.0
	11	5	50.0	50.0
	12	9	90.0	10.0
	13	4	60.0	40.0
	14	4	60.0	40.0
	15	7	30.0	70.0
Athletes	7	16	84.2	15.8
	8	59	41.6	58.4

1: N= number of participants where answered questions correctly.

2:% = percentage of the participants where answered questions with Yes.

3:% = percentage of the participants where answered questions with No.

4. Discussion

Creative and talented athletes are an essential part of the wealth of a nation. It is considered to reflect the development of the nation in the field of sport. Therefore, all the elements of care and attention must be paid to all

the relevant aspects of these elite athletes. This can be done in a variety of ways, such as holding special training programs and courses on all subjects related to their physical, nutritional, and psychological capabilities, and improving them all.

One of the most important foundations for maintaining

physical, mental, and psychological fitness is their commitment to a healthy and balanced diet, their knowledge of DS, and their awareness of the limits of consumption. Proper and balanced healthy nutrition is also one of the most important foundations for the advancement and success of athletes.

The importance of this study stems from the fact that to the best of the researcher's knowledge, there has been no study assessing nutritional knowledge and attitudes regarding the use of DS among elite athletes and coaches in the Jordan Olympic Preparation Program and this is the first study to date in Jordan to report on the use of DS among elite athletes. This study assessed the perception of elite athletes and coaches towards DS and demonstrated the frequency of their use, which is an important area of ongoing clinical concern.

One of the main objectives of this research is also to assess and broaden the knowledge of elite athletes in Jordanian society about DS, to improve the nutritional attitudes, knowledge, and practices of elite athletes, particularly in the field of DS, as this will lead to more athlete-conscious food and DS society and more healthy elite athletes.

This study showed that consumption of DS was common among elite athletes as 41.6% of athletes admitted to using DS and 46.5% of athletes believed that not using these supplements could impair their athletic performance. As noted in previous research by Sekulic et al. in 2019, elite athletes used DS because they believe it is an easy and quick way to build muscle and contribute to building a stronger physical structure [15].

Several other factors make a significant contribution to the spread of DS among athletes, such as rapid developments in the marketing of DS through media such as magazines, internet and television advertisements, attractive DS information, and ease of purchase from pharmacies and supermarkets, because there is no need for a prescription to purchase and therefore the product is called over the counter (OTC). In addition to the wide range of prices for each product, certain supplements are available at low prices and are affordable for most of them.

Also, most athletes who know that these DS are not safe for long-term use and over-consumption of DS may have negative health effects. The results of this study were consistent with those of previous studies that showed a high rate of consumption, such as a study in Southeast Europe of 912 elite athletes showing that 12.7% of athletes use DS equal to 116 athletes [15] and a Canadian study of 247 elite athletes found that 99 percent of elite athletes used DS at least once [16].

In addition, there were statistically significant differences between the athlete's knowledge of athlete practice ($P=0.024$), but their attitude did not affect the practice ($P=0.161$) because they believed that nutritional supplementation was an essential component of improving their athletic performance [12].

There are no statistically significant differences in nutritional knowledge and practice for DSs due to gender ($P=0.335$, $P=0.490$) while statistically significant differences in nutritional behavior for DS due to gender ($P=0.006$). The proportion of attitudes for females was almost higher than for males because females have healthier beliefs than males in general. These results were like those of Heikkinen et al. [8] conducted in elite Finnish athletes and showed no difference in the use of DS between male and female elite athletes either in the prospective study in 2002 or in the follow-up study in 2009.

In the same field, there are statistically significant differences in knowledge and attitude on DS due to sport type between athletes ($P=0.002$, $P=0.001$), Whereas 100% of taekwondo athletes use DS and are the most widely used, followed by football athletes with 58% also team sports athletes are more likely to use DS than individual sports athletes. Also, in terms of practice and attitude, boxing and karate were superior parts of the questionnaire, but the highest degree of knowledge mostly belonged to Muaythai. These results were like a study conducted in elite Finnish athletes, which showed that speed and power athletes were the highest in DS use [8]. Also, a study conducted on elite Lithuanian athletes showed that all DS use among athletes in team sports was higher than among athletes in individual sports [17].

As for the difference between knowledge, attitude and practice of DS depending on the BMI, there was no significant statistical difference in practice ($P=0.623$), knowledge ($P=0.323$) and attitude ($P=0.070$) between these groups due to the convergence of responses between all groups. These results were the opposite of the recently conducted study, which showed statistically significant differences in the use of DS due to BMI ($P < 0.0001$) [17].

Also, 50% of underweight athletes use DS, while only 37% of overweight athletes take DS and 42% of normal weight athletes use DS. This could be an indication that underweight athletes are more likely to use DS to replace body weight loss and increase muscle mass.

On the other hand, the education level categories had statistically significant differences in the athlete's knowledge of DS ($P=0.006$), where diploma athletes had the highest nutritional supplement knowledge, with approximately 55% having good knowledge, while 50.7% of graduate athletes and 42.3% of graduate athletes had good knowledge of DS. There were no statistically significant differences in attitudes ($P=0.499$) and practices ($P=0.160$) in the education level categories. They are due to their adherence to the consumption of DS as part of their concern to have good performance to improve recovery, to try to have an athletic and healthy body shape and to prevent any deficiency in vitamins and minerals [17].

In addition, the percentage of athletes holding a diploma was the least used for DS and about 14% followed by students holding a university degree by 40%

and those holding a secondary degree by 42% and the highest in the use of supplements. It's the opposite of what's expected. 63% of university graduates say they have taken DS courses and workshops, while only 43% and 46% of graduates and high school graduates take DS courses and work. This can be explained by the fact that university students are having an impact on each other as they try to improve muscle mass and body appearance [18].

It has also been shown that there are no statistically significant differences between knowledge, attitudes, and DS practices among elite athletes that can be attributed to age, sleep duration, and experience variables among coaches, like those of [8] which showed that there are no statistically significant differences in age-related DS use. Our study showed that 50% of athletes between 31 and 36 years of age were the most frequent users of DS, although 56% had good knowledge of DS. As for athletes between the ages of 25 and 30, only 37% of them used DS and 42% of athletes under the age of 24 used DS supplements. In addition, long-sleep athletes had the least use of DS, with only about 29% of those using DS, while the average sleeper category was the largest user of DS, with about 50% and 44% of short-sleepers.

As far as income groups are concerned, there were statistically significant differences in DS utilization due to the purchasing power of athletes who have a job ($P=0.011$), as 47% of athletes who have a job with DS compared to 29% of unemployed athletes did not use DS, but there were no significant differences in knowledge ($P=0.076$) and attitude ($P=0.060$) among elite athletes. There was a convergence between the percentage of athletes whose source of income was work and who had good knowledge of DS and athletes whose source of income was family and had good knowledge of DS, as follows: 49% and 42.7%.

One of the most important objectives of this research is to know the influence of coaches on elite athletes on the issue of DS. It was noted that 84.2% of the players considered the coach to be the most important source of information on DS, and this indicates that the coach had a massive impact on elite athletes in terms of DS, such as Parr et al. (1984) which showed that 36.3% of athletes were the source of their nutritional knowledge, and another study showed that 12% was the coach [19].

In general, only about 1% of all elite athletes have a knowledge score of 100%, and 53% have a knowledge score of less than 50%, while 47% have a knowledge score of more than 50%, indicating that knowledge of DS among elite athletes is inadequate. They must therefore be subject to courses and seminars on DS and limitations on the use.

5. Conclusion

The current study found that Jordanian athletes do not

have sufficient knowledge and belief about DS. Although more than half of the elite athletes reported not using DS, and the reason for this may be due to the athlete's income factor, the results showed a correlation between the athlete's income and the use of DS. In addition, the athlete's knowledge of DS was statistically significant with respect to the type of sport and the level of education. As for the attitude of DS among athletes, it was statistically significant with age, gender, and type of sport where the effect of the sport type on the knowledge and belief of athletes by coaches was since most athletes indicated that their coach was a key reference for DS information.

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