

Title page

Regular Article

Title: Assessment of adverse events and near-misses during voluntary sports by Japanese middle-aged and older adults: A 14-month prospective study

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Abstract

This study aimed to prospectively record the occurrence of adverse events and near-misses during sports in middle-aged and older adults who voluntarily engaged in sports in the community and to clarify the frequency and characteristics of such events.

The participants comprised 14 groups (14 sports) of middle-aged and older adults who voluntarily played sports in Sakae Ward, Yokohama. The follow-up period was 14 months (November 1, 2022, to December 31, 2023). Representatives of the target groups reported once a month to Sakae Ward via postcards regarding the status of their activities and the occurrence of adverse events and near-misses. The survey items included the age of the main participants in each group, number of activities during the month, duration of each activity, number of participants per activity, adverse events, and near-misses during sports.

During the 14-month observation, eight adverse events and two near-misses were reported in the 14 groups, mainly comprising middle-aged and older adults. Of the eight adverse events, four were falls, all occurring in those aged ≥ 70 years and triggered by environmental problems. In this study, there were only two near-misses compared to eight adverse events, suggesting that the participants may have been unaware of near-misses. Therefore, even for sports played by groups of residents, it is important to

identify risks by assessing health conditions prior to exercise and to implement initiatives to foster safety awareness among participants, such as hazard prediction training.

Keywords

athletic injuries, accidental falls, recreation, exercise, incidence

邦題

日本人中高年者が自主的に実施するスポーツ中の有害事象やヒヤリハットの評

価：14ヶ月間の前向き研究

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要旨

本研究は、地域で自主的にスポーツを実施している中高年者集団を対象に、スポーツ中の有害事象・ヒヤリハットの発生状況を前向きに記録し、その発生頻度と内容を明らかにすることを目的とした。

本研究の対象は、横浜市栄区において、中高年者が自主的にスポーツを実施している14グループ（14スポーツ）を対象とした。追跡期間は、2022年11月1日から2023年12月31日までの14ヶ月間であった。対象グループの代表者

は、1ヶ月に1回、活動状況と有害事象・ヒヤリハットの発生状況について、ハガキを用いて栄区に報告した。なお、本研究開始前に各グループの代表者を対象に研究の趣旨や有害事象・ヒヤリハットの定義について対面で説明する機会を設けた。調査項目は、各グループで活動している主なスポーツ参加者の年代、今月の活動回数、1回あたりの活動時間、1回あたりの参加人数、スポーツ中の有害事象およびヒヤリハットとした。

14ヶ月間の観察期間中に、主に中高年者が参加している14グループで有害事象は8件、ヒヤリハットは2件の報告があった。有害事象8件のうち、4件が転倒であり、すべて対象は70歳以上、環境的な問題を契機に発生していた。本研究では、8件の有害事象に対してヒヤリハットは2件しかなく、スポーツ参加者がヒヤリハットを認識していない可能性が示唆された。したがって、住民集団で行うスポーツであっても、運動前の健康状態の把握などでリスクを把握するとともに、危険予知トレーニングの様な参加者の安全意識を醸成する取り組みを実施することが重要である。

キーワード

スポーツ外傷・障害、転倒、レクリエーション、運動、発生率

1 **Introduction**

2 Physical activity has various health benefits, and efforts have been made to promote
3 physical activity.¹⁾ Physical activity can include work or household chores, transportation,
4 as well as walking, cycling, sports, and recreational activities (such as dance, yoga, and
5 tai chi) in a variety of ways.¹⁾

6

7 Generally, the benefits of physical activity outweigh the risks; however, considerations
8 should be made depending on the physical activity status and health of the participant.

9 For example, reports indicate that individuals with no daily physical activity habits have
10 a higher risk of acute myocardial infarction during exercise if they engage in sudden,
11 strenuous exercise.²⁾ Moreover, coronary artery disease is a common cause of sudden
12 cardiac death during exercise.³⁾ The current authors reported falls as a relatively common
13 adverse event during sports performed by community residents.⁴⁾ The risk of falls
14 increases with age,⁵⁾ and the number of people visiting medical facilities for certain
15 diseases also increases with age group.⁶⁾ In Japan, which is currently experiencing a
16 rapidly aging population, it is necessary to create an environment in which people can
17 continue to enjoy sports by implementing safety measures tailored to the characteristics
18 of local sports types and participants.

19

20 It is important to understand the current situation and analyze the causes of adverse events
21 to prevent them during sports.⁷⁾ To date, reports on adverse events in community sports
22 are limited. In Europe and the United States, Lindqvist et al.⁸⁾ and Conn et al.⁹⁾ reported
23 the occurrence of adverse events in community residents of a wide age range and in
24 multiple sports disciplines. In Japan, the current authors reported the occurrence of
25 adverse events among active sports leaders and directors during sports voluntarily
26 performed by residents of Sakae Ward, Yokohama City.⁴⁾ However, both studies
27 conducted in Europe and the United States only included injuries that had been attended
28 to by a health care provider, which does not capture all adverse events.^{8,9)} And, as the
29 frequency of adverse events during sport is expected to be lower in residents compared
30 to athletes, it is desirable to understand more minor cases and those that trigger serious
31 accidents in order to take preventive measures. In a study of Sakae Ward residents
32 reported by the authors, leaders and directors were asked about adverse events and near-
33 misses they had experienced in the past three years in an online questionnaire using a
34 recall method.⁴⁾ This previous study was able to identify the environment for the
35 implementation of sport in residents. However, the study did not target sports participants
36 themselves, and there was an issue of recall bias in the study design. To address these

37 issues, prospective studies are needed on the occurrence of adverse events and near-
38 misses among residents participating in sports.

39

40 Therefore, this study aimed to prospectively record the occurrence of adverse events and
41 near-misses during sports in a group of middle-aged and older adults who voluntarily
42 perform sports in the community and to determine the frequency and characteristics of
43 such events.

44

45 **Methods**

46 This was a descriptive epidemiological study that summarized the outcomes of a 14-
47 month prospective observation of adverse events and near-misses during activities
48 conducted by residents in a sports group. This study complied with the STROBE
49 statement, a set of guidelines to improve the transparency and quality of reporting on
50 observational studies.

51

52 ***Description of the target population***

53 Sakae Ward, Yokohama City, has been certified as a Safe Community and has received
54 international certification since October 2013 (The term expired in October 2023.). A Safe

55 Community is a program in which communities take steps to prevent accidents and
56 injuries through cross-sectoral collaboration based on the idea that fatal accidents and
57 injuries can be prevented by identifying their causes. Certification is granted after an
58 assessment based on indicators presented by the International Nongovernmental
59 Organization (NGO) Safe Communities Certification Center (formerly the World Health
60 Organization [WHO] Collaborating Center on Community Safety Promotion). In Sakae
61 Ward, subcommittees have been established for eight themes: (i) child safety, (ii) sports
62 safety, (iii) traffic safety, (iv) child abuse prevention, (v) safety for the elderly, (vi) disaster
63 safety, (vii) suicide prevention, and (viii) crime prevention.¹⁰⁾ Since 2019, the authors,
64 commissioned by Sakae Ward, Yokohama City, have cooperated with the Taskforce
65 Committee for Sports Safety, Sakae Ward Safe Community, Yokohama City, to
66 investigate adverse events and implement safety measures during voluntary sports
67 activities by Sakae Ward residents.

68

69 ***Participants***

70 The target groups were members of the Sakae Ward Sports Association, one of the
71 organizations of the Task Force Committee for Sports Safety, Sakae Ward Safe
72 Community, Yokohama City. The member organizations of the Taskforce Committee for

73 Sports Safety were as follows: the Sakae Ward Sports Association, Sakae Ward Sports
74 Promotion Committee, Sakae Ward Youth Instructors Council, Sakae Ward Sawayaka
75 Sports Promotion Committee, Nonprofit organization (NPO) Sakae Sports Club, and
76 Sakae Sports Center (Facilitated by Yokohama City Sports Association.).

77

78 The 22 groups (22 sports each) were affiliated with the Sakae Ward Sports Association.
79 The target population for this study comprised 14 groups whose main sports participants
80 were middle-aged or older. Groups whose main participants were juveniles or mature (n
81 = 6) and those with no activity during the follow-up period (n = 2) were excluded from
82 the analysis [Fig. 1]. The follow-up period was 14 months, from November 1, 2022, to
83 December 31, 2023. Representatives of the target groups reported once a month to Sakae
84 Ward by postcard on the status of their activities, the occurrence of adverse events, and
85 near-misses. An opportunity to explain the study aim and the definitions of adverse events
86 and near-misses was provided and discussed with representatives from each group. At the
87 meeting, specific examples of adverse events were given as “injuries or illnesses that
88 occurred during the activity, feeling sick, physical pain, falls”. Specific examples of near-
89 misses were given as “almost falling over, almost colliding with people or objects, finding
90 damaged facilities or equipment”. Any uncertainties or questions were discussed at the

91 meeting to ensure consistency in the standards between the researchers and participants.

92 A delegate from one group asked the following striking question, "In our own sport, due

93 to the nature of the sport, falls and bruises are common, do we have to report them all?".

94 In response to this question, we replied: 'What normally happens during sport is not

95 subject to reporting. However, unintentional falls and bruises, e.g. falls or person-to-

96 person collisions that occur without proper equipment or compliance with the rules,

97 should be reported." This was shared with representatives of all groups.

98

99 **Fig. 1: Flowchart for the selection of target groups.**

100

101 *Survey items*

102 The survey items included the age of the main participants in each sports group, number

103 of activities during the month, duration of each activity, number of participants per

104 activity, adverse events, and near-misses during sports (date and time of occurrence, sex

105 and age of the parties, circumstances at the time of occurrence, and response after

106 occurrence). The research team received 14 months of follow-up data from Sakae Ward

107 for analysis.

108

109 Sports in this study refers to leisure-time physical activities performed by each group.
110 Adverse events and near-misses that occurred during sports activities (including the time
111 between competitions and the time for clean-up and preparation before and after the
112 competition) were recorded. In this study, the appearance of pain after sports activities,
113 for example, was not ascertained. Considering the age (middle-aged or older) group of
114 the subjects, we considered falls as adverse events regardless of whether there was an
115 injury after the fall. Adverse events were defined as any unfavorable events, such as
116 accidents, injuries, or illnesses, that occurred physically or mentally during exercise or
117 physical activity. Furthermore, near-misses were defined as incidents that did not cause
118 physical or mental harm to participants but caused a “near miss” or “aha” experience for
119 instructors or supporters in the field of practice.⁴⁾

120

121 This study was approved by the Ethical Review Committee of the Sports Medicine
122 Research Center of Keio University (approval number: 2022-08).

123

124 ***Statistical analysis***

125 The proportionality scale is expressed as mean (M) \pm standard deviation (SD). The
126 frequency of adverse events and near-misses was calculated from the number of reported

127 activities (times), number of hours per activity (hours), and number of participants per
128 activity (persons). Microsoft Excel (Microsoft Corp., Redmond, WA, USA) and IBM
129 SPSS Statistics ver. 29 (IBM Corporation, Armonk, NY, USA) were used for the analysis.

130

131 **Results**

132 *Attributes of the target groups*

133 Fourteen Sakae Ward Sports Association member groups whose main sports participants
134 were middle-aged or older were involved in the study. The attributes of each group
135 (sports) are presented in [Table 1]. The average follow-up period for the 14 groups was
136 12.6 ± 2.3 (range 5.0–14.0) months. The groups with the shortest observation periods was
137 gateball, which lasted for 5 months. The group for tug-of-war, kendo, Japanese archery
138 (kyudo), and target bird golf had the longest observation period of 14 months. The mode
139 was 13 months for all seven groups.

140

141 The group with the highest number of activities per month was kendo, with 20.8 activities
142 per month; the group with the lowest number of activities per month was table tennis,
143 bowling, and soft tennis, with 1.0 activities per month. The three groups with the lowest
144 number of activities per month were table tennis, bowling, and soft tennis.

145

146 The average duration per sport activity was 3.8 ± 2.1 (range 1.4–8.0) hours. The group
147 with the longest average duration per activity was tennis at 6.9 hours per activity; the
148 group with the shortest average duration per activity was kendo at 1.4 hours per activity.

149

150 The group with the highest average number of participants per sporting activity was
151 softball, with 92.5 participants per activity. The group with the lowest average number of
152 participants per session was volleyball, with 8.8 participants per session.

153

154 **Table 1: Status of the sports groups' activities.**

155

156 *Adverse events*

157 Eight adverse events were reported during the 14-month observation period in the 14
158 groups. Five of the 14 target groups reported adverse events. There were 3 adverse events
159 in target bird golf, 2 in walking, and 1 each in kyudo, volleyball, and tennis.

160

161 For the 14 groups in this study, the total observation period was 181 months, the total
162 number of activities was 983, the total duration of activities was 2487.8 hours, and the

163 total number of participants was 33771. The following table shows the frequencies of
164 adverse events reported for each group [Table 2]. Concerning the number of occurrences
165 per 1000 person-hours calculated from the number of participants and activity duration,
166 tennis was 0.017 events/person-hours, walking was 0.013 events/person-hours, volleyball
167 was 0.008 events/person-hours, target bird golf was 0.001 events/person-hours, and
168 kyudo was 0.0003 events/person-hours.

169

170 **Table 2: Incidence of adverse events (November 1, 2022 to December 31, 2023).**

171

172 Four of the eight adverse events were falls, and none involved fractures. Three of the four
173 falls resulted in skin wounds, one of which required medical attention and wound suturing.

174 All participants who fell were between 70 and 90 (mean 80.8 ± 14.7) years of age. Other
175 than falls, there was one case each of a sprain, muscle spasm, contusion, and wound.

176 [Table 3]

177

178 **Table 3: Description of adverse events.**

179

180 Two near-misses were reported during the observation period, both during gateball. The

181 contents were: (1) “Participant swung the stick around 2–3 times when hitting the ball.
182 As a result, there was a risk of the sticks hitting people around them.” and (2) “Participant
183 forgot to include a necessary item (e.g. drink, medicine.)” [Table 4].

184

185 **Table 4: Description of near-misses.**

186

187 **Discussion**

188 In this study, the occurrence of adverse events during sports voluntarily performed by
189 community residents was prospectively recorded for 14 months, from November 1, 2021,
190 to December 31, 2022. The group consisted of 14 sports, with the participants being
191 middle-aged or older. Eight adverse events and two near-misses occurred during the study
192 period. Of the eight adverse events, four were falls.

193

194 All falls in this study occurred in those aged 70 years or older. The incidence of fall-
195 related injuries has been reported to increase with age.¹¹⁾ Fall-related fractures in the
196 elderly are a significant cause of death¹²⁾ and are independent predictors of nursing home
197 placement.¹³⁾ Thus, fall prevention is important in sports. The risk factors for falls in
198 community-dwelling older adults have been reported to include age (older), sex (female),

199 and medication.¹⁴⁾ Therefore, especially in older age groups, it is necessary to identify
200 and consider high-risk individuals by checking the risk factors for falls, such as a history
201 of falls, underlying medical conditions, and medication status, before the start of sports.
202 All falls in the present study were caused by environmental factors (tripping over mats,
203 poles on the road surface, and tree roots). In the field of occupational safety,
204 environmental factors, including the inclination of support surfaces, lighting, and floor
205 conditions, are considered fall prevention factors. In sports for middle-aged and older
206 adults, environmental considerations are necessary for events that occur in parks or
207 sidewalks.

208

209 There were only two near-misses in this study (gateball): “Participant swung the stick
210 around 2–3 times when hitting the ball. As a result, there was a risk of the sticks hitting
211 people around them.” and “Participant forgot to include a necessary item (e.g. drink,
212 medicine.)”. Forgetfulness is unique to the elderly, and it is necessary to take measures
213 such as making a list of belongings for the day, informing family members who live with
214 them where to go, and wearing items with identifying information. However, in cases
215 where participants break the rules and safety checks of the sports field, it is important to
216 regularly check the rules and precautions within the exercise group and to share cases

217 where a minor incident (near miss) leads to an adverse event so that the danger is known
218 to all. In fact, there was an adverse event in a different sport (target bird golf) in which a
219 participant hit another participant with a ball during a competition.

220

221 Heinrich's Law¹⁵⁾ and Bird's Law¹⁶⁾, which are well-known in the safety management
222 field, indicate that there are more near-misses than major accidents and minor adverse
223 events. However, in this study, there were only two near-misses compared to eight adverse
224 events, suggesting that the workers may not have been aware of near-misses. Hazard
225 prediction training and occupational health and safety training have been reported to be
226 effective in improving awareness of health and safety in the fields of medicine¹⁷⁾ and
227 occupational health and safety.¹⁸⁾ We believe that by implementing such initiatives to
228 foster safety awareness at sports sites, it will be possible to maintain a high level of safety,
229 even when there is a turnover of participants or a change in group representatives.

230

231 In terms of the frequency of adverse events based on the number of adverse
232 events/number of participants × exposure (hours), the lowest frequency was 0.0003
233 events/1000 person-hours in kyudo, and the highest frequency was 0.017 events/1000
234 person-hours in tennis. In a cohort study of 3657 individuals in Finland, all physical

235 activities (including recreational and competitive sports) were considered, and the
236 occurrence of sports injuries was ascertained via telephone.¹⁹⁾ This previous study
237 reported a higher number of occurrences per 1000 person-hours in sports such as soccer
238 and tennis than in walking and golf. This difference in the frequency of occurrence by
239 sports discipline shows a trend similar to that observed in this study. However, regarding
240 the number of occurrences per 1,000 person-hours, this study differed significantly from
241 previous studies. This may be because the previous study included young people (15–75
242 years old) and “competitive sports” in its sample. However, Parkkari et al.¹⁹⁾ reported in
243 a similar paper that the incidence of adverse events was higher in team sports and contact
244 sports, but the absolute number of adverse events was higher in relatively low-risk sports
245 such as walking. Because walking and other low-risk sports are relatively widely
246 practiced by a large number of people, efforts to prevent injuries associated with these
247 sports are important. In this study, the number of participants in tennis, the sport with the
248 highest frequency of occurrence, was 58300 person-hours, or 2.6 times higher than the
249 number of participants-activity times in walking (156330 person-hours).

250

251 The current authors report the results of a survey conducted by Sakae Ward and its sports
252 safety subcommittee in 2017.²⁰⁾ This previous study (a mixed study) qualitatively and

253 quantitatively analyzed the “efforts that exercise participants believe are necessary to
254 prevent adverse events.” From the results, the following initiatives were identified:
255 “appropriate warm-up efforts prior to exercise,” “daily physical activity and
256 understanding one’s own physical function and condition,” and “creating and preparing
257 an emergency response plan. However, according to a survey⁴⁾ conducted by the Sakae
258 Ward in 2020 on exercise instructors and supporters of the Sports Safety Subcommittee,
259 only 32% (35 of 108 eligible participants) had taken a lifesaving course. Therefore, in
260 addition to creating EAPs, it is necessary to promote education regarding
261 cardiopulmonary resuscitation and the use of automated external defibrillators.

262

263 ***Strengths and limitations***

264 The strengths of this study are twofold. First, this is the first prospective observational
265 study in Japan to target sports voluntarily played by residents. It is difficult to grasp the
266 actual situation of sports played voluntarily by residents because they are played in
267 various places and forms. Second, activities, adverse events, and near-misses were
268 recorded using uniform standards. As described above in Methods, the representatives of
269 each group were given an opportunity to explain the purpose of the study and the
270 definitions of specific adverse events and near-misses in person before the study began.

271 The results are expected to contribute to the development of safe and secure community
272 exercise environments.

273

274 This study has five notable limitations. First, the individual attributes such as age, sex,
275 exercise intensity, and activity time of each participant were not ascertained because it is
276 difficult to ascertain each individual participant in exercises in which residents participate
277 freely because of the large number of participants and the frequent comings and goings
278 of participants. Second, the number of reported adverse events and near-misses was low.

279 An omission in the reporting of adverse events and near-misses would significantly affect
280 the overall trend. In this study, representatives from each group were given a forum to
281 explain the purpose of the study and the definitions of adverse events and near misses to
282 gain a common understanding. However, compliance within each group was not
283 ascertained. They were left to the representatives of each group. Therefore, it cannot be
284 ruled out that adverse events and near-misses on activity days when the representative
285 was absent may not have been reported. Third, the novel coronavirus infection may have
286 had an impact on the findings. During the observation period (November 1, 2022, to
287 December 31, 2023), there were no emergency restrictions or restrictions on priority
288 measures by the Japanese government, such as preventing the spread of the disease.

289 However, a decrease in physical activity was noted in elderly Japanese after the
290 coronavirus pandemic compared to before the pandemic.²¹⁾ It is unclear whether the
291 subjects in this study recovered to their pre-pandemic activity levels. Therefore, if there
292 were fewer sports participants than usual, there may have been fewer accidents and other
293 adverse events due to crowding. Fourth, the type of activity in the target group was not
294 uniform and varied among the population. Some groups reported only one-off events,
295 whereas others reported regular practice and other activities. However, reported of one-
296 off competitions were excluded from this study. Therefore, comparisons were not made
297 between the groups (sporting events). Fifth, the present study does not adequately
298 distinguish between 'triggers', such as collisions with people, objects or falls, and
299 'consequences', such as fractures, sprains, etc. Studies using sports injuries in athletes or
300 the development of death or disease in the general population as outcomes have used clear
301 criteria such as interruption of practice or diagnosis by a doctor; it is difficult to establish
302 such a clear criterion in this research area. Therefore, when using the current definition
303 of adverse events, it will be necessary in the future to consider both the trigger and the
304 outcome along with their description, respectively. In addition, given the goal of fulfilling
305 the establishment of a safe condition corresponding to the attributes of the sports
306 participant and the nature of the activity, it is important to describe and organize them as

307 accurately as possible as the 'undesirable events: adverse events' and 'near-misses' that the
308 subject has experienced.

309

310 Based on this study, we propose the following suggestions for creating a safer sports
311 environment. First, even for sports played by groups of residents, initiatives to foster
312 safety awareness among participants, such as hazard prediction training, are crucial.
313 Second, recording and sharing the occurrences of adverse events and near-misses should
314 be implemented on an ongoing basis in community sports. Third, in small groups and for
315 one-off sporting events associated with each athletic organization in this study, adverse
316 events, and near-misses should be recorded and measures should be taken and updated
317 regularly.

318

319 **Conclusion**

320 This study prospectively investigated the occurrence of adverse events and near-misses
321 during sports voluntarily conducted by residents of Sakae Ward, Yokohama, Japan. Eight
322 adverse events and two near-misses were reported during a 14-month observation period
323 across the 14 groups, mainly involving middle-aged and older residents. Of the eight
324 adverse events, four were falls, all of which occurred in those aged 70 years or older and

325 were triggered by environmental issues. In the target population of this study,
326 preparedness for falls, such as pre-exercise health checks and environmental
327 modifications, is necessary.

328

329 **Acknowledgments**

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336

337 **Conflict of Interest**

338 The authors declare that there are no conflicts of interest.

339

340 **Author Contributions**

341 AH and YO designed this study. AH analyzed the data and drafted the manuscript. YO
342 and TH edited and revised the manuscript. All authors have approved the final version of

343 the manuscript for submission.

344

345 **Data Statement**

346 The datasets generated and analyzed in the current study are available from the

347 corresponding author upon reasonable request.

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417

The organizations that make up the Taskforce Committee for Sports Safety, Sakae Ward Safe Community, Yokohama City.

Sakae Ward Sports Association	Sakae Ward Sawayaka Sports Promotion Committee
Sakae Ward Sports Promotion Committee	NPO Sakae Sports Club
Sakae Ward Youth Instructors Council	Yokohama City Sports Association

Survey Requested Subject

Sakae Ward Sports Association
22 groups (sports)

Exclude

- Groups whose main participants are NOT middle-aged or older
6 groups (sports)
- Group with no activity during the observation period
2 groups (sports)

Analysis subject

Sakae Ward Sports Association
Groups where the main participants are middle-aged or older
14 groups (sports)

Sakae Ward Table Tennis Association	Sakae Ward Tennis Association
Sakae Ward Tug-of-War Federation	Sakae Ward Dance Sports Federation
Sakae Ward Kendo Federation	Sakae Ward Target Bird Golf Association
Sakae Ward Kyudo Association	Sakae Ward Softball Association
Sakae Ward Bowling Association	Sakae Ward Soft Tennis Federation
Sakae Ward Volleyball Association	Sakae Ward Gateball Association
Sakae Ward Badminton Association	Sakae Ward Walking Association

1 NPO: Nonprofit organization

2 Fig. 1: Flowchart for the selection of the target groups.

3 Table 1: Status of sports group's activities.

Sport Name (group)	Tracking period (months)	Months with activity (months)	Average number of activities per month (times/month)	Average time per activity (hours/activity)	Average number of participants per activity (persons/activity)
Table tennis	13	2	1.0	3.8	57.0
Tug of war	14	9	1.7	2.1	29.5
Kendo	14	13	20.8	1.4	60.0
Kyudo	14	14	13.2	3.1	30.1
Bowling	13	13	1.0	2.7	43.5
Volleyball	13	13	6.7	2.0	8.8
Badminton	12	12	2.2	3.0	26.6
Tennis	12	7	2.3	6.9	33.1
Dance sports	13	13	3.9	1.5	13.3
Target Bird Golf	14	14	17.1	2.8	19.4

Softball	13	5	3.4	5.8	92.5
Soft tennis	13	3	1.0	6.0	76.7
Gate ball	5	5	6.0	3.0	10.0
Walking	13	13	2.1	5.0	42.9
Average	12.6±2.3	9.7±4.4	5.9±6.5	3.5±1.8	38.8±25.2

All ages of the main participants in the target groups are middle-aged or older

Average number of activities per month (total number of activities/ number of months with activities)

Average time per activity (total activity time/ total number of activities)

Average number of participants per activity (total participants/ total number of activities)

Mean±SD (standard deviation)

4

5

6 Table 2: Incidence of adverse events (November 1, 2022 to December 31, 2023).

Sport Name (Group)	Adverse events (cases)	Total number of activities (times)	Total time of activity (hours)	Total number of participants (persons)	Number of participants × activity duration (person-activities)	Number of participants × activity time (person-hours)	Incidence rate (cases/1000 persons- activities)	Incidence rate (cases/1000 persons-hours)
Kyudo	1	185	572.5	5574	1031190	3191115	0.001	0.0003
Volleyball	1	87	171.0	766	66642	130986	0.015	0.008
Tennis	1	16	110.0	530	8480	58300	0.118	0.017
Target bird golf	3	240	673.5	4650	1116000	3131775	0.003	0.001
Walking	2	27	135.0	1158	31266	156330	0.064	0.013

Total number of activities = Total number of activities reported each month

Total activity hours = Average activity hours per reported activity × Number of activities

Total number of participants = Average number of participants per reported activity × Number of activities

Number of participants × Activity hours = Total activity hours × Total number of participants

Incidence rate (cases/1000 participants/activity)= number of adverse events/ (total number of participants × total number of activities × 1000)

Incidence rate (cases/1000 person-hours) = number of adverse events/ (total number of participants × total activity hours × 1000)

7

8

9 Table 3: Description of adverse events.

Sports (Group)	Adverse events (cases)	Sex	Age (y)	Body part	Adverse event classification	Description of adverse events	Onsite response to adverse events
Kyudo	1	Male	85	-	Falls	Stumbled over a dustproof mat and fell.	-
Volleyball	1	Female	51	Lower Leg	Sprains	Injury sustained when stepping hard during volleyball.	The participant was transported home by a family member due to difficulty walking.
Tennis	1	Male	50	Lower Leg	Muscle spasms	Cramped leg during exercise.	-

		Female	78	Back	Bruises	Struck on the back by a ball hit by another person.	The patient improved with follow-up.
Target bird golf	3	Female	90	Face	Falls	Stumbled over a tree root and fell. Hit the forehead on the ground.	A medical facility was consulted, and the wound was sutured.
		Male	78	Finger	Wounds	Stabbed left index finger with a wire while stowing a rope.	Sterilized and bandaged the wound on site.
Walking	2	Female	72	Knee	Falls	Stumbled over a bump in the road and fell, scraping the knee.	Sterilized and bandaged the wound onsite.
		Male	76	Hand	Falls	Hit a pole on the sidewalk and fell, scraping the hand.	Sterilized and bandaged the wound onsite.

A blank column means no response was received (Not completed in the report).

11 Table 4: Description of near-misses.

Sports (Group)	Near-misses (cases)	Sex	Age (yrs)	Description of near-misses
Gateball	2	Male	-	Participant swung the stick around 2–3 times when hitting the ball. As a result, there was a risk of the sticks hitting people around them.
		Male	80	Participant forgot to include a necessary item (e.g. drink, medicine.)

A blank item means no response was received (Not completed in the report).

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