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1 **Running every time, planking sometimes: Youth adherence to a neuromuscular training**
2 **program**

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23 **ABSTRACT**

24 **Introduction:** Neuromuscular training (NMT) warm-up programs are effective in reducing sport
25 and recreation injuries when adherence is adequate. To understand how to improve adherence,
26 it is important to analyze different measures of adherence, such as the utilization of different
27 exercises and components.

28 **Methods:** The intervention arm of a randomized controlled trial in junior high school physical
29 education (PE) was included in this study. After one school was excluded due to inadequate
30 adherence data, five schools (32 classes) were analyzed. For 12 weeks, the schools
31 implemented the iSPRINT (Implementing a School Prevention program to Reduce Injuries
32 through NMT) program comprising of 15 exercises in four components (aerobic, agility, strength,
33 balance). Utilization fidelity, cumulative utilization (program/component/exercise), and utilization
34 frequency (program/component) were calculated.

35 **Results:** An iSPRINT session was conducted (i.e. ≥ 1 exercise out of 15 was performed) during
36 858 out of 1572 (54.6%) PE classes. Utilization fidelity was 13 (Q1,Q3: 7,14) out of 15
37 exercises. Between the five schools, utilization fidelity ranged from 5 to 14 exercises. The most
38 frequently utilized exercise was the Forward Run (96% of all iSPRINT sessions) and the least
39 frequently utilized exercise was the Forward Running with Intermittent Stops (36%). Utilization
40 frequency of different exercises in individual schools varied from 9% to 100%. On average, the
41 program was conducted twice a week. Out of all the iSPRINT sessions, 98% included some
42 aerobic, 89% included agility, 90% included strength, and 78% included balance exercises.

43 **Conclusions:** On average the schools adhered well to the program and all components were
44 implemented to some extent. This indicates that there are no program components or exercises
45 that are systematically underperformed. With adherence varying between the schools, it is

- 46 important to take into account that the implementation context may differ across school
47 environments and barriers to maximizing adherence require consideration.

Author version

48 INTRODUCTION

49 Physical education (PE) supports students in leading an active life through learning to
50 appreciate the importance of physical activity.[1] PE class provides an opportunity to introduce
51 healthy lifestyle practices, such as injury prevention strategies, to all students as it is not limited
52 to those participating in sport and recreational activities. Introducing injury prevention strategies
53 in PE aims to prevent injuries during PE class and in all sport and recreational activities outside
54 of PE class.

55 Neuromuscular training (NMT) warm-up programs have been shown to be effective in
56 reducing injury rates in youth team sports.[2,3] NMT warm-up programs typically include four
57 components; aerobic, strength, balance and agility exercises, and take 10 to 20 minutes to
58 complete.[4] The use of NMT programs in PE classes has not been studied as extensively as in
59 the team sport setting, but there is evidence supporting the use of NMT programs in the school
60 setting.[5–7] Collard and colleagues [8] established that the iPlay program was effective in
61 improving injury prevention knowledge in primary school students. Richmond and colleagues [6]
62 reported that the iSPRINT warm-up reduced sport-related injuries and also improved measures
63 of adiposity and fitness in a pilot study with junior high school students. Emery and colleagues
64 [7] reported that the iSPRINT warm-up was effective in reducing rates of all injuries (46%), lower
65 extremity injuries (64%), and medically treated sport and recreational injuries (71%) in female
66 junior high school students (ages 11-16), but not in males.

67 NMT warm-up programs only prevent injuries when they are properly implemented.[9–
68 11] Modifying NMT programs to meet the needs of the group and the environmental constraints
69 is common.[12–14] The ability and willingness of the teacher or coach to adapt the program has
70 been identified as a way to overcome some barriers of implementation.[15,16] However, there
71 are concerns that adaptation could lead to important components of the program being left out,
72 which could influence the effectiveness of the program.[17]

73 Adherence to NMT warm-up programs is often reported on the level of cumulative
74 utilization, referring to the number of sessions (i.e. PE class, training, match) in which the NMT
75 warm-up program was completed out of all sessions, often expressed as a proportion.[18]
76 However, Owoeye and colleagues [19] recommend reporting additional levels of adherence in
77 order to fully capture its dimensions, such as utilisation frequency (i.e. number of NMT warm-up
78 sessions completed per week) and utilisation fidelity (number of exercises or number of program
79 components completed per warm-up session).

80 The aim of this study was to determine adherence to the iSPRINT (implementing a
81 **School Prevention Program to Reduce Injuries through Neuromuscular Training**) program in
82 junior high school PE considering the program, components (aerobic, strength, balance, agility),
83 and exercises (15 exercises). In order to best understand the level of adherence across the
84 participating schools, most measures are reported on the school level to allow for reporting of all
85 values instead of group averages, while weekly sessions (utilization frequency) is reported on
86 class level. The findings of this study will inform the future design and implementation of NMT
87 warm-up programs in PE settings.

88 **METHODS**

89 **Study design and participants**

90 This study is a secondary analysis of intervention group data from iSPRINT, a cluster-
91 randomized controlled trial (RCT) in junior high schools (youth ages 11-16 years) in Calgary,
92 Alberta (2014–2017).[7] The participating schools were from two school boards in Calgary,
93 Alberta, Canada that had regular PE programming. PE is compulsory in junior high schools in
94 Alberta. In school board A (Schools # 1, 2, 3, and 4) PE classes take place every day; while in
95 school board B (School #5), classes were scheduled based on a 6-day rotation, resulting in two
96 to four PE classes per week.

97 The intervention group comprised 6 schools, but one (from school board B) was
98 excluded from this analysis due to inadequate collection of warm-up adherence data. The study
99 design, including recruitment strategy, has been described in detail elsewhere.[7] Ethical
100 approval was obtained from the Health Research Ethics Board of the University of Calgary
101 (REB14-0470). All participants provided written informed consent for participation in the study.
102 The study was performed in accordance with the Declaration of Helsinki (2008).

103 **Intervention**

104 iSPRINT is a 10-15 minute NMT warm-up program that comprises four components: aerobic (6
105 exercises), agility (3 exercises), strength (4 exercises), and balance (2 exercises).[7] The full
106 program is described in Table 3. The program was piloted as a RCT in two Calgary schools [6]
107 prior to carrying out the larger RCT.[7] Teachers instructing PE classes from schools
108 randomized to the intervention arm attended an in-person, active workshop to learn the
109 iSPRINT program prior to the beginning of the study. Workshops included an in-depth review of
110 all exercises in the program, including practicing delivery instructions and feedback, as well as
111 strategies for implementing the program in the PE class setting.

112 **Data Collection**

113 Adherence data was collected at the class level. Teachers were asked to deliver the program at
114 the beginning of each PE class over the 12-week study period and to complete a diary for each
115 PE class, reporting iSPRINT implementation. The diary included an open-ended question on
116 iSPRINT warm-up duration (minutes), checklist to mark which iSPRINT exercises were
117 completed, and an open-ended question to describe any adaptations made to the program. An
118 investigator visited each school weekly to collect the diaries. If a diary was not completed for a
119 day when a PE class was scheduled, it was interpreted that the iSPRINT warm-up was not

120 completed that day. This assumption was confirmed by conversations with teachers at all
121 schools following the intervention period.

122 **Outcome Measures**

123 Adherence measures were based on the recommendations by Owoeye et al.[19]. Utilization
124 fidelity was measured as the average number of iSPRINT exercises completed per iSPRINT
125 warm-up session. Cumulative utilization for the program was calculated as the total number of
126 iSPRINT sessions out of all PE classes during the study period. Cumulative utilization by
127 component/exercise was calculated as the total number of times a component/exercise was
128 completed out of the total number of sessions that the iSPRINT program was completed during
129 the study period. Utilization fidelity and cumulative utilization are reported on the school level to
130 allow for reporting of all values and not only averages, making it possible to observe the
131 adherence profile of each school.

132 Utilization frequency for the program was the average number of times the iSPRINT
133 program was completed weekly during the study period. Utilization frequency by component
134 was the average times a component (aerobic/strength/balance/agility) was completed per week
135 during the study period. Utilization frequency is reported on class level to allow for comparisons
136 of weekly utilization.

137 Optimal adherence was defined as performing at least two sessions per week.[11] For
138 an iSPRINT session to be counted for optimal adherence, the session had to include at least
139 one exercise from each component (aerobic, balance, strength, agility) and at least 12 of the 15
140 exercises (80%).

141 **Statistical Analysis**

142 Descriptive statistics were used for all outcome measures. All analyses were performed using
143 SPSS (v26, SPSS Inc., Chicago, Illinois, USA).

144 School level

145 Utilization fidelity was calculated as the median (Q1, Q3 and range) for each school and for the
146 sample of five schools. Cumulative utilization was calculated as the proportion (%) of iSPRINT
147 sessions out of all PE classes for each school and for the sample of five schools.

148 Cumulative utilization by exercise was calculated for the 15 exercises as the proportion
149 (%) of sessions an exercise was used out of all iSPRINT sessions. Cumulative utilization by
150 exercise was calculated for each school and the sample of five schools.

151 Class level

152 Utilization frequency was calculated for each classroom as the median (Q1, Q3) of weekly
153 iSPRINT sessions. The median of medians was calculated for the sample of 32 classrooms.
154 Optimal utilization was calculated on the classroom level as the median of weekly sessions that
155 met the criteria of an optimal iSPRINT session.

156 **RESULTS**

157 Students from a total of 32 classes participated in the study (Table 1). During the 12-week study
158 period, a total of 1572 PE classes were scheduled for the participating classes and a total of
159 858 iSPRINT warm-ups were completed during the study, making cumulative utilization of the
160 iSPRINT program 54.6%. Warm-up duration was reported for 584 iSPRINT sessions (missing
161 n=274). Median duration was 10 minutes (Q1, Q3: 10, 15).

162 Nineteen teachers delivered the warm-up program in PE classes across all five schools.
163 Teacher demographics are presented in Table 2. Eleven (91.7%) of the 12 teachers who
164 reported holding additional coaching certifications were certified through the Coaching
165 Association of Canada's National Coaching Certification Program (NCCP). The remaining
166 teacher obtained their certification through the school sport association's provincial governing
167 body. None of the teachers indicated that they had previous education or exposure to injury

168 prevention warm-up programs previously; of the two coaches who indicated exposure, one
169 reported that it was a taping course and the other reported that it was a general lifestyle fitness
170 course.

171 **Utilization Fidelity and Cumulative Utilization**

172 Across all schools, the median number of exercises included in an iSPRINT session was 13 out
173 of 15 (Q1, Q3: 7, 14). (Table 1). Cumulative utilization for the 15 exercises ranged from 36.3%
174 for the Forward Running with Intermittent Stops to 95.5% for Forward Run. Cumulative
175 utilization for each exercise is presented in Table 3.

176 At the component level, cumulative utilization was highest for the Aerobic component
177 with 98.4% of iSPRINT sessions including at least one (32.7%) or all (65.7%) of the six
178 exercises comprising this component (Table 4). Lowest cumulative utilization, 78.4%, was
179 reported for the Balance component, with 32.8% of sessions including at least one and 45.7% of
180 sessions including the two exercises in this component.

181 **Utilization Frequency and Optimal Utilization**

182 The medians for the number of times per week the classes completed the iSPRINT program
183 ranged from 1 to 3.5, with a median of 2 across all classes. None of the 32 classes in the study
184 reached optimal adherence of at least 2 iSPRINT sessions with at least 80% exercises
185 completed on every week of the 12-week study period. Utilization frequency and the number of
186 optimal iSPRINT sessions each week is presented in Figure 1.

187 For the 12-week study period, the median times per week classes completed at least
188 one exercise from the aerobic component ranged from 1.0 to 3.5. The range was 1.0 to 3.5 for
189 the agility, 1.0 to 4.0 for strength and 0.5 to 2.5 for balance. The median across all classes for
190 each component was 2. Utilization frequency for each component by week is presented in
191 Figure 2.

192 **DISCUSSION**

193 Utilization fidelity was high with 13 out of 15 exercises completed on average per session. This
194 is similar to utilization fidelity of 12 out of 13 exercises that has been previously reported in
195 youth basketball, with similar workshop delivery methods.[20] Although the average utilization
196 fidelity was good, school #5 completed on average only 5 exercises in each iSPRINT session.
197 Interestingly, it does not seem like they were excluding any components: at least one exercise
198 from each of the four components was used in at least 39% of all iSPRINT sessions in this
199 school. Utilization fidelity can be impacted by different factors. For example, time is the most
200 frequently reported barrier to NMT warm-up program implementation in both sports [21] and
201 PE.[15] Time constraints could lead to exercises being left out of the NMT warm-up program.
202 The school with low utilization fidelity was the only school in the study that did not have PE
203 every day of the week. With less time for PE during the school year compared to the other
204 schools, it is possible that teachers felt constrained by time and chose to shorten the iSPRINT
205 warm-up to fit their needs.

206 Teachers' experience teaching PE ranged from 1–20 years and was particularly lower in
207 School 2 (median=2, range 1-3 years across all 4 teachers). This school also only had one
208 teacher who reported holding an additional coaching certification. However, their lower
209 experience did not seem to impact program adherence, as patterns were similar to those
210 observed in other schools. Most of the teachers with a coaching certification had an NCCP
211 certification. Although content on injury prevention warm-up programs has not been included in
212 the NCCP modules to date, the teacher's coaching backgrounds may have contributed to their
213 willingness to implement warm-up program components.

214 **Cumulative utilization on the program, component and exercise level**

215 Cumulative utilization of the iSPRINT program during the study period was 54.6%, indicating
216 that at least some exercises from the iSPRINT warm-up were implemented in over half of the

217 PE classes scheduled over the 12 week period. It is not possible to compare this finding to
218 previous studies as there is paucity of research on adherence to NMT warm-up programs in the
219 PE setting. A previous qualitative study among teachers and students from four iSPRINT
220 schools identified program length as the most important barrier of implementation [15] and this
221 is consistent with studies on sport-specific NMT warm-up programs.[14,21,22] It is very likely
222 that lack of time was also the reason why a form was not completed for many of the PE classes
223 during which the iSPRINT warm-up was not implemented. However, it must also be kept in mind
224 that cumulative utilization alone does not provide a lot of information about the dose of the NMT
225 warm-up program and therefore it is important to explore a variety of adherence measures.

226 Cumulative utilization for the six aerobic exercises ranged from 75% to 96%. This is not
227 surprising as these exercises, such as forward run and running with knee lifts, are very
228 traditional warm-up exercises and can feel familiar and easy to use. Out of all the 15 exercises,
229 the one with lowest cumulative utilization was Forward Running with Intermittent Stops, an
230 agility exercise that was used in 36% of all iSPRINT sessions. Interestingly, cumulative
231 utilization was not low across all five schools: one school used this exercise 95% of the time
232 while lowest recorded cumulative utilization was 9%. This indicates that this exercise is not
233 problematic across the board but there might be factors related to the teacher, students or the
234 environment that creates barriers for the use of this exercise in some schools. This exercise
235 does require students to be able to decelerate and stop safely and a teacher might not feel
236 competent in teaching this or gym space could be limited. The Forward Running with
237 Intermittent Stops is the only exercise in the program that required a leader (e.g. teacher or
238 student champion) to facilitate the exercise. Specifically, external cues are used to direct the
239 students to 'stop' and 'start' running, which may have been a barrier for some classes due to the
240 extra supervision and organization needed.

241 The two balance exercises were utilized 53% and 71% of the time. This was surprisingly
242 high considering that both exercises required a piece of equipment, an Airex pad and a wobble

243 board. The need for equipment has previously been identified as a barrier for implementation of
244 the iSPRINT program, mostly because of the time it took to get all the equipment out of storage
245 and to return them.[15] Similarly, the Nordic Hamstring Curl, a strength exercise which typically
246 requires the use of a mat or an Airex pad as a cushion for the knees, was used 67% of the time.
247 This cumulative utilization varied across schools; three of the schools included this exercise
248 over 70% of the time, while the other two only used it approximately one-third of the time.
249 Previous studies have identified some barriers related to the implementation of the Nordic
250 Hamstring Curl among youth in different settings: difficulty of the exercise [15], risk of Delayed
251 Onset Muscle Soreness [23] Although comparisons to previous studies are limited due to the
252 different contexts and reporting, it seems that the cumulative utilization of the Nordic Hamstring
253 Curl and the other strength exercises was similar to what is reported for the 11+ in youth soccer:
254 for strength exercises the cumulative utilization was lower than for aerobic exercise but higher
255 than for balance exercises.[23]

256 Different patterns of cumulative utilization at the component level were observed across
257 the five schools, yet there doesn't seem to be a component that was fully utilized all of the time.
258 Unsurprisingly, the aerobic components were utilized the most frequently, while consistent
259 implementation of the agility, strength and balance components were lower. This highlights the
260 need to emphasize the importance of including agility, strength, and balance exercises within
261 warm-ups performed in physical education classes, as these components are key for injury
262 prevention.

263 **Utilization frequency**

264 On average, the program was used twice per week. Previous research has reported that the
265 largest preventative effect for lower extremity injuries in youth athletes is observed when a NMT
266 warm-up program is performed two to three times per week, with a weekly volume of 30–
267 60min.[11] This 30-60 minute recommendation would not be feasible nor realistic in a junior high

268 school PE setting given that the PE class length for schools participating in this study ranged
269 from 41–58 minutes, including changing time required at the beginning and end of class.
270 However, recent evidence indicates that weekly volume of <30 min might be adequate, as a 10-
271 min NMT program performed approximately twice a week was reduces ankle and knee injury
272 rates in youth basketball.[24] However, this finding needs to be confirmed in other settings.
273 Quite interestingly, the median utilization frequency for each of the four components (at least
274 one exercise completed) was 2 times/week but when looking at cumulative utilization by
275 component, over 10% of iSPRINT sessions didn't include any strength or agility exercises and
276 over 20% didn't include any balance exercises. This is another indication of why it is important
277 to use several adherence measures and also report adherence on different levels (i.e.
278 school/club; class/team; student/athlete).

279 It is interesting that the mean number of weekly sessions seemed to increase around
280 weeks 6-8. Since schools began the intervention at different times in the year (start dates
281 ranged from October to March), it is unlikely that trends in the school calendar year (e.g. holiday
282 breaks) contributed to this observation. It is possible that this indicates the length of time
283 required for participants to become familiar with the program before it became routine.

284 **iSPRINT implementation in PE class**

285 In general, the schools adhered well to the iSPRINT program. While adherence mostly didn't
286 meet what was considered optimal by the investigators, it must be taken into consideration that
287 this level of adherence led was protective of injuries in girls in these schools.[7] It has also been
288 previously reported that the implementation of the iSPRINT program in junior high school can
289 lead to statistically significant and clinically relevant changes in waist circumference in 12
290 weeks.[6] The qualitative research on iSPRINT has established that teachers appreciated the
291 structure and organization that implementation of the iSPRINT program added to the warm-up
292 procedures in PE classes.[15] While the aim of the present study is to generate information that

293 can guide strategies to improve adherence to NMT warm-up programs in the future, it is also
294 important to keep in mind that in practice, when barriers like time and lack of equipment might
295 be limiting what exercises can be performed, doing something is better than doing nothing. This
296 message was also communicated during the workshop: teachers were encouraged to adapt the
297 program when needed.[7] However, it has yet to be established how much an effective NMT
298 warm-up program can be adapted to still achieve a reduction in injury rates and positive
299 changes in health measures. Until further evidence is available about the dose-response effect
300 of each exercise component, it is recommended to incorporate aerobic, balance, strength and
301 agility exercises in the NMT warm-up.

302 **Strengths and limitations**

303 This study is among the firsts to analyze NMT warm-up program adherence using several
304 measures as recommended,[19] thus providing a more detailed analysis of adherence. Although
305 we are limited to descriptive analyses with only five schools, this sample size makes it possible
306 to report all the school level data, not just averages for the full sample, thus providing detailed
307 information about how differently the program is utilized in different settings. It is the first study,
308 to our knowledge, to describe adherence to a NMT warm-up program within a school setting in
309 such detail.

310 iSPRINT was implemented within a representative sample of junior high school students
311 attending urban Canadian schools with regular PE programming, making results from this study
312 generalizable to the broader Canadian youth population. This is in contrast to previous research
313 on NMT warm-up program adherence in youth sport, which includes athletes and would be
314 context specific within each sport.[20,25,26] It is important to note that adherence data was
315 collected in the context of a randomized controlled trial; teachers may have been more likely to
316 implement the program given that it was part of a study, and adherence data may not accurately
317 reflect adherence to a NMT program that would be observed in the real-world. Further, a

318 selection bias exists: the schools who agreed to participate in the study may have been more
319 likely to demonstrate higher adherence to the prescribed program. Regardless, the data
320 demonstrated that adherence was not optimal for any of the components and provides direction
321 on where to focus implementation efforts moving forward. Exercise fidelity [26] (assessment of
322 exercise volume and technique) was not evaluated in the present study. In future studies it
323 would be beneficial to also measure how well the exercises are performed as well as to
324 determine if exercise volume aligns with what is prescribed in the program (e.g. number of reps,
325 time, etc).

326 **CONCLUSION**

327 On average the schools seemed to adhere well to the iSPRINT program and all components of
328 the program were implemented to some extent. This indicates that there are no program
329 components that are systematically underperformed in the context of the iSPRINT program that
330 would need to be addressed. iSPRINT resulted in statistically significant reductions in injury in
331 females and clinically relevant injury reductions in males compared to the control group, as
332 reported in the original study.[7] This is promising; indicating that important benefits still exist
333 even when the program is not performed in its entirety. It is important to provide support for
334 teachers so that they are able and comfortable in adapting the program to their students' needs
335 and their school environment while ensuring adequate adherence necessary to maintain
336 program effectiveness. With opportunity for adaptations, NMT warm-up programs are feasible to
337 implement in a junior high school setting,[15] and school stakeholders should strive to
338 incorporate NMT warm-up programs within their PE programming. PE provides the opportunity
339 to deliver content to youth broadly, not just those who participate in sport. Future research
340 should strive to incorporate measures of adherence not included in the present study,
341 particularly exercise fidelity. Previous research has demonstrated that even when adherence on
342 team level is considered to be good, exercise fidelity, measured on the player level, can be

343 inadequate.[27] Determining exercise fidelity through evaluation of movement quality in a PE
344 class setting can support NMT implementation strategies moving forward. It is important to
345 provide teachers with opportunities to continued education on NMT warm-up programs to
346 ensure successful adoption of the programs, with a particular emphasis on the importance of
347 including agility, strength, and balance components.

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355 **Conflict of Interest (COI) and Source of Funding**

356 The authors have no conflicts of interest to declare.

Author version

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446 **Table 1.** Number of classes, PE classes and iSPRINT sessions and utilization fidelity. iSPRINT
 447 sessions refers to warm-ups in which ≥ 1 exercise from the iSPRINT program was performed.

	School 1	School 2	School 3	School 4	School 5
Classes total	3	4	6	12	7
Grade 7	1	2	2	4	2
Grade 8	1	1	2	4	2
Grade 9	1	1	2	4	3
Total scheduled PE classes during the study, n	162	216	312	648	234
iSPRINT sessions during the study, n (%)	95 (58.6%)	114 (52.8%)	143 (45.8%)	361 (55.7%)	145 (62.0%)
Utilization fidelity, median (Q1, Q3) (per 15 exercises)	14 (14, 14)	12 (8, 13)	10 (6, 13)	13 (13, 14)	5 (5, 6)
Utilization fidelity, range	7 to 15	1 to 15	2 to 15	4 to 15	2 to 9

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450 **Table 2.** Characteristics of the physical education (PE) teachers delivering the iSPRINT

Characteristics	School 1	School 2	School 3	School 4	School 5	Total
Teachers, n	2	4	5	4	4	19
Female, n (%)	0 (0%)	1 (25%)	2 (40%)	2 (50%)	1 (25%)	6 (31.6%)
Male, n (%)	2 (100%)	3 (75%)	3 (60%)	2 (50%)	3 (75%)	13 (68.4%)
Years teaching PE, median (range)	10.5 (7-14)	2.0 (1-3)	13.0 (8-20)	12.5 (1-17)	8.0 (5-9)	9.0 (1-20)
Exposure to injury prevention programs, n (%)	1 (50%)	0 (0%)	1 (20%)	0 (0%)	0 (0%)	2 (10.5%)
Teachers with coaching certifications, n (%)	2 (100%)	1 (25%)	3 (60%)	4 (100%)	2 (50%)	12 (63.2%)

451 **Table 3.** Cumulative utilization (%) for each exercise

Exercise	All schools	School 1	School 2	School 3	School 4	School 5
Aerobic component						
Forward Run	95.5	95.0	86.5	81.4	99.4	100.0
Forward Running, with Skipping	82.5	95.0	82.0	78.4	99.4	32.4
Forward Running, with Knee Lifts	82.1	95.0	82.9	81.4	99.4	27.6
Forward Running, with Heel Kicks	82.2	95.0	75.7	78.4	99.4	35.9
Sideway Shuffles	79.5	95.0	72.1	75.5	99.4	25.5
Speed Runs	74.6	95.0	69.4	47.1	95.6	29.7
Agility component						
Zigzag Running	70.7	94.0	47.7	61.8	90.6	26.9
Forward Running with Intermittent Stops	36.3	95.0	71.2	59.8	9.4	18.6
Jumping	77.4	84.0	58.6	75.5	95.6	41.4
Strength component						
Plank	66.3	53.0	91.9	72.5	77.0	22.8
Side plank	57.2	32.0	26.1	70.6	76.5	39.3
Hamstrings	66.9	78.0	70.3	32.4	83.9	36.6
Lunges	78.7	87.0	77.5	65.7	90.9	50.3
Balance component						
Wobble board balance	52.8	78.0	63.1	26.5	53.7	42.1
Airex pad balance	70.9	78.0	64.9	39.2	85.0	55.9

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454 **Table 4.** Cumulative utilization for each component (%).

	All schools	School 1	School 2	School 3	School 4	School 5
Aerobic						
Full	65.7	100	43.4	43.0	95.6	2.1
Partial	32.7	0	52.2	51.0	4.4	96.6
None	1.6	0	4.4	6.0	0	1.4
Agility						
Full	23.2	88.4	38.9	47.0	3.1	2.1
Partial	65.3	11.6	36.3	42.0	95.6	64.1
None	11.4	0	24.8	11.0	1.4	33.8
Strength						
Full	40.5	7.4	15.8	28.0	76.4	1.4
Partial	49.4	84.2	78.9	56.0	15.2	84.1
None	10.1	8.4	5.3	16.0	8.6	14.5
Balance						
Full	45.7	82.1	59.8	23.0	53.6	6.9
Partial	32.8	0	7.1	21.0	31.9	84.1
None	21.6	17.9	33.0	56.0	14.4	9.0

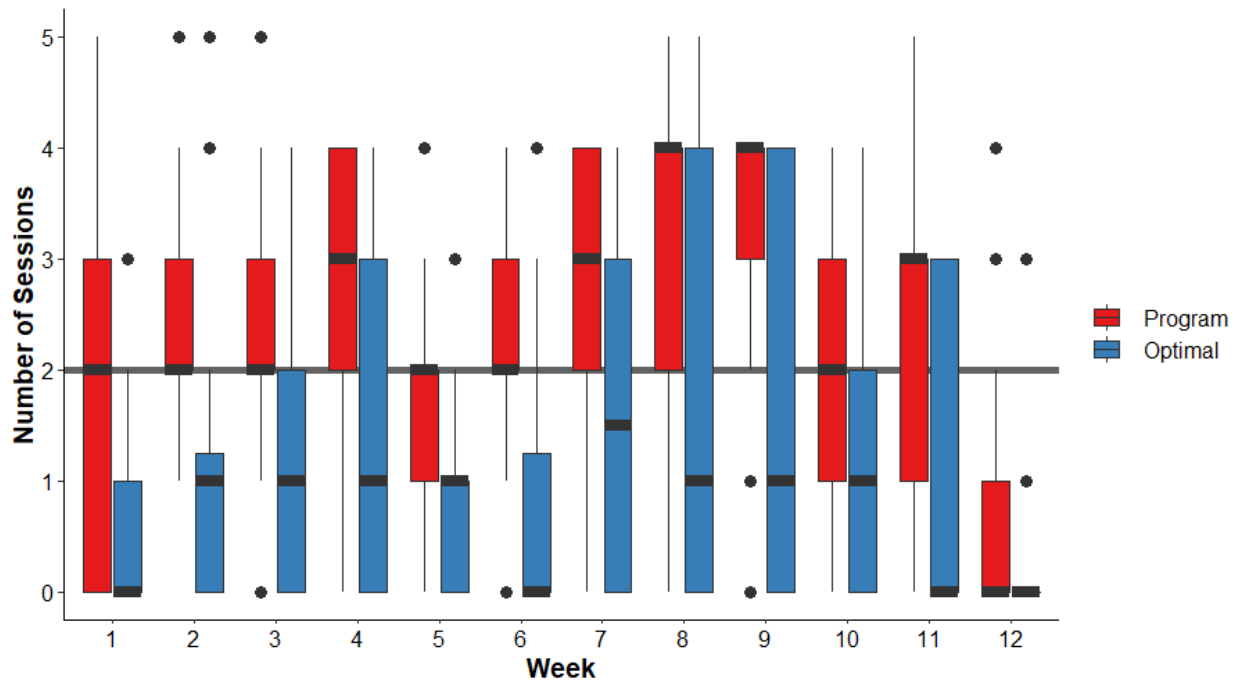
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457 **Figure legends**

458 Figure 1. Number of weekly iSPRINT sessions and optimal sessions (≥ 2 sessions during the
459 week, including ≥ 12 exercises, ≥ 1 from each component). On each box, the central mark
460 indicates the median, and the bottom and top edges of the box indicate the 25th and 75th
461 percentiles, respectively. The whiskers extend to the most extreme data points not considered
462 outliers, and the outliers are plotted as dots. One dot can present more than one class. The red
463 line indicates the median for weekly sessions across the classes.

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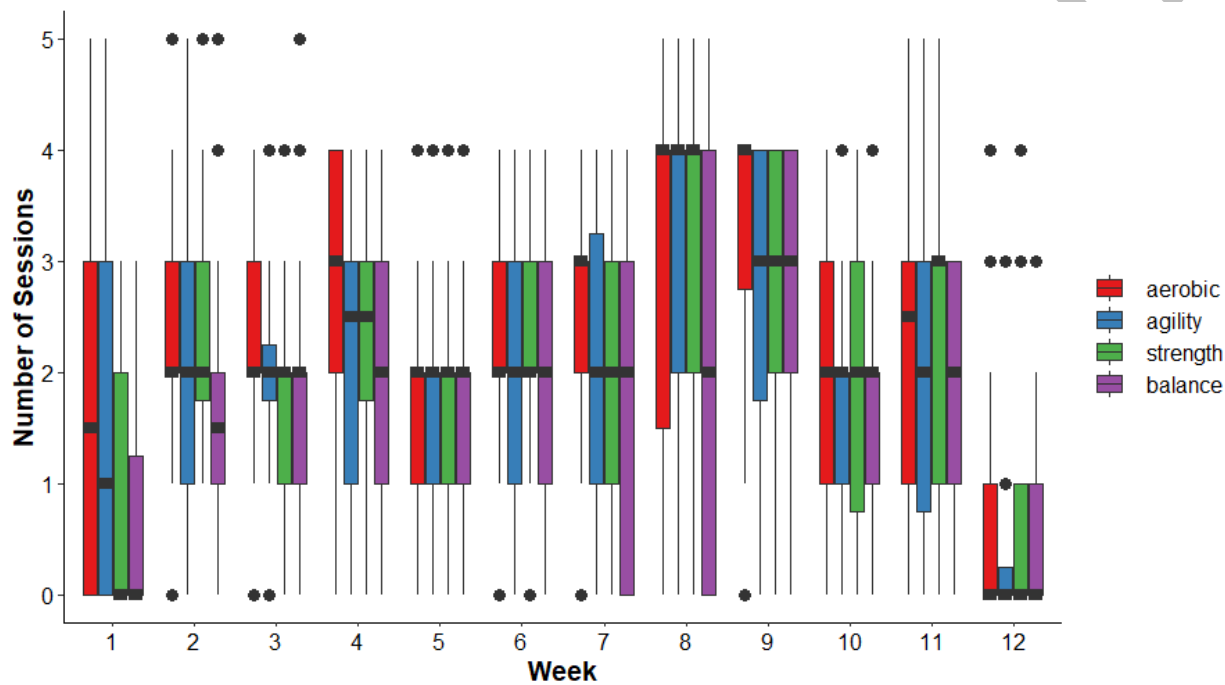
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471 Figure 2. Number of weekly iSPRINT sessions by component. On each box, the central mark
472 indicates the median, and the bottom and top edges of the box indicate the 25th and 75th
473 percentiles, respectively. The whiskers extend to the most extreme data points not considered
474 outliers, and the outliers are plotted as dots. One dot can present more than one class.

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