

## Involving Pharmacists in Japanese Athletes' Self-Medication

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### Abstract

**Objective:** Individuals commonly self-medicate without a prescription. Athletes, however, are prohibited from taking substances listed by the World Anti-Doping Agency (WADA). Since it can be very difficult to verify whether a banned substance is contained in a particular medicine, athletes risk unintended doping when they self-medicate. This study documents young athletes' self-medication practices, and the problems they encounter when doing so. It also makes recommendations for increasing their knowledge of self-medication, and discusses the role sports pharmacists can play in preventing young athletes' unintended doping.

**Methods:** We asked university student-athletes to complete a structured survey that gathered basic personal information (sex, age), type of sport (group sport or individual competition), and level of sport (elite or general athlete), respondents' attitudes toward purchasing over-the-counter (OTC) drugs, their nutritional intake, and their knowledge of and experience with doping.

**Results:** The survey was completed by 820 student athletes. Within the past year, 59.1% had used OTC drugs, 51.5% had used supplements, and 18.2% of the respondents said they checked or consulted with someone about whether a drug was prohibited before taking it. Of those, 62.4% used the Internet to get information, and 30.2% asked a pharmacist. Among all respondents, 43.5% had learned about anti-doping from a "school lecture," and 2.2% from a "pharmacist." Female athletes were more likely to take OTC drugs ( $p < 0.01$ ) than male athletes ( $p < 0.01$ ). Elite athletes and athletes involved in individual competitions were more likely to hesitate before taking drugs than general athletes and group sport athletes ( $p < 0.01$ ).

**Conclusion:** Athletes do not regard pharmacists as having a responsibility for providing anti-doping information. Pharmacists should provide information on prohibited drugs, anti-doping activities, self-care related to proper nutrition, and drug use according to each athlete's individual needs.

**Keywords:** Anti-doping; Pharmacist; Young Athlete; Self-Medication; Anti-Doping Education; OTC drug; Supplement; Energy Drink

### Introduction

The 2020 Olympics will be held in Tokyo Japan. Public interest in these games has been growing, and drawing attention to the problem that top athletes are frequently being charged with doping violations [1]. There is obviously an urgent need to implement measures that will combat doping.

The Japanese government is promoting self-medication to control increasing health care costs, and individuals commonly self-medicate or treat their own illnesses or symptoms using medicines that are available without a prescription [2]. In the year 2013, "Japan Revitalization Strategy" promoted the use of pharmacies and pharmacists as a community based hub for health information through the provision of advice on the appropriate use of OTC drugs as well as consultation services and health information [3]. In terms of convenience, athletes may also self-medicate, and especially so when they experience pain, tiredness, or injuries. Unlike ordinary people,

however, athletes must be aware of the hundreds of substances and methods classified under different categories that athletes are prohibited from taking both in- and out-of-competition that have been prohibited by the World Anti-Doping Agency (WADA) [4]. Since the drugs prohibited by WADA change yearly, and the related requirements are becoming more stringent, athletes are always at risk of unintended doping when they use OTC drugs [4].

The Japan Anti-Doping Agency (JADA) launched the Sports Pharmacist System in 2009, with the objective of providing athletes with anti-doping information. By completing this course of study, pharmacists become certified as sports pharmacists, whose main responsibility is providing correct information on WADA's latest list of prohibited drugs to athletes [5]. As of 2018, however, only a limited number of pharmacists have been accredited as sport pharmacists, and athletes are not always able to consult with them about a drug they wish to take, making it difficult for athletes to self-medicate [6].

Some studies have investigated athletes' attitudes, beliefs, and knowledge about doping [7]. However, evidence is limited as to what the actual hardships are for athletes on conducting self-medication, and what kind of knowledge and support they need from pharmacists.

A study from Saudi Arabia revealed that young athletes are at risk of using prohibited substances [8]. Therefore, a survey with young athletes is considered essential.

This study aimed to document young athletes' self-medication practices and the problems they encounter when doing so. It also makes recommendations for improving their environment of self-medication and discusses the role of pharmacists in preventing unintended doping for young athletes. University student-athletes were asked to complete a structured survey that gathered information about respondents' attitudes toward purchasing over-the-counter (OTC) drugs, their nutritional intake, and their knowledge of and experience with doping.

## Methods

We conducted a structured survey of university student-athletes at a university in Tokyo, Japan, between November 2017 and January 2018 during class lectures of sport science. All students who participated in the lectures completed the survey. Respondents were asked to complete the survey by providing basic personal information (sex, age), information on the type of sport they were involved in (group sport or individual competition), and the level they had achieved in their sport (whether they had participated in events above or below the level of Japan's National Sports Festival). In Japan, doping tests are administered to athletes who compete at levels higher than the National Sports Festival, and we identified these individuals as elite athletes. We also documented respondents' attitudes toward OTC purchases, nutritional intake, and their knowledge of and experience with doping.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS®) Version 25, which facilitated the presentation of descriptive statistics for each question. The significance of any differences between young athletes' sex, type of sport, and level of sport with regard to their attitudes toward purchasing OTC drugs, their nutritional intakes, and their knowledge of and experience with doping was determined using chi-square tests (statistical significance,  $p < 0.05$ ).

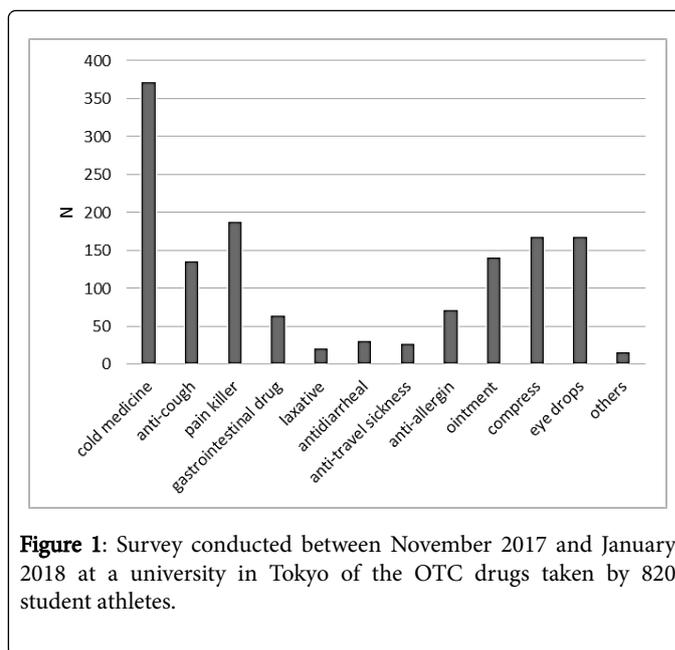
The protocol used to conduct the study's survey followed ethical guidelines for medical and health research involving human subjects, and was approved by the ethical review board of the Nihon University's School of Pharmacy. The survey was conducted anonymously.

## Results

In total, 820 student athletes completed the survey. Table 1 summarizes respondents' basic information.

### Use of drugs and supplements

Of all the respondents, 50.5% (414/820) had used prescription drugs, and 59.1% (485/820) had used OTC drugs within the past year (Table 2). Of those who had used OTC drugs in the past year, 76.5% (371/485) had used cold medicines. The next most commonly used drugs were painkillers, by 38.6% (187/485) of the respondents, and ointments and compresses, by 34.4% (167/485) (Figure 1).



**Figure 1:** Survey conducted between November 2017 and January 2018 at a university in Tokyo of the OTC drugs taken by 820 student athletes.

Parameters	Category	No.	%
Age	10s	476	58
	20s	345	42
Sex	male	513	62.5
	female	308	37.5
Type of sport	individual competition	183	22.3
	group sport	531	64.8
	both	106	12.9
Years of sport	1-5 years	172	21
	6-10 years	374	45.6
	10 years more	274	33.4
Level of sport	experienced Olympic	4	0.5
	experienced World championship	58	7.1
	experienced Japan championship	77	9.4
	experienced National Sports Festival in Japan	187	22.8
	experienced other national level competition	424	51.6
	experienced regional level competition	596	72.6
Experience of doping test	yes	58	7.1
	no	757	92.9

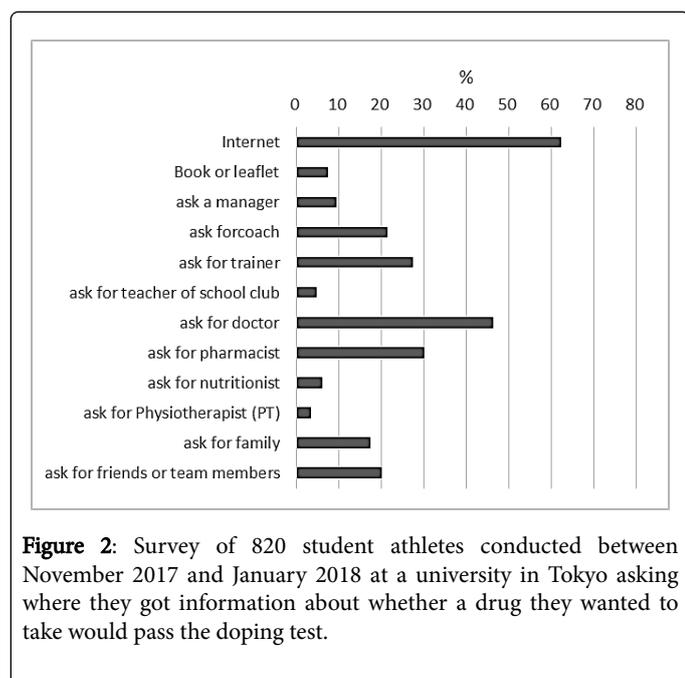
**Table 1:** Survey of 820 student athletes conducted between November 2017 and January 2018 at a university in Tokyo: Respondents' basic information.

To the question “Before you take a drug, do you check or consult with someone whether the drug is prohibited?”, 18.2% (149/820) of the respondents answered “yes,” and of them, 62.4% (93/149) used the Internet as an information source, and 30.2% (45/149) asked a pharmacist for advice (Table 2, Figure 2).

Questionnaire		Sex						p	Level of sport					Type of sport				
		Total	%	M	%	F	%		EA*1	%	GA*2	%	p	IC	%	GS	%	p
Have you ever had an experience of the doping test?	yes	58	7.117	40	7.9	18	5.8	ns	45	18.8	12	2.2	p<0.01	23	12.6	21	4	p<0.01
	no	757	92.88	467	92.1	290	94.2		194	81.2	525	97.8		159	87.4	507	96	
When you sick or injured, which is the most likely medical action for you? Yes - See a doctor and ask for drug, or go to the drug store and buy OTC drug No - Not using drug as possible	yes	627	86.2	390	85.9	238	86.9	ns	183	85.1	419	87.1	ns	142	85.5	406	87.3	ns
	no	100	13.8	64	14.1	36	13.1		32	14.9	62	12.9		24	14.5	59	12.7	
Do you have an experience that you stop or hesitate to take drug, because you were afraid of unintended doping violation?	yes	119	14.57	80	15.7	39	12.7	ns	81	33.2	34	6.4	p<0.01	52	28.6	36	6.8	p<0.01
	no	698	85.43	431	84.3	267	87.3		163	66.8	500	93.6		130	71.4	492	93.2	
Did you take prescription drug within 1 year?	yes	414	50.49	246	48	168	54.5	ns	112	45.9	282	52.5	ns	100	54.6	252	47.5	ns
	no	406	49.51	266	52	140	45.5		132	54.1	255	47.5		83	45.4	278	52.5	
Did you take OTC drug within 1 year?	yes	485	59.15	277	54.2	208	67.5	p<0.01	134	54.9	337	62.9	p<0.05	104	56.8	314	59.4	ns
	no	335	40.85	234	45.8	100	32.5		110	45.1	199	37.1		79	43.2	215	40.6	
Before you take drug, do you check or consult someone whether the drug is prohibited?	yes	149	18.19	103	20.1	46	15	ns	103	42.2	42	7.8	p<0.01	61	33.5	57	10.8	p<0.01
	no	670	81.81	409	79.9	261	85		141	57.8	494	92.2		121	66.5	473	89.2	
Did you take supplement within 1 year?	yes	421	51.5	299	58.5	122	39.9	p<0.01	133	55.2	270	50.4	ns	110	60.4	262	49.5	p<0.05
	no	396	48.47	212	41.5	184	60.1		108	44.8	266	49.6		72	39.6	267	50.5	
Did you take energy drink within 1 year?	yes	622	76	416	81.4	206	67.1	p<0.01	175	72.6	417	77.7	ns	133	72.7	408	77.1	ns
	no	196	24	95	18.6	101	32.9		66	27.4	120	22.3		50	27.3	121	22.9	

Before you take supplement or energy drink, do you check or consult someone whether the supplement or the energy drink is prohibited?	yes	124	15.16	88	17.2	36	11.7	p<0.05	81	33.2	41	7.7	p<0.01	59	32.2	44	8.3	p<0.01
	no	694	84.84	423	82.8	271	88.3		163	66.8	494	92.4		124	67.8	485	91.7	
*1 elite athlete: have experience to attend the National Sports Festival in Japan above																		
*2 general athlete: have experience to attend the National Sports Festival in Japan less																		
M – Male; F – Female; EA – Elite athletes; GA – General athletes; IC – Individual competition; GS – Group sport																		

**Table 2:** Survey conducted between November 2017 and January 2018 at a university in Tokyo of 820 student athletes' experiences with and attitudes toward doping and self-medication.



**Figure 2:** Survey of 820 student athletes conducted between November 2017 and January 2018 at a university in Tokyo asking where they got information about whether a drug they wanted to take would pass the doping test.

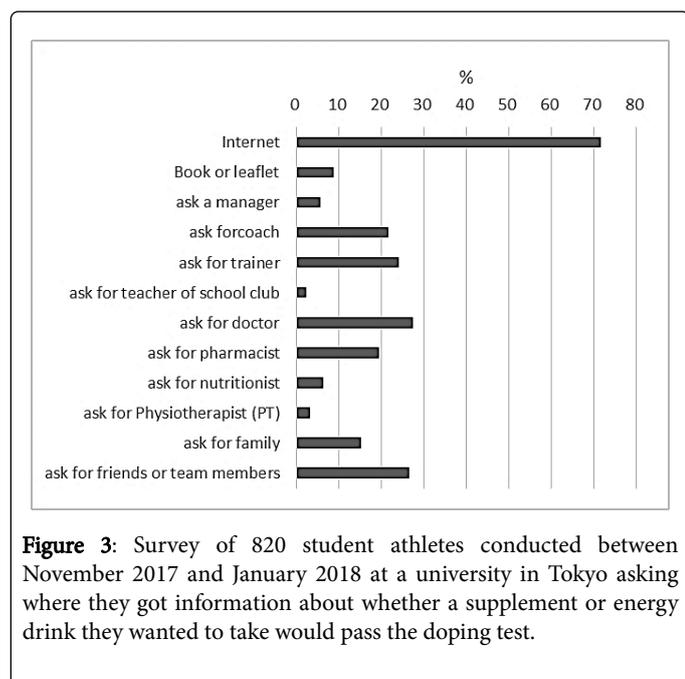
Regarding the types of OTC drugs used in the past year, males, at 77.3% (214/277), were more likely to use cold medicines than females, at 68.3% (142/208), ( $p<0.05$ ). Females were more likely to use painkillers (males 27.2% [75/277], females 49.5% [103/208],  $p<0.01$ ), laxatives (males 1.8% [5/277], females 6.7% [14/208],  $p<0.01$ ), ointments (males 20.9% [58/277], females 35.6% [74/208],  $p<0.01$ ), compresses (males 26.7% [74/277], females 40.4% [84/208],  $p<0.01$ ) (Table 3). There were no statistically significant differences between the level of sport and type of sport in terms of the types of OTC drugs used in the past year (Table 3).

Within the past year, 51.5% (421/817) of the respondents had used supplements, and 76% (622/818) consumed energy drinks. In response to the question “Before you take a supplement or energy drink, do you check or consult with someone as to whether the supplement or energy drink is prohibited?”, 15.2% (124/818) answered “yes,” and of these, 71.8% (89/124) used the Internet as an information source, and 19.4% (24/124) asked a pharmacist (Table 2, Figure 3).

Type	Sex					Level of sport					Type of sport				
	M	%	F	%	p	EA*1	%	GA*2	%	p	IC	%	GS	%	p
	(N=277)		(N=208)			(N=132)		(N=338)			(N=104)		(N=314)		
cold medicine	214	77	142	68	$p<0.05$	103	78	240	71	ns	78	75	231	74	ns
anti-cough	74	27	53	26	ns	33	25	90	27	ns	28	27	87	28	ns
pain killer	75	27	103	50	$p<0.01$	55	42	118	35	ns	35	34	113	36	ns
gastrointestinal drug	37	13	26	13	ns	15	11	45	13	ns	16	15	38	12	ns
laxative	5	1.8	14	6.7	$p<0.01$	6	4.5	13	3.8	ns	6	5.8	11	3.5	ns

antidiarrheic drug	19	6.9	9	4.3	ns	6	4.5	21	6.2	ns	7	6.7	17	5.4	ns
anti-travel sickness	11	4	16	7.7	ns	4	3	22	6.5	ns	8	7.7	14	4.5	ns
anti-allergic	42	15	22	11	ns	13	9.8	50	15	ns	15	14	43	14	ns
ointment	58	21	74	36	p<0.01	31	24	98	29	ns	28	27	89	28	ns
compress	74	27	84	40	p<0.01	39	30	116	34	ns	34	33	104	33	ns
eye drop	92	33	63	30	ns	36	27	116	34	ns	31	30	105	33	ns
*1 elite athlete: have experience to attend the National Sports Festival in Japan above															
*2 general athlete: have experience to attend the National Sports Festival in Japan less															
M – Male; F – Female; EA – Elite athletes; GA – General athletes; IC – Individual competition; GS – Group sport															

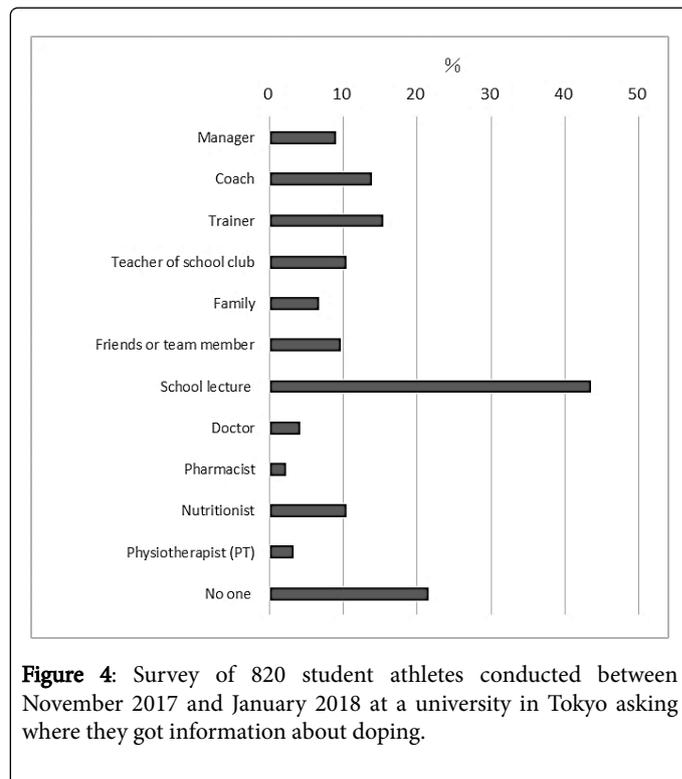
**Table 3:** Survey conducted between November 2017 and January 2018 at a university in Tokyo of 820 student athletes' OTC drug use in the past year.



**Figure 3:** Survey of 820 student athletes conducted between November 2017 and January 2018 at a university in Tokyo asking where they got information about whether a supplement or energy drink they wanted to take would pass the doping test.

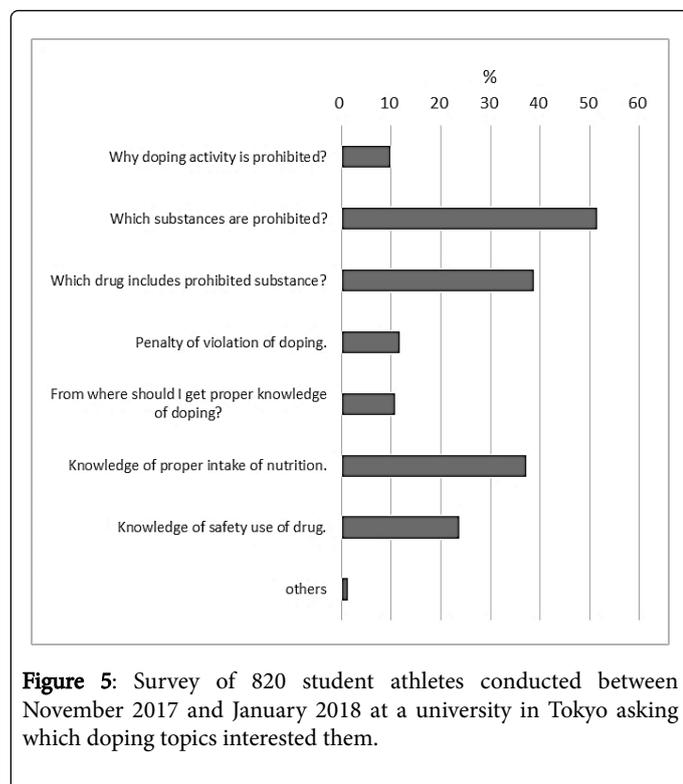
### Knowledge of doping

In response to the question “Where did you get knowledge about doping?”, 43.5% (357/820) of the respondents answered “a school lecture”, “no one” 21.6% (177/820), “a trainer” 15.3% (126/820), “a coach” 13.9% (114/820), “a teacher at a school club,” “a nutritionist” 10.5% (86/820), “friends or team member” 9.6% (79/820), “a manager” 9.0% (74/820), and “a pharmacist” 2.2% (18/820) (Figure 4).



**Figure 4:** Survey of 820 student athletes conducted between November 2017 and January 2018 at a university in Tokyo asking where they got information about doping.

When answering the question “What kind of topic interests you about doping?” respondents, at 51.4% (422/820) and 38.7% (318/820) respectively, asked, “which substances are prohibited?” and “which drugs include a prohibited substance?” Some respondents said they wanted to learn about healthy lifestyles, and not directly about doping, by saying they wanted to acquire “knowledge of proper intake of nutrition,” and “knowledge of using drugs safely,” at 37.3% (306/820) and 23.8% (195/820) respectively (Figure 5).



**Figure 5:** Survey of 820 student athletes conducted between November 2017 and January 2018 at a university in Tokyo asking which doping topics interested them.

### Intake of OTC drugs and supplements (Comparison of sex, level of sport, and type of sport)

Within the past year, females (67.5%, 208/308) used more OTC drugs than males (54.2%, 277/511) ( $p < 0.01$ ). Respondents who have attended the National Sports Festival in Japan or higher levels of competition (elite athletes) used fewer OTC drugs than athletes with no experience of the higher levels of competition (general athletes), (54.9%, 134/244) and 62.9% (337/536) respectively ( $p < 0.05$ ). Among the respondents who had used OTC drugs in the past year, 42.2% (103/244) of elite athletes and 7.8% (42/536) of the general athletes checked or consulted someone as to whether a drug was prohibited ( $p < 0.01$ ). Athletes involved in individual competitions were more likely to check or consult with someone as to whether a drug was prohibited than athletes involved in group sports, at 33.5% (61/182) and 10.8% (57/530) respectively ( $p < 0.01$ ) (Table 2).

In the past year, 58.5% (299/511) of male athletes had used supplements, whereas 39.9% (122/306) of the female athletes had used supplements ( $p < 0.01$ ). Males also used more energy drinks than females. Athletes involved in individual competitions were more likely to take supplements than athletes involved in group sports, at 60.4% (110/182) and 49.5% (262/529) respectively ( $p < 0.05$ ). Among the athletes who used supplements or energy drinks in the past year, those who checked or consulted with someone as to whether the supplements or energy drinks were prohibited included 17.2% (88/511) of the males and 11.7% (36/307) of the females ( $p < 0.05$ ). Elite athletes were more likely to check or consult with someone as to whether supplements or energy drinks were prohibited than general athletes, at 33.2% (81/244) and 7.7% (41/535) respectively ( $p < 0.01$ ). Of athletes involved in individual competition, 32.2% (59/183) checked or consulted with someone as to whether supplements or energy drinks

were prohibited, compared to only 8.3% (44/529) of the group sport athletes ( $p < 0.01$ ) (Table 2).

### Knowledge of and experience with doping (Comparison of sex, level of sport, and type of sport)

Table 2 summarizes young athlete respondents' characteristics by sex, level of sport, and type of sport in terms of their knowledge of and experience with doping. Athletes who had experienced the doping test were more likely to be elite rather than general athletes, at 18.8% (45/239) and 2.2% (12/537) respectively ( $p < 0.01$ ). Of the athletes involved in individual competitions, 12.6% (23/182) had been tested, and 4% (21/528) of the group sport athletes had been tested ( $p < 0.01$ ).

In response to the question "Have you had an experience that makes you stop or hesitate to take a drug, because you are afraid of an unintended doping violation?" 33.2% (81/244) of the elite athletes said yes, whereas only 6.4% (34/534) of the general athletes responded in the affirmative ( $p < 0.01$ ). Athletes involved in individual competitions tended to be afraid of unintended doping violations, and were more hesitant to take drugs than athletes involved in group sports, at 28.6% (52/182) and 6.8% (36/528) respectively ( $p < 0.01$ ).

### Discussion

This study documented young athletes' nutritional intake and use of OTC drugs, with the objective of making recommendations that would improve athletes' self-medication environment. We found that 50% of the athletes we surveyed had used prescription drugs in the past year, and 59% had used OTC drugs. Among the young athletes (between 10 and 29) who tended to prefer self-medicating over seeing a doctor OTC drugs were more popular than prescription drugs. This finding was consistent with the results of prior research [9].

Of the respondents, 52% had used supplements, and 76% had used energy drinks in the past year, and of those, 15% indicated that they checked or consulted with someone as to whether the supplements or energy drinks were prohibited. Sometimes young athletes buy supplements by shopping online. One unintended doping violation was reported from taking a supplement made overseas and sold via the Internet, so there is a need to let athletes know about this risk [10,11]. It is also necessary that athletes take supplements that are both safe, and have Japan Anti-doping Drug Agency (JADA) certification [12].

Most of these athletes got their information about whether a drug or supplement was prohibited or not from the Internet, and the rest got their information from a doctor. However, OTC drugs, supplements, and energy drinks are sold mainly in drugstores, where there are no doctors, but rather pharmacists, so pharmacists should be providing more information about doping.

Female athletes—who tend to take painkillers and laxatives—used OTC drugs more than male athletes. These drugs are mainly used for period pain and chronic constipation, both of which are often experienced by young ladies [13]. Other gender differences revealed in this study related to the intake of supplements and energy drinks. Though female athletes took more OTC drugs, male athletes consumed more supplements and energy drinks. Among the general population, females are more likely to take supplements than males [14,15], since they tend to take supplements to enhance their beauty and prevent lifestyle diseases. On the other hand, athletes tend to take supplements to build muscle, and that is why male athletes tend to take supplements [14,16,17].

With regard to different types of sport, our survey revealed that athletes involved in individual competition had had more experiences taking the doping test, and tended to avoid or hesitate taking a drug because they were afraid of unintended doping violations. They also tended to check or consult with someone as to whether a drug, a supplement, or an energy drink was prohibited before using it.

In terms of the level of sport athletes were involved in, elite athletes were among those who had had more experiences taking the doping test, and tended to stop or hesitate before taking a drug, because they were afraid of unintended doping violations. General athletes were more likely to take OTC drugs than elite athletes. A study conducted in the UK showed that elite athletes have to take doping tests more often than general athletes, so elite athletes' have more knowledge of doping, and as a result they are more likely to hesitate before taking OTC drugs. Our findings were consistent with this result [18].

Pharmacists educated 2.2% of athletes about anti-doping. A prior study confirmed the educational effects of sport pharmacists' involvement in anti-doping. Since research has shown that pharmacists can effectively teach athletes about anti-doping, they should assume this role in future [19]. Our results showed that athletes want to know what proper nutritional intake is, and whether the drugs they want to use are safe, and this information should be included in anti-doping information.

For pharmacists to be recognized as a source of anti-doping information, they should become actively involved in providing this information to others, including young athletes, and so move beyond being involved in passive activities such as consulting with individual athletes. Sports pharmacists in health facilities must be available to give athletes ready access to doping information. Effective immediately, all clinical pharmacists involved in taking care of athletes should have at least the minimum required knowledge of anti-doping. Nonetheless, an anti-doping education provides information about prohibited drugs, and also conveys a wide range of health related knowledge that includes the appropriate use of a drug. In addition, considering the high consumption of supplements and energy drinks reported in this study, athletes also need to be provided with a sound knowledge of good nutrition, and nutritionists who can provide this information should be made available [20].

## Conclusion

This study found that athletes do not regard pharmacists as being responsible for providing them with anti-doping information. In particular, having pharmacists promote anti-doping information is considered to be a future task. Our study also found that different athletes' have different attitudes toward anti-doping by analyzing individual athletes' personal characteristics—such as sex and sport level, use of drugs, supplements, and energy drinks. Effective immediately, pharmacists should provide information to athletes about prohibited drugs, proper nutrition, and the safe use of drugs, and provide self-medicating and anti-doping advice, according to the needs of individual athletes. In so doing, they will teach them to practice self-care.

## Acknowledgement

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## Conflict of Interest

None declared.

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