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Anti-Doping Knowledge among Parents of Triathlon Athletes

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Abstract In Japan, cases have occurred in which inadequate home management of medicines contributed to the detection of prohibited substances in athlete samples, resulting in anti-doping rule violations. We aimed to systematically clarify the level of anti-doping (AD) knowledge among parents and guardians of junior triathlon athletes. The target population comprised parents/guardians of athletes competing in junior high school, U19, and U23 triathlon categories (n = 216). An anonymous, self-administered questionnaire was distributed during athlete registration (the day before and the day of the competition) and through team outreach, with voluntary participation. The final sample included 75 respondents, none of whom had previously received AD education. The total score for the 10 knowledge items was 4 (range: 0–10) points for parents/guardians and 6 (range: 0–10) points for age-group athletes, with the latter showing significantly higher scores (P <0.01). In response to the question, “Are you interested in recent media coverage of doping?”, 49.3% answered “Very interested” or “Interested.” Moreover, 12% answered “Yes” to the question, “In your household, do you discuss with your child how prescription and other medications are managed?”. These findings indicate that, under the current educational framework, AD information does not adequately reach parents/guardians, who are the athlete support personnel closest to junior athletes. Therefore, the provision of information to parents/guardians regarding AD and medication management should be strengthened.

Keywords Anti-Doping Education, Field Survey, Parents/Guardians

1. Introduction

Doping is a serious violation that undermines the integrity of sports and poses substantial risks to athletes’ health, potentially endangering life, and is a global concern. The World Anti-Doping Agency (WADA) strongly emphasizes the importance of education for the prevention of doping and the promotion of understanding. In 2021, the International Standard for Education (ISE) established the core principle that an athlete’s first exposure to anti-doping (AD) should be through education rather than doping control [1]. Within this framework, athletes and their parents, coaches, and healthcare professionals (collectively referred to as athlete support personnel [ASP]) are designated as target groups for education, and the need for a societal structure in which all stakeholders share responsibility for AD is emphasized. Moreover, the Japan

Anti-Doping Agency (JADA) has expanded outreach to include parents and educational settings through the development of educational and informational materials [2]. From fiscal year 2023, in addition to athletes, head coaches, sports physicians, and athletic trainers participating in the JAPAN GAMES, parents/guardians of athletes aged <18 years during the competition are required to complete AD education [3].

However, the implementation framework for AD education in households and schools remains underdeveloped, and the appropriateness of educational content and methods, as well as the evaluation of effectiveness across different target groups, remains unresolved. Murofushi et al. [4] investigated the relationship between the history of AD education and knowledge scores among Japanese collegiate athletes and examined the impact of exposure to education on knowledge acquisition. Their results indicated that more frequent attendance at AD education sessions was associated with higher knowledge scores, suggesting the importance of continuous education. Matsuo et al. [5] assessed interest in AD among collegiate athletes. The group with previous AD experience demonstrated a higher interest in doping-related issues, indicating the necessity of AD education. However, information on the current status of AD education among junior age groups remains limited. Kukidome and Iida [6] conducted a questionnaire survey on AD among junior wrestlers aged 17–20 years and found that the proportion reporting interest in AD was 20% among male and 30% among female individuals, suggesting the need to initiate AD education and outreach at the junior stage. Thus, differences in the understanding and awareness of doping arise depending on previous exposure to AD education, indicating that systematic education is necessary regardless of competitive level or age.

Notably, cases have been reported, in which anti-doping rule violations (ADRVs) have occurred for reasons unrelated to athletes' intent, with inadequate management of medicines at home identified as a precipitating factor. In a 2017 case published by JADA, a minor athlete ingested a prohibited substance without checking the patient information leaflet, and the parent/guardian failed to adequately review the leaflet for a prescribed medication; the athlete was consequently found to have committed an ADRV [7]. In a 2019 case, it was reported that although the athlete believed the household medicine box was managed appropriately from an AD perspective, a parent/guardian had without the athlete's knowledge stored a medication containing a prohibited substance; the athlete mistakenly used it, resulting in an ADRV [8]. These cases collectively indicate that deficiencies in household information sharing and management practices are contributing factors to ADRVs, and that parents/guardians' insufficient knowledge and failure to exercise their duty of care pose substantial risks to athletes. Therefore, establishing AD education and robust medication-management systems within households is essential for AD among minor athletes.

Triathlon is characterized by its multidiscipline format, performed over extended durations and involving high-intensity physical demands. Consequently, athletes are more likely to use supplements and medications relatively frequently for recovery and health management. However, insufficient knowledge of the ingredients and proper use or dosage may increase the risk of inadvertent ingestion of prohibited substances. In Japan, since 2018, doping control has been implemented in the triathlon age-group (general adult) category. Thus, besides elite and junior athletes, age-group participants were also tested. Since compliance with AD rules is required regardless of competitive level or age, athletes' knowledge and responsibility, as well as the knowledge and attitudes of ASP involved with medications and supplements, may significantly impact doping prevention. In the junior cohort, the choice of medications, medication management, and health monitoring are often entrusted to parents or guardians. Thus, AD education and strong household medication-management systems are essential for preventing doping among junior athletes.

This study aimed to elucidate the level of AD knowledge and the status of household medication-management practices among parents/guardians of junior triathlon athletes. In particular, we focused on whether parent–child discussions were held regarding the management of medicines in the home. This approach could highlight gaps in current educational programs and lay the groundwork for a household-centered strategy for doping prevention.

2. Materials and Methods

The number of attending parents/guardians was unknown. Theoretically, the maximum possible number of attendees was 432, assuming both parents accompanied each of the 216 athletes. Therefore, as the total population size could not be confirmed, the response rate was not calculated. During athlete registration on the day before and the day of the events, as well as during post-race outreach to each team, we distributed an anonymous, self-administered questionnaire printed double-sided on A4-size cardstock and collected it on-site from volunteers. A total of 90 responses were obtained, of which 89 were valid. Based on the questionnaire responses, the final analytical sample comprised 75 respondents who had not previously received AD education.

The questionnaire (19 items) was adapted from instruments used in previous studies (Figure 1) [5]. To ensure content validity, all authors, including four physicians, reviewed the adequacy of the item content and wording. To verify the reliability of items 6–15, which assessed knowledge related to AD, Cronbach's α

coefficient was calculated using SPSS Statistics (version 31.0; IBM Corp., Armonk, NY, USA). The resulting α coefficient was 0.624, indicating an acceptable level of internal consistency for these items. As the respondents were Japanese, the questionnaire shown in Figure 1 was translated into Japanese and administered. Items 1–3 captured respondent demographics, and analyses focused on items 4–19. Item 4 assessed interest in doping, item 5 evaluated attitudes toward the acceptability of doping, and items 6–15 measured knowledge related to AD. Item 16 inquired about experience with doping control, items 17 and 18 assessed previous learning experiences related to AD, and item 19 asked whether parent–child discussions were held. Descriptive tabulations were conducted for each item, and correct response rates were calculated. To contextualize the AD knowledge levels of parents and guardians, we compared them with those of age-group athletes who had not received AD education. The results of a questionnaire survey administered to 109 age-group athletes (mean age: 53.5 years) at the 2022 Ishigaki Triathlon, were used as reference values. As this survey employed items and a format comparable to those used in the present study, comparability was supported. For analysis, total scores for the 10 knowledge items (Questions 6–15) were calculated separately for parents/guardians and age-group athletes, and the median (minimum–maximum) values were determined. The Shapiro–Wilk test was used to assess the normality of score distributions in each group, and the Mann–Whitney U test was applied to evaluate differences between groups. Item-wise differences in knowledge were calculated by subtracting the correct response rate of age-group athletes from that of parents/guardians. The independence between response accuracy for each item and group classification (parents/guardians vs. age-group athletes) was examined using the χ^2 test. Statistical analyses were conducted using SPSS Statistics (version 31.0), with the level of significance set at $P < 0.05$.

However, age-group athletes and parents/guardians may differ in age, educational background, competitive experience, and history of AD education; therefore, these comparisons should be interpreted with caution. Accordingly, the comparison was positioned as supplementary, intended solely to provide a relative understanding of knowledge levels.

This study was approved by the Institutional Review Board for Studies Involving Human Subjects at Nara University of Education (approval no. 5-7). Participants were verbally informed of the purpose of the study, the estimated time required for completion, the voluntary nature of participation, and that aggregated results would be used for academic presentations without identifying individuals. Only those who provided consent after receiving this explanation were asked to complete the questionnaire.

1. As of July 22, 2023, please enter your age in the parentheses below.

( ) years

2. Please select one option below. (Select one)

○ Male ○ Female ○ Prefer not to answer

3. Please select all that apply.

□ I have never competed in a triathlon.
□ I am currently an age-group athlete.
□ I have competed in an "elite" event in the past. (*Note 1: "Elite" refers to domestic championships level or above.)
□ I have competed in an "age-group" event in the past. (*Note 2: "Age-group" refers to levels other than Note 1 above.)
□ I have a child in elementary school who competes in triathlons.
□ I have a child in junior high school who competes in triathlons.
□ I have a child in the U19 category who competes in triathlons.
□ I have a child in the U23 category who competes in triathlons.
□ I have a child aged 24 years or older who competes in triathlons.

4. Are you interested in recent media coverage of doping? (Select one)

○ Very interested ○ Interested ○ Neither ○ Not very interested ○ Not at all interested

5. What do you think about engaging in doping? (Select one)

○ Definitely not acceptable ○ Rather not acceptable ○ Neither ○ Rather acceptable ○ Acceptable

6. What do you think doping refers to? (Select one)
○ Developing strategies and tactics to win against an opponent
○ Warming up before participating in sport
○ Consuming prohibited substances to enhance performance
○ Obtaining information about an opponent before a match
○ Don't know

7. Why do you think doping is prohibited? (Select all that apply)
□ To ensure fairness and equity among athletes
□ To safeguard the values of sport
□ To protect athletes' physical and mental health
□ Don't know

8. Which athletes do you think are subject to anti-doping rules? (Select one)
○ All competitive athletes
○ Only athletes who compete in the Olympic/Paralympic Games and World Championships
○ Only adult athletes
○ Don't know

9. Which of the following do you think could lead to anti-doping rule violations? (Select all that apply)
□ Prescription medications
□ Over-the-counter medications
□ Nutritional/energy drinks
□ Don't know

10. Which of the following constitute anti-doping rule violations? (Select all that apply)
□ Using prohibited substances/methods
□ Assisting with or being involved in doping
□ Possessing prohibited substances without a legitimate reason
□ Attempting to use a prohibited substance/method
□ Obstructing whistleblowers or retaliating against doping reports
□ Don't know

11. Which of the following statements about the side effects of prohibited substances are correct? (Select all that apply)
□ There have been cases where athletes have died.
□ Some side effects persist long after retirement.
□ Some prohibited substances may cause liver impairment.
□ Some prohibited substances may cause psychiatric symptoms.
□ There are no side effects.
□ Don't know

12. Do you think supplements contain substances prohibited in doping? (Select one)
○ Commercially available supplements do not contain them.
○ Supplements manufactured in Japan do not contain them.
○ No supplements contain prohibited substances.
○ Some supplements may contain prohibited substances.
○ Don't know

13. How can someone check whether a substance is prohibited? (Select all that apply)

□ Ask a certified Sports Pharmacist

□ Contact the JTU Anti-Doping Hotline

□ Use the Global DRO

□ Don't know

14. Which organization is responsible for developing and updating the World Anti-Doping Code? (Select one)

○ World Health Organization (WHO)

○ World Anti-Doping Agency (WADA)

○ International Olympic Committee (IOC)

○ Japan Anti-Doping Agency (JADA)

○ Don't know

15. Do you think AD rules change over time? (Select one)

○ They never change.

○ They are revised every four years.

○ Some rules are revised at least once a year.

○ Don't know

16. Have you ever undergone a doping control? (Select one) ○ Yes ○ No

17. Have you ever received AD education or attended an AD seminar? (Select one) ○ Yes ○ No

18. If you answered "Yes" to Q17, please specify where you received the education/seminar in the parentheses below.

Example: A workshop held during a training camp ( )

19. In your household, do you discuss with your child how prescription and other medications are managed? (Select one)

○ Yes ○ No

Figure 1. Questionnaire Used in this Study (19 Items). Modified from a previous study [5]. Items 1–3 assessed demographic information; Item 4 examined interest in doping; Item 5 evaluated attitudes toward the acceptability of doping; Items 6–15 measured anti-doping (AD) knowledge; Item 16 addressed experience with doping control testing; Items 17–18 assessed experience with AD education; and Item 19 inquired about parent–child discussions. Analyses were conducted on Items 4–19.

3. Results

The analytical sample comprised 75 respondents (mean age: 48.2 years; 52.0% male, 48.0% female). Seven respondents were former or current athletes, and none had previously undergone doping control.

The total score for the 10 knowledge items was 4 (range: 0–10) points for parents/guardians and 6 (range: 0–10) points for age-group athletes, with the latter showing significantly higher scores ($P < 0.01$). As shown in Table 1, among the 10 items assessing AD-related knowledge, only three items (Questions 6, 8, and 12) had a correct response rate exceeding 50% among parents/guardians. The highest rate was observed for item 6 ("definition of doping") at 86.7%, followed by item 8 ("knowledge of athletes subject to AD rules") at 74.7%. The lowest rate was for item 13 ("how to check prohibited substances") at 12.0%.

Compared with age-group athletes without previous AD education, parents/guardians scored lower on nine of the 10 items; notably, items 10, 11, and 14 were lower by > 30% (45.1, 38.0, and 36.9 percentage points, respectively). Significant associations between response accuracy and group classification (parents/guardians vs. age-group athletes) were observed for items 8, 9, 10, 11, and 14 ($\chi^2 = 8.738$, $\chi^2 = 11.084$, $\chi^2 = 36.594$, $\chi^2 = 25.670$, $\chi^2 = 24.608$; $P < 0.05$). No significant differences were found for the remaining items ($P > 0.05$).

Interest in doping is presented in Figure 2. In response to the question, "Are you interested in recent media coverage of doping?", 49.3% answered "Very interested" or "Interested."

Regarding the acceptability of doping ("What do you think about engaging in doping?"), the combined proportion answering "Definitely not acceptable" or "Rather not acceptable" was 68.0% (Figure 3).

Table 1. Correct response rates (%) for items assessing knowledge related to AD

Q	Items	Parents/ guardians	Age-group participants	Difference	*p*-value
6	What do you think doping refers to?	86.7	93.6	-6.9	0.112
7	Why do you think doping is prohibited?	42.7	51.4	-8.7	0.245
8	Which athletes do you think are subject to anti-doping rules?	74.7	90.8	-16.2	0.003
9	Which of the following do you think could lead to anti-doping rule violations?	29.3	54.1	-24.8	< .001
10	Which of the following constitutes anti-doping rule violations?	17.3	62.4	-45.1	< .001
11	Which of the following statements about the side effects of prohibited substances are correct?	25.3	63.3	-38.0	< .001
12	Do you think supplements contain substances prohibited in doping?	69.3	74.3	-5.0	0.458
13	How can someone check whether a substance is prohibited?	12.0	21.1	-9.1	0.109
14	Which organization is responsible for developing and updating the World Anti-Doping Code?	34.7	71.6	-36.9	< .001
15	Do you think AD rules change over time?	48.0	41.3	6.7	0.367

For each item, the correct response rate (%) was calculated using simple aggregation. The difference was obtained by subtracting the correct response rate of age-group athletes from that of parents/guardians.

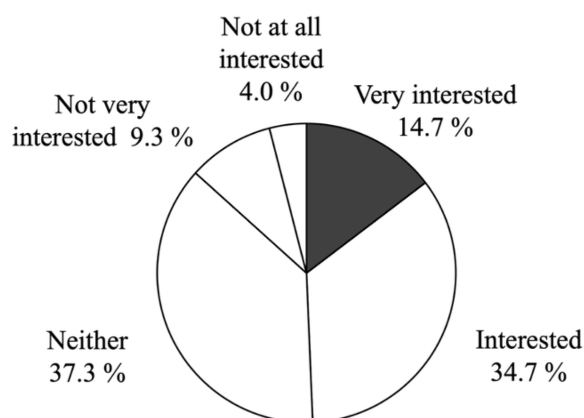

Figure 2. Interest in Doping. Responses to the question, "Are you interested in recent media coverage of doping?" are shown.

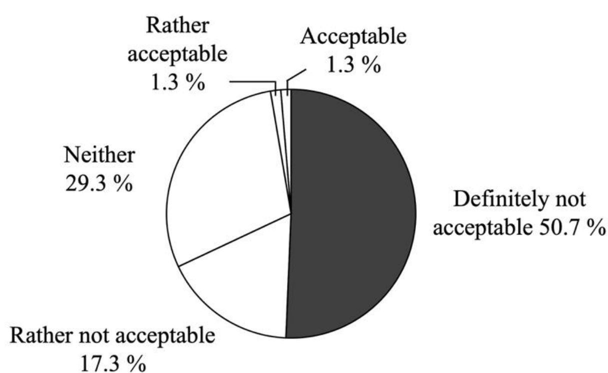

Figure 3. Attitudes Toward the Acceptability of Doping. Responses to the question, "What do you think about engaging in doping?" are shown.

For the item "In your household, do you discuss with your child how prescription and other medications are managed?", 12.0% of respondents answered "Yes."

4. Discussion

Our findings revealed that parents/guardians without prior experience of AD education generally had lower levels of knowledge regarding AD compared with age-group athletes, and their interest in media reports related to doping was limited. Hence, parents/guardians may have few opportunities to access basic AD information. Within the environment surrounding junior athletes, educational support at home may be insufficient. The infrequency of parent–child discussions on household medication management suggests that a system for preventing doping through routine communication has not been adequately established, underscoring the critical role of parents/guardians.

Most previous studies have targeted university or junior athletes, and few have focused on parents/guardians. By centering on household medication management and parent–child dialogue, this study specifically examined the parental role and identified challenges and needs in AD education. The χ^2 test results indicated significant associations between response accuracy and group classification for items 8, 9, 10, 11, and 14. The findings showed that parents/guardians possessed generally limited AD knowledge, whereas age-group athletes had a >50% correct response rate on eight of 10 items, and parents/guardians did so on only three items. The lowest correct rate was for item 13 ("how to check prohibited substances") at 12.0%, revealing a lack of practical knowledge regarding verification methods. These findings indicate low knowledge levels among parents/guardians and may reflect a lack of opportunities for systematic information provision. Murofushi et al. [4] reported that more frequent participation in AD education sessions was associated with higher correct response rates, suggesting

that educational interventions may likewise be effective for the parents/guardians of junior athletes in facilitating knowledge acquisition. Moreover, the finding that only approximately 50% of participants expressed interest in doping media coverage indicates a low initial level of engagement in AD-related information seeking and understanding, implying that motivation to participate in education itself may be limited prior to knowledge acquisition.

Matsuo et al. [5] reported that the presence or absence of previous AD learning experience is associated with the level of interest in doping, raising the possibility that educational interventions could be effective among parents/guardians. In the present study, 68.0% of respondents answered “Definitely not acceptable” or “Rather not acceptable” to the item, “What do you think about engaging in doping?” This suggests that moral and ethical aversion may not be fully developed. Thus, these findings indicate that parents/guardians’ limited AD knowledge may stem from a lack of educational opportunities and low intrinsic motivation, such as limited interest and willingness to learn. Based on a survey study, Murofushi et al. [9] reported that although collegiate athletes generally exhibited high learning motivation, such motivation was not necessarily associated with actual knowledge acquisition. A similar pattern may be observed among parents/guardians. Therefore, achieving durable knowledge acquisition requires expanding opportunities for information provision and introducing motivational approaches that enhance interest in learning and ethical awareness.

Moreover, 12% of respondents answered “Yes” to the item, “In your household, do you discuss with your child how prescription and other medications are managed?” In cases published by JADA in 2017 and 2019 [7, 8], a parent/guardian inadvertently provided a medication containing a prohibited substance, and the athlete consumed it without verifying its ingredients, resulting in ADRVs. These cases illustrate that, irrespective of athletes’ intent, deficiencies in household information sharing and management can lead to serious rule violations. Hence, although family members are the closest ASP to the athlete, their roles are not being adequately fulfilled. Although ISE explicitly underscores the need to educate athletes and ASP, routine engagement and dialogue within the household are indispensable to ensure effectiveness in practice. Psychologically, parental involvement has been reported to contribute to the deterrence of ADRVs. Winand et al. [10] clarified the role that parents/guardians of young athletes play in doping prevention and examined how they should engage in appropriately conveying WADA’s Clean Sport values to children. Their findings suggest that for parents/guardians to effectively influence children’s attitudes, they should receive education on AD values. Moreover, a survey by Dodge [11] indicated that although communication about anabolic steroids increases among individuals who trust and are willing to consult their parents, this does not directly translate into greater intention to use anabolic steroids. Therefore, these findings indicate that routine household dialogue and active parental engagement are crucial for shaping athletes’ attitudes and behavioral choices toward doping prevention, and AD education should permeate the entire support system, including the family.

Considering the nature of triathlon, supplement use is common. In a survey of 232 athletes registered with the Spanish Triathlon Federation, 92.2% reported using at least one supplement [12]. Moreover, despite the implementation of quality management systems in supplement manufacturing, trace contamination by substances prohibited in sports remains possible [13]. Consequently, supplementary use may lead to ADRVs [14, 15]. Thus, supplements are ubiquitous among triathlon athletes, and from an AD perspective, accurate knowledge and education regarding supplement use are indispensable. In the junior cohort, parental involvement was substantial. Appropriate information sharing within the household and informed decision-making about product selection can significantly contribute to doping prevention. Therefore, strengthening home-based education is a critical component of AD education. The ISE emphasizes the need to provide education to athletes and ASP [1]. Lim et al. [16] surveyed ASP in Southeast Asian countries regarding their knowledge and attitudes toward AD. Although some ASPs reported providing athletes with information on the use of medications and supplements, only 11.8% stated that they regularly updated their AD-related information. These findings indicate that, similar to athletes, educational systems that continuously provide ASP with updated knowledge must be established.

In summary, the limited AD knowledge observed among parents/guardians appears to stem from insufficient information-seeking skills, inadequate home management and parent–child communication, weak motivation, and a lack of systematic learning experiences. These factors can be interpreted as vulnerabilities within the three components of the Theory of Planned Behavior [17]—Attitude, Subjective Norm, and Perceived Behavioral Control. Based on these underlying factors and behavioral theory, we propose a practical educational program for parents/guardians that combines parent–child participation in JADA outreach activities and AD education sessions organized by sports federations with short, modular e-learning content covering AD fundamentals, procedures for checking prohibited substances, and the management of medications and supplements at home. Furthermore, incorporating brief on-site sessions and distributing checklists at competition venues may facilitate the immediate application and behavioral reinforcement of clean sport practices.

This study has several limitations. First, as a cross-sectional survey targeting parents/guardians who attended specific events held on the same date and in the same region, it relied on convenience sampling and is therefore subject to selection bias. Since the attendance was unknown, the response rate could not be calculated. This limitation should be considered when assessing the representativeness of the findings. In addition, as the survey was anonymous and self-administered, it was difficult to eliminate the potential influence of self-selection and social desirability biases. Furthermore, AD knowledge was assessed through a simple aggregation of correct response rates, meaning that the psychometric validity and reliability of the scale were not fully verified. The comparison with age-group athletes also did not adequately control for background characteristics and should therefore be interpreted as supplementary.

Future research should aim to strengthen the evidence base for improving knowledge and promoting behavioral change by: (a) determining the population size and reporting response rates; (b) conducting multi-site studies across multiple regions and competitions to increase sample diversity; (c) performing psychometric validation of the questionnaire; (d) incorporating objective and behavioral indicators such as parent–child dialogue and medication-management practices; (e) developing and evaluating educational interventions targeting parents/guardians as key ASPs through pre–post and follow-up comparisons; and (f) conducting comparative analyses including other ASPs beyond parents/guardians.

5. Conclusions

In this study, we aimed to elucidate the level of AD knowledge among parents/guardians of junior triathlon athletes. The survey revealed that many parents/guardians possessed insufficient AD knowledge and that parent–child discussions on household medication management were infrequent. These findings indicate that, under the current educational framework, AD information does not adequately reach parents/guardians, who are the ASPs closest to junior athletes. Therefore, the provision of information to parents/guardians regarding AD and medication management should be strengthened.

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Conflicts of Interest

The authors declare no conflicts of interest.

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