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Anti-doping knowledge and educational needs of Finnish pharmacists

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ABSTRACT

Objectives: Pharmacists' role in health care has evolved towards a more collaborative practice to combat current public health challenges and to support rational use of medicines. Previous literature also demonstrates pharmacists' emerging role in sports and exercise medicine, including anti-doping and health counselling of athletes. The aim of this study was to assess: 1) What is the pharmacists' self-assessed knowledge about doping and anti-doping activities? 2) How does the pharmacists' and pharmacy characteristics effect on the self-assessed knowledge about doping and anti-doping activities? 3) What educational needs do the pharmacists report about doping and anti-doping activities?

Material and Methods: A cross-sectional online survey was conducted among Finnish pharmacists in 2019. A convenience sampling method was used to reach the target group. The survey consisted of 26 questions considering pharmacists' perceptions about doping, knowledge, and need for education about the pharmacology of doping agents, anti-doping counselling, and information sources. Descriptive statistics and cross-tabulation with Pearson's χ^2 and the Kruskal-Wallis tests were used to analyse the data.

Results: A total of 246 pharmacy professionals completed a national online survey targeted at pharmacists in Finland. The average age of the respondents was 43 years ($SD = 10$), where 94% were females and 6% males. Pharmacists reported their self-assessed knowledge on anti-doping counselling to be poor or rather poor. Their highest needs for education were related to nutritional supplements' doping risks, substances listed as doping agents, their mechanisms of action and purpose of use, and the adverse effects of doping agents and interactions with other medicines. More information was also needed about prohibited substances and methods in sports and doping in recreational sports.

Conclusion: Pharmacists were willing to participate in anti-doping activities, including counselling athletes. However, many pharmacists perceived their knowledge as insufficient and reported educational needs that could be considered in undergraduate and continuing education of pharmacists. Universities, anti-doping organisations, and other related actors in the pharmacy and anti-doping field have an important role in providing more educational opportunities to pharmacists.

1. Introduction

1.1. Anti-doping activities and sports pharmacy

Doping in organised and recreational sports was recognised as a public health issue in the European Union (EU) in 2007, when the EU

White Paper on Sport was published (Commission of the European Communities, 2007). This paper recommended that all actors with a responsibility for public health should take the health-hazard aspects of doping into account in their activities. International anti-doping activities consist of doping prevention, harm reduction, and health promotion which include doping control, anti-doping education, research, and

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raising population awareness about doping agents and the adverse effects of doping use (Backhouse et al., 2014; World Anti-Doping Agency, 2020a). The goal of the anti-doping activities is to maintain the integrity of sports, as well as to protect athletes' and recreational athletes' health and, more generally, public health by prevention of performance and image enhancing drugs (PIEDs) use outside of sports. In sports, anti-doping work is regulated by the Code of the World Anti-Doping Agency (WADA), which contains the List of Prohibited Substances & Methods in Sports. At the national level, preventive anti-doping activities are usually part of the national anti-doping agencies' strategy programs, which commonly include population awareness, prevention, and education projects such as the U.S. Anti-Doping Agency's (USADA) HealthPro Advantage online anti-doping educational tutorial for the health professionals (Tandon, Bowers & Fedoruk, 2015; World Anti-Doping Agency, 2020b).

Pharmacist's role in health care has shifted from dispensing medicines and other pharmaceutical tasks towards a more collaborative practice and primary prevention through health education to combat current public health challenges and to support rational use of medicines, meaning that the patient only receives medication appropriate to their clinical needs (International Pharmaceutical Federation 2017; World Health Organization, 2006). Pharmacists' potential role in sports medicine has also been recognised (Hooper, Cooper, Schneider & Kairuz, 2019). Suggested role includes injury management, first aid and sports medicine education, and participation in anti-doping activities such as doping prevention and control. The International Pharmaceutical Federation (FIP) has provided a guideline for pharmacy professionals in the fight against doping in sports which includes recommendations for governments, pharmaceutical associations, pharmaceutical manufacturers and pharmacists (International Pharmaceutical Federation 2014). According to the guideline, pharmacists should promote the benefits of exercise, provide information about nutritional supplements and the risks associated with using them, stay up-to-date on which medicines contain a substance included in the WADA Prohibited List, differentiate between the appropriate use of medication and illegitimate practice and refuse to supply a medicine intended to be used to improve performance illegitimately.

Even though pharmacists have been identified as the key sources of medicine information for medicine users along with physicians and package leaflets (Mononen, 2020), and recognised also as a potential source of information for athletes and recreational athletes (Hooper et al., 2019; Howard et al., 2018; Malek, Taylor & Mansell, 2014), little is known about their knowledge and educational needs on doping and anti-doping issues. Previous studies have focused on pharmacists' awareness, perceptions and knowledge towards doping and the needs for anti-doping education on a national level. The recent systematic review on sports pharmacy research (Hooper et al., 2019) found that pharmacists would be willing to counsel athletes, but they feel that their confidence and knowledge for doing this is inadequate. Based on the same review, pharmacists report having limited educational opportunities in sports pharmacy and anti-doping issues. There is also some research showing that pharmacists do not have sufficient knowledge on the FIP Statement, national anti-doping organisations, identifying the drugs classified as doping agents and sport supplement products and their doping risks (Auersperger et al., 2011; Chiang, Hatah & Shamsuddin, 2018; Howard et al., 2018; Laure & Kriebitzsch-Lejeune, 2000; Mottram et al., 2016; Starzak, Derman, McKune & Semple, 2016). Similar findings on pharmacists' educational needs have been made among pharmacy students (Awaisu et al., 2015; El-Hammadi & Hunien, 2013; Saito et al., 2013; Shibata, Ichikawa & Kurata, 2017). Some studies have compared the attitudes and the level of knowledge of general practitioners and pharmacists, and educational needs were found in both groups (Auersperger et al., 2011; Starzak et al., 2016).

The need for further research and pharmacists' anti-doping education is clearly global. For the purposes of developing anti-doping education and pharmacists' competence in sports and exercise medicine

counselling, further studies should also focus on more detail in pharmacists' knowledge and educational needs in anti-doping activities in recreational sports, doping as a public health issue and the health risks of PIEDs use. Additionally, research is needed on pharmacists' awareness of the current FIP guidelines, pharmacists' role in doping prevention and the difference between anti-doping activities in organised and recreational sports such as motives for doping use and doping prevention strategies. With more detailed knowledge about the possible gaps in educational areas, a more comprehensive training in anti-doping work can be instituted, so that pharmacists are able to effectively perform anti-doping counselling and doping prevention.

1.2. Context of the study

The study was conducted in cooperation with A-Clinic Foundation's Dopinglinkki, the Finnish Center for Integrity in Sports FINCIS, the Pharmaceutical Information Centre, and the University of Helsinki. In Finland, anti-doping activities are divided between two separate organisations in cooperation: the Finnish Center for Integrity in Sports, responsible for doping prevention and control in sports and ethically sustainable sports culture, and A-Clinic Foundation's Dopinglinkki, responsible for preventive anti-doping activities in recreational sports.

During the time of the study in 2019, there were 819 pharmacies (including University Pharmacies) in Finland, of which 623 were main pharmacies and 196 were subsidiary pharmacies (Association of Finnish Pharmacies, 2019). In cooperation with other health care providers, pharmacies' role is to support the rational and safe use of medicines (Hämeen-Anttila, Närhi, & Tahvanainen, 2018). Pharmacists are obliged to ensure appropriate and safe use of medicines while dispensing medicines in pharmacies (Finnish Medicines Agency Fimea, 2016), as well as to counsel customers on how to use their medicines.

Community pharmacies have increasingly been developing their services and concepts to support the rational use of medicines and public health, the Exerciser's Pharmacy concept being one of the most recent concepts developed (Tuunanen, Koivuniemi, & Kivimäki, 2012). The Finnish Ministry of Education and Culture funds the Exerciser's Pharmacy concept, which is an operating model maintained by the Fit for Life program, the Organisation for Respiratory Health, the Association of Finnish Pharmacies, and regional sports organisations. The concept aims to promote health-enhancing physical activity in the public and educate community pharmacists on how to bring up the topic of physical activity to pharmacy's customers and provide health information about the benefits of exercise in pharmacies.

Dispensing and counselling work in pharmacies is performed by pharmacists mainly with a BSc (Pharm) degree, but also by pharmacists with an MSc (Pharm) degree. The BSc degree takes 3 years to complete and consists of 180 European Credit Transfer System (ECTS) credits. The MSc (Pharm) degree takes an additional 2 years to complete and consists of 300 ECTS credits. Given that one of the key pharmacists' competency areas is medication counselling, i.e. pharmacist-patient-communication, teaching medication counselling skills has been integrated into pharmacy education throughout the curriculum in Finland (Mononen, 2020). Pharmacology and pharmacotherapy are also widely covered, including medicines used for doping purposes. However, there is only limited education about the use of medicinal products and controlled substances in performance-enhancing purposes and other non-medical practice in undergraduate and continuing education programs.

1.3. Aim of the study

This study was a continuation of a large international Erasmus+ Sport project evaluating the accessibility and usability of e-learning programs about performance and image enhancing drugs, and thus, improving best practices in healthcare through education and counselling (Atkinson et al., 2021). The aim of this study was to assess pharmacists' knowledge about doping and the need for education in

anti-doping counselling with the following research questions:

- 1) What is the pharmacists' self-assessed knowledge about doping and anti-doping activities?
- 2) How does the pharmacists' and pharmacy characteristics effect on the self-assessed knowledge about doping and anti-doping activities?
- 3) What educational needs do the pharmacists report about doping and anti-doping activities?

2. Material and methods

2.1. Study design, methods and participants

This study involved a national cross-sectional online survey targeted at pharmacists in Finland. The survey was conducted between March 11 and April 1, 2019. An invitation to participate was sent via e-mail by the Finnish Pharmacists' Association, the Finnish Pharmacists' Society, and Helsinki Pharmacy Students' Association. One reminder was sent to pharmacists during the data collection period. A total of 260 surveys were completed, of which 246 responses were included in the analysis. Pharmacy students were excluded ($n = 14$) to better reflect the graduated pharmacists' anti-doping knowledge and educational needs in working life.

2.2. Survey instrument

Using the Webropol 3.0 survey tool, an online survey was developed to assess pharmacists' knowledge about doping and the need for education on anti-doping counselling (Webropol, 2021). The survey was partly based on the Doping E-learning Tools (DELTS) project's survey for physicians, which was modified for the purposes of this study, as well as on previous literature and anti-doping experience of experts working in A-Clinic Foundation's Dopinglinkki, the Finnish Center for Integrity in Sports, and the Pharmaceutical Information Centre (Atkinson et al., 2021; Hooper et al., 2019). To confirm the face and content validity and technical functioning of the survey instrument, the survey was piloted by 3 pharmacy students and 6 graduated pharmacists. Based on feedback received from the pilot, some small changes were made relating to wording and some technical issues in the survey.

The final survey included altogether 26 questions, of which the majority were structured. Obligatory questions (12 questions) were marked and coded with the survey tool. The survey consisted of 4 sections assessing the pharmacists' self-assessed views, knowledge, and educational needs regarding doping issues and the developmental needs of medication counselling tools in pharmacies. The first section of the survey was about the pharmacists' background; the second section was about the pharmacists' views on doping and anti-doping activities; the third section was about knowledge and educational needs regarding doping and anti-doping activities; and the last section was about development of the pharmacies' medication counselling tools. Questions on pharmacists' knowledge and educational needs regarding anti-doping are focused on in this study. The results about the development of medication counselling tools in pharmacies will be reported in another publication (in-progress).

2.2.1. Pharmacists' background and demographic information

Standard demographic information (gender and age), educational level, and previous anti-doping-related education were gathered from the pharmacy professionals. Examples of educational anti-doping courses, e.g. WADA the Anti-Doping e-learning platform Adel, were listed in the survey, and the pharmacists were asked to select from that list of the courses in which they had participated. Additionally, they were able to report other anti-doping courses or lectures in an open-ended question. Work experience and working background were gathered from the pharmacy professionals, and if the pharmacist was working in a community pharmacy, the size of the pharmacy was

obtained.

2.2.2. Views about doping and anti-doping activities

The second section of the survey included multiple-choice and 5-point Likert scale questions about pharmacists' views on doping and anti-doping activities. Pharmacists were asked about the most common motives for doping use, willingness to participate in different anti-doping activities (1 = very little or not at all, 2 = little, 3 = to some extent, 4 = much, 5 = very much), and encounters with anti-doping-related customers during their working career.

2.2.3. Knowledge and educational needs in doping and anti-doping activities

The third section of the survey included 5-point Likert scale questions (1 = poor, 2 = rather poor, 3 = neither poor nor good, 4 = rather good, 5 = good) such as, "How well are you able to provide counselling about following health-related subjects?" and "What is your self-assessed knowledge about the following issues considering doping?" These included subcategory statements about health and anti-doping counselling in pharmacies, pharmacology of doping substances, and information searching knowledge about doping substances and anti-doping activities. The section ended with a multiple-choice question: "On which of the following doping-related subjects are you in need of more information or education?" Pharmacists could select their educational needs regarding doping and anti-doping from a structured list of options.

2.3. Data analysis

All data collected were analysed using IBM SPSS Statistics for Windows, version 26.0.0. Descriptive data are presented as proportions, means, and standard deviations. The frequencies of the variables were calculated and cross-tabulated to examine whether work experience or the size of the pharmacy was related to self-assessed knowledge (e.g. health and anti-doping counselling) by using Pearson's χ^2 tests. Due to low frequency of responses in some of the Likert scale question categories the scales 1–2 ("poor or rather poor") and 4–5 ("rather good or good") were combined. The Kruskal-Wallis test was used to determine statistically significant differences when work experience and pharmacy's annual prescription volume were compared to the self-assessed knowledge and pharmacists' willingness to participate in anti-doping activities. Significance values were adjusted by the Bonferroni correction for multiple tests. A P value < 0.05 was considered statistically significant.

2.4. Ethical considerations

The study was conducted in accordance with the guidelines of the Finnish National Advisory Board on Research Integrity (Varantola, Launis, Helin, Spoof, & Jäppinen, 2012). The aim of the study was carefully explained prior to the data collection, and informed consent was obtained electronically. All data were collected and analysed anonymously. Research approval was obtained from A-Clinic Foundation's Ethics Committee.

3. Results

3.1. Characteristics of respondents

The majority of the respondents were female (93.9%) (Table 1). The mean age was 43 ± 10 years, working in a community pharmacy (67.9%), and had a Bachelor of Pharmacy degree (85%). The majority of the respondents (94.3%) had not received any extra courses or continuing education about anti-doping issues. Importantly, 67.9% reported that they had encountered doping user groups as pharmacy customers at some point in their career.

Table 1.
Characteristics of the respondents.

	N	%
Gender		
Female	231	93.9
Male	15	6.1
Age, in years		
20–29	30	12.2
30–39	62	25.2
40–49	82	33.3
50–59	61	24.8
60–64	11	4.5
Education		
Bachelor of Pharmacy	208	84.6
Master of Pharmacy	31	12.6
Licentiate or PhD of Pharmacy	7	2.8
Work experience in the pharmacy, in years		
Up to 10	86	35
11–20	80	32.5
More than 20	80	32.5
Current employer		
Community pharmacy	167	67.9
Hospital, municipality	25	10.2
Government, the Social Insurance Institution in Finland, or University	9	3.6
Pharmaceutical industry or wholesale	18	7.3
Staff rental company	11	4.5
Unemployed	4	1.6
Other (including Biotechnology)	12	4.9
Pharmacy's annual prescription volume in 2018 ^a		
Up to 40 000	15	9.3
40 001–80 000	43	26.5
80 001–120 000	57	35.2
Over 120 000	47	29
Anti-doping related updating education		
Courses or lectures	8	3.3
Other education	6	2.4
No further education or courses	232	94.3
Encountered doping user groups as pharmacy customers		
Yes	167	67.9
No	79	32.1

Note. N = 246.

^a n = 162. If pharmacists were working in a community pharmacy, they were asked about their pharmacy's annual prescription volume. The response rate was 97%.

3.2. Pharmacists' self-assessed knowledge on anti-doping counselling

The responding pharmacists (n = 246) estimated their knowledge mostly to be good or rather good on counselling health- and disease-related issues (93% of respondents) and lifestyle issues such as quitting smoking (89%) and alcohol use (74%) (Table 2). However, less than half of the pharmacists (48%) estimated their knowledge to be good or

Table 2.
Self-assessed knowledge on different health counselling categories.

	Poor or rather poor		Neither poor nor good		Rather good or good		M	SD
	n	%	n	%	n	%		
	1		2		3			
Health and disease in general	1	<1	17	7	228	93	2.0	.6
Quitting smoking	3	1	25	10	218	89	2.0	.1
Moderate alcohol consumption	13	5	51	21	182	74	2.0	.2
Nutritional supplements and natural products	53	21	78	32	115	47	1.5	.5
Drug withdrawal	122	50	89	36	35	14	1.2	.4
Prohibited substances and methods in sport	136	55	60	25	50	20	1.5	.5
Doping in recreational sports	188	76	49	20	9	4	1.8	.4

Note. N = 246. The highest percentage values are bolded.

rather good on nutritional issues. Pharmacists' had the most limited knowledge about doping in recreational sports and prohibited substances and methods in competitive sports.

Pharmacists were asked about their detailed knowledge on anti-doping counselling in three subcategories: counselling, pharmacology of doping agents, and information searching and sources (Table 3). In general, most pharmacists' responses on anti-doping counselling were poor or rather poor (range: 65–85%). Most of the self-assessed knowledge on pharmacology of doping agents' statements was also reported to be poor or rather poor (range: 39–70%). The pharmacists' least known topic in this category was different doping agents' interactions with other medicines (70%). Information searching skills were perceived as poor or rather poor when pharmacists were asked to recognise anti-doping actors in Finland and report their skills in recreational sports

Table 3.
Pharmacists' self-assessed knowledge on anti-doping .

	Poor or rather poor		Neither poor nor good		Rather good or good		M	SD
	n	%	n	%	n	%		
	1		2		3			
Counselling								
Different motives of doping usage in recreational sports and competitive sports	159	65	49	20	38	15	1.5	.7
Symptoms and recognition of doping usage	182	74	38	15	26	11	1.4	.5
The differences in doping in sport and recreational sports	196	80	35	14	15	6	1.3	.6
Athlete anti-doping counselling and therapeutic use exemption (TUE) policy	196	80	31	12	19	8	1.3	.6
Communication and health care guidance with doping user	199	81	34	14	13	5	1.2	.7
Directing the doping user to health care services	210	85	29	12	7	3	1.4	.7
Pharmacology of doping agents								
Substances listed as doping agents	97	39	69	28	80	33	1.9	.8
Performance enhancing effects of doping agents	137	56	58	23	51	21	1.7	.8
Doping agents' chronic adverse effects	137	56	66	27	43	17	1.6	.8
Doping agents' mechanism of action	137	56	71	29	38	15	1.6	.7
Doping agents' acute adverse effects	149	61	57	23	40	16	1.6	.8
Different types of doping agent usage	157	64	50	20	39	16	1.5	.8
Doping risks of nutritional supplements and natural products	168	68	48	20	30	12	1.4	.7
Doping agents' interactions with other medicine	173	70	55	23	18	7	1.4	.6
Information searching and sources								
Reliable anti-doping information sources	115	47	62	25	69	28	1.8	.8
Evaluating the scientific basis of doping information in the internet and online bulletin boards	145	59	59	24	42	17	1.6	.8
Information searching about athlete anti-doping counselling & therapeutic use exemption (TUE)	164	67	48	19	34	14	1.5	.7
Anti-doping actors in Finland	174	71	39	16	33	13	1.4	.7
Information searching about anti-doping in recreational sports	176	72	53	21	17	7	1.4	.6

Note. N = 246. The highest percentage values are bolded.

(71% and 72%, respectively).

The work experience influenced how pharmacists recognised the different motives of doping usage in recreational sports and competitive sports. Pharmacists with less than 10 years work experience knew the different motives significantly better than work experience groups 11–20 years and more than 20 years ($H(2)=10.7, p<0.01$). Recognition of anti-doping actors in Finland were significantly lower when the work experience was more than 20 years compared to the work experience less than 10 years ($H(2)=6.75, p = 0.03$). Furthermore, the self-assessed knowledge on evaluating the scientific basis of doping information in the internet and online bulletin boards was significantly better when work experience was less than 10 years compared to other work experience groups ($H(2)=19.8, p<0.01$).

3.3. Willingness to participate in anti-doping activities and educational needs regarding anti-doping

Responding pharmacists were willing to participate in several anti-doping activities (Table 4), mostly in general health promotion (e.g. exercise, nutrition, sleep: 63%), promoting the values of clean exercise (56%), anti-doping counselling of athletes (43%), and preventive anti-doping activities (e.g. raising awareness among the general population, youth and educational work: 41%). The size of the pharmacy (pharmacy's annual prescription volume) ($n = 162$) was not significantly associated with the willingness to participate in anti-doping activities, except in promoting the values of clean exercise ($H(3) = 9.04, p = 0.03$) and therapeutic use exemption ($H(3) = 8.86, p = 0.03$) i.e. pharmacists working in the pharmacies with bigger annual prescription volume were more willing to participate in these activities.

Pharmacists reported that their highest needs for further education were related to nutritional supplements' doping risks, classification, and mechanisms of action and motives for use (88% and 84%, respectively; Fig. 1).

4. Discussion

4.1. Main findings

This study focused on pharmacists' knowledge and educational needs regarding doping and anti-doping activities among community pharmacists, which is a timely and important topic with only limited

Table 4.
Willingness to participate in anti-doping activities.

	Poor or rather poor		Neither poor nor good		Rather good or good		M	SD
	n	%	n	%	N	%		
	1	2	3	4	5	6		
General health promotion (e.g. exercise, nutrition, sleep)	29	12	61	25	156	63	1.6	.5
Promoting values of clean exercise	44	18	64	26	138	56	1.6	.5
Anti-doping counselling of athletes	69	28	71	29	106	43	1.4	.5
Preventive anti-doping activities (youth and educational work, raising population awareness)	64	26	81	33	101	41	1.4	.5
Anti-doping related harm reduction	74	30	76	31	96	39	1.4	.5
Therapeutic use exemption (TUE) policy	103	42	62	25	82	33	1.3	.5
Clean needle and syringe services	117	48	65	26	64	26	1.3	.4
Doping testing	154	63	45	18	47	19	1.2	.4

Note. $N = 246$. The highest percentage values are bolded.

research internationally, and in Finland the first national survey of its kind to focus on anti-doping activities in the pharmacy. Community pharmacists' support for organised and recreational athletes may be useful, and it should be ensured that pharmacists have sufficient, evidence-based knowledge on anti-doping activities and best practice models. This study found that Finnish community pharmacists are willing to participate in several anti-doping activities including doping prevention, harm reduction, and promoting clean exercise. However, most of the pharmacists perceived their knowledge as insufficient and reported educational needs in many areas, such as doping agents' adverse drug reactions and interactions with other medicines, doping in recreational sports, and prohibited substances and methods in sports. On the other hand, pharmacists with less than 10 years' work experience in the pharmacy field tended to have greater confidence in awareness of anti-doping actors in Finland, different motives for doping use, and evaluating the scientific basis of doping information in the internet and online bulletin boards, which may relate to the recent curriculum reforms of pharmacy education towards meeting the future healthcare needs with more patient focus, and including more assignments on use of medicines information sources and databases to support medication counselling (International Pharmaceutical Federation 2017; Katajaviuori et al., 2017; Mononen, 2020; Pitkä, Airaksinen & Pohjanoksa-Mäntylä, 2018). Results on pharmacists' willingness to participate in anti-doping activities and lack of educational opportunities are in line with previous research conducted in other countries (Hooper et al., 2019).

In this study, most pharmacists self-assessed as having good or rather good knowledge on general health, diseases, and lifestyle issues supporting well-being, such as smoking and alcohol use. This is not surprising, as those are among the key competence areas of pharmacists and thus widely covered in pharmacy education on a global scale (Atkinson et al., 2016; International Pharmaceutical Federation 2012; Pharmacy Council of New Zealand, 2015; Saseen et al., 2017). These are also issues that pharmacists should discuss daily with their customers with chronic diseases while dispensing medicines, although some research suggests that pharmacists more commonly discuss medicine-specific issues with their customers than, e.g. the smoking status, nutrition and physical activity of the patient (Chong, Aslani & Chen, 2014; Heikkilä, Parkkamäki, Salimäki, Westermarck & Pohjanoksa-Mäntylä, 2018). Furthermore, the future challenge might be how to bring up doping substance use with the customers, create confidential customer relationship and direct them to seek healthcare counselling, given that for example anabolic steroid users tend to have trust issues towards health care professionals (Havnes, Jørstad & Wisløff, 2019). In that case it has been suggested that it's essential that users can discuss with health professional and ask questions about treatment options and without the fear of being accused. In a pharmacy setting, in addition to improving pharmacists' confidence in their anti-doping knowledge through education and guidelines, these circumstances demand facilities for confidential conversation between a pharmacist and a customer, e.g. private consultation rooms in community pharmacies, where the conversation can't be overheard. Confidential consultation areas are also recognised as a Good Pharmacy Practice, and in many countries (incl. Australia, the Netherlands and Scotland), those already exists and are even as a requirement when establishing a pharmacy (International Pharmaceutical Federation, 1997; Pharmaceutical Society of Ireland 2015).

Our study identified gaps in pharmacists' pharmacological knowledge relating to doping agents' adverse drug reactions and interactions with other medicines. This is surprising, as medicine-specific pharmaceutical knowledge has traditionally been considered pharmacists' strong competence area (Famiyeh & McCarthy, 2017; Kallio, Eskola, Pohjanoksa-Mäntylä & Airaksinen, 2020). During medicine dispensing, drug-drug interactions are also routinely screened in community pharmacies with electronic databases and screening tools. This finding may be due to the over-critical self-assessment of pharmacists, but also due to the fact that pharmacists reported that they were unsure about

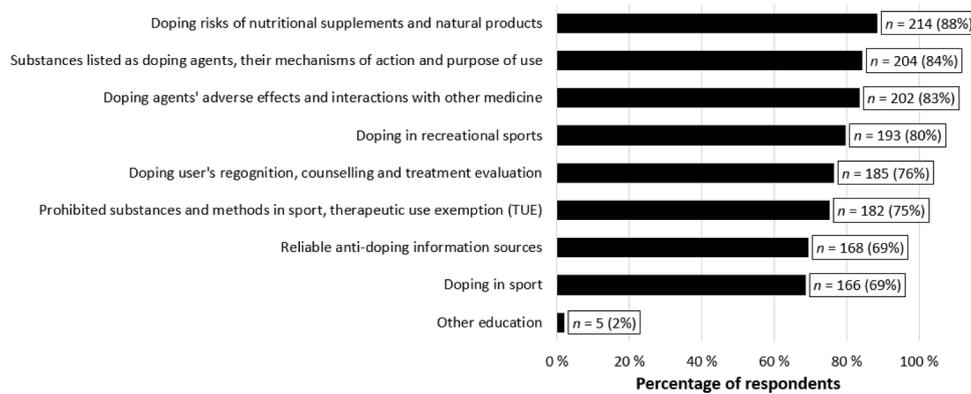


Fig. 1.. Pharmacists' Self-Assessed Educational Needs Regarding Anti-Doping

Note. $N = 246$ (100%). The results show proportions of the respondents who reported the need for education n (%). Respondents were able to select multiple choices or leave the statements unmarked.

prohibited substances and methods. Additionally, previous research has suggested that pharmacists might have difficulty assessing the clinical significance of the adverse drug reactions and interactions since therapeutic decisions are usually consulted from a physician (Kallio et al., 2020). Both undergraduate and continuing education should be provided and focused not only on pharmacology of medicines used for doping purposes, but also on the content of current FIP guidelines and the doping classifications of medicines, such as The Finnish Center for Integrity in Sports' KAMU medicine search (Finnish Center for Integrity in Sports, 2021a; International Pharmaceutical Federation 2014). This database is based on the annually updated WADA prohibited list, according to which substances are classified as prohibited substances, substances prohibited under certain conditions, and permitted substances (World Anti-Doping Agency, 2020a). Based on this study, it seems that this database together with the other evidence-based anti-doping information sources have not been fully implemented among pharmacies in Finland, and the integration of these sources is needed in the pharmacy information systems.

4.2. Strengths and limitations

The cooperation of different actors in the pharmacy and anti-doping field provided a proficient way to exchange knowledge about good pharmacy and anti-doping practice from diverse perspectives. During the survey development, support from the Finnish pharmacies' information system providers was also received, which led to the follow-up research on developmental needs for pharmacies' anti-doping counselling tools. In the future, the same collaboration and synergy of the stakeholders can be utilised when designing anti-doping educational courses for pharmacists, and further, when developing practical guidelines about doping prevention in pharmacies.

The survey was sent to pharmacists via multiple professional organisations covering the majority of the pharmacists working in community pharmacies throughout Finland. Responding pharmacists represent Finnish pharmacists well in terms of gender, education, and working years. However, the number of responding pharmacists was rather low, especially from smaller size pharmacies, and thus, our results are not generalizable to all Finnish pharmacists.

Additionally, utilising multiple associations in the distribution of the web-based survey makes it challenging to calculate an accurate response rate, since pharmacists can be active members in multiple organisations which might cause overlapping in the distribution. Furthermore, web-based distribution doesn't guarantee that the associations' members actually saw the invitation to participate in the survey. Associations also used different dissemination strategies in the distribution of the survey invitation link, e.g. sent a separate e-mail for members, included the link in a monthly newsletter and/or advertised the survey in the social

media.

Lastly, the pharmacists' knowledge was based on self-assessment, which could cause bias in our results due to over- and under-estimation (Kruger & Dunning, 1999). Future studies should consider external evaluation of pharmacists' anti-doping knowledge and, for example, focus on how an anti-doping-related education affects pharmacy professionals' perception and knowledge.

4.3. Practical implications for doping prevention in pharmacies

Based on our study and previous findings, pharmacists are willing to participate in anti-doping activities, and play an important role in public health promotion, ensuring the safe and rational use of medicine. Internationally, many studies and guidelines identify the evolving role of pharmacists in supporting public health (European Pharmacists Forum, 2015; Lai, Trác & Lovett, 2013). Their role in public health support includes medicine adherence, screening, self-care, and disease prevention, and it also applies to sports medicine and doping-prevention strategies, which is recognised in the FIP statement (International Pharmaceutical Federation 2014). Furthermore, sports pharmacy is becoming a well-recognised speciality within pharmacy practice (Hooper et al., 2019).

National anti-doping organisations and other related actors play a role in delivering education to pharmacies. One example of the development of pharmacists' anti-doping knowledge is the "Sports Pharmacist System" project, launched by the Japan Anti-Doping Agency in 2009 (Japan Anti-Doping Agency 2020). The project aims to educate and certify pharmacists to attain up-to-date knowledge of prohibited substances and methods in sports. In 2019, 9530 sports pharmacists were educated and certified through the program, and a recent study demonstrated that accredited sports pharmacists referred significantly more to WADA'S Prohibited List, the Global Dro, and the Japan Pharmaceutical Association's anti-doping hotline than non-sports pharmacists (Nakajima, Onuma, Watanabe & Kamei, 2020). In Finland, similar actions can be taken through the Exerciser's Pharmacy concept, where the participating pharmacies are encouraged to promote physical activity in support of pharmacotherapy (Tuunanen, Koivuniemi, & Kivimäki, 2012). During this article's publication process, this concept has already been expanded in promoting anti-doping activities in both organised and recreational sports, starting with educational material and webinars.

As community pharmacists become more involved in sports and exercise medicine, including anti-doping counselling, future pharmacy education should provide knowledge about reliable anti-doping information sources, advising proper use of medicines and health education for elite and recreational athletes, and providing models of good practice when encountering different types of anti-doping customers in a

pharmacy setting. In comparison, elite athletes' counselling might centre on prevention of unintentional doping, therapeutic use exemption policies, and rational use of nutritional supplements, while recreational athletes (e.g. anabolic steroid users) could benefit from preventive health counselling and harm-reduction strategies.

While doping in sport is controlled by the WADA's Prohibited List, doping use is also regulated by each country's national legislation. Doping legislation in Finland is described and the list of substances classified as doping agents is found in the Criminal Code chapter 44 which criminalizes doping substances' manufacture, import, distribution, and possession of doping substances for distribution purposes (Criminal Code of Finland, 1889). PIEDs are obtained illicitly through online and offline trafficking, which is controlled by the Government law enforcement and customs authorities (Kainulainen, 2014).

The list in the Finnish Criminal Code is considerably narrower than the list of prohibited substances in sport, since the provisions of the Criminal Code on doping offences intend to protect against health risks related to the misuse of doping substances with special focus on the youth population. Therefore, the Criminal Code lists only substances associated with a known medical risk (Finnish Center for Integrity in Sports, 2021b). The use of doping substances is not an offence in Finland, apart from the use of narcotic agents, which means that when a doping substance user consults a healthcare professional about PIEDs use the patient/ customer doesn't directly admit to illicit behavior. This creates a potential low-threshold doping prevention platform for PIEDs users also in pharmacies. Anabolic steroid use in recreational sports is rarely discussed in the pharmacy field and calls for addressing the role of pharmacies in harm reduction, including drug withdrawal treatment and needle exchange services. In this case, more research about perceptions and knowledge of harm reduction in the pharmacy field and possible global guidelines for these services from governments and participating associations is also needed.

4.4. Unanswered questions and future research

Research indicates that pharmacists are one of the most reliable medical information sources, and athletes perceive pharmacists as a good substance and anti-doping information source (Howard et al., 2018; Malek et al., 2014; Mononen, 2020). However, this study and the previous literature demonstrate the need for more educational opportunities for pharmacists regarding anti-doping (Hooper et al., 2019). Future studies should concentrate on measuring the effectiveness of anti-doping education in universities and/or the private sector in developing pharmacists' knowledge of anti-doping. These anti-doping educational programs for pharmacists should be evaluated with careful consideration to acceptability, feasibility, and implementation. From a wider perspective, concerning the sports pharmacy field, or in other words, pharmacists' role in sports and exercise medicine, international and stakeholder cooperation combined with multicentre studies could also be an asset. The expanding role of the pharmacist in public health promotion also requires more support from medication counselling tools and medical information sources. With simple and feasible tools, anti-doping counselling is easy to adopt in the workflow of pharmacies whenever the need arises. The development of these tools and databases need to be complemented with research from the user's perspective.

5. Conclusions

Pharmacists are willing to participate in anti-doping activities to promote organised and recreational athletes' health and in support of public health issues. However, pharmacists identified their lack of knowledge about doping agents and inadequate confidence in anti-doping counselling. They reported a need for more knowledge and education about doping and anti-doping activities, e.g. doping agents' adverse effects and interactions with other medicines, prohibited substances and methods in sports, and doping in recreational sports.

National anti-doping organisations and other related actors in the pharmacy and anti-doping fields have an opportunity to provide anti-doping education for pharmacists. Courses about sports and exercise medicine and sports pharmacy can also be implemented in universities' graduate pharmacy programs. Future research is needed on the effectiveness of these educational opportunities, the support of pharmacies' medication counselling tools, and the utilisation and usability of anti-doping information sources.

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Declarations of Competing Interest

The authors report no declarations of interest.

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