ORIGINAL RESEARCH

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Healthier Lifestyle for Girls Who Accumulate More Years in the FitSpirit School-Based Intervention

Abstract: *The main aim was to verify in a group of adolescent girls undergoing a school-based intervention if the number of years of participation in the intervention is related to healthy lifestyle habits, body weight status, and perceived health. Cross-sectional analysis of the FitSpirit data was performed. Body mass index, lifestyle variables, and perceived health were collected through an online questionnaire. Chi-square test, Fisher's test, and ANOVA were performed. Mean age of the 272 girls was 14.7 ± 1.5 years. Higher percentage of girls with 3 or more years of participation met the recommendations for physical activity (PA) and sleep duration (P < .05). Girls who participated ≥3 years showed higher levels of moderate-to-vigorous PA than girls with 1 and 2 years of participation (P < .01). No differences were found between the number of years of participation and body mass index, screen time, fruit/vegetable consumption, or perceived health. A healthier body weight status and following recommendations for healthier habits (PA, screen time, sleep, fruit/vegetable consumption) were related to better perceived health (P < .05). Girls with more years in FitSpirit had healthier lifestyle habits (PA and sleep) compared to those with fewer years. A healthier body weight status and meeting healthy lifestyle recommendations were related to better perceived health.*

Keywords: intervention; FitSpirit; physical activity; perceived health; adolescents

Recently, there has been a growing concern over the effects of unhealthy lifestyle habits in young people. The rapid increase in obesity, diabetes, and hypertension[1,2] in youth is alarming and has been partly attributed to sedentary behaviors[3] and low levels of physical activity (PA).[4,5] Currently, research literature reveals that more PA, less screen time, and adequate sleep duration are independently associated with better health among adolescents.[2] Additionally, the combination of these lifestyle habits is associated with the prevention of many chronic diseases[6] and important health indicators in youth such as adiposity, cardiometabolic biomarkers, physical fitness, and quality of life.[7] Despite this evidence, only 24.4% and 28.1% of Canadian adolescents aged between 12 and 17 years meet the 24-hour guidelines regarding moderate-to-vigorous intensity PA and screen time,

Currently, research literature reveals that more PA, less screen time, and adequate sleep duration are independently associated with better health among adolescents.

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respectively.[8] Moreover, 31.9% of Canadian adolescents do not meet the sleep duration recommendation.[8] Accordingly, interventions are needed to improve healthy lifestyle habits in adolescents.[9]

There is limited evidence on how to best promote PA and improve health among adolescents.[9,10] However, it has been advocated to target girls, as girls have been found to be less interested in PA and less physically active than boys.[8,10,11] Furthermore, schools have been identified as important institutions for the promotion of healthy lifestyles.[12,13] More specifically, extracurricular interventions are of interest because they offer additional teaching occasions and they have a positive effect on adolescent's PA levels and physical fitness.[9] In addition, adolescence is an excellent life stage to promote good lifestyle habits to prevent health-related risk factors. The habits developed in adolescence tend to persist in adulthood, including choices concerning PA.[14]

FitSpirit partners with Canadian schools to implement an extracurricular school-based PA intervention specifically for adolescent girls. Through different activities, FitSpirit aims to improve adolescent girls' PA engagement. Reasonably, this large-scale program, implemented yearly since 2007 in approximately 250 schools in Canada, engages approximately 12 000 adolescent girls in PA participation. Such interventions can potentially address the problem of physical inactivity since school-based programs have greater effects on the PA levels of adolescent girls than community-based programs.[15] It is unknown whether such an intervention is associated with the overall healthy lifestyle habits of adolescents.

Healthy lifestyle habits are not the only important outcomes of these interventions' evaluation. Self-perceived health has been used as an indicator of overall health status[16] and it is an important determinant in explaining people's behaviors and choices. It is also better associated with quality of life than measured body weight.[17] This assessment has been used to identify participants with poor perceived health, and to guide effective intervention strategies to improve health among adolescents.[18] Interestingly, the way adolescents perceive their health status influences their behavioral choices which can lead to a healthy lifestyle in adulthood[16] (eg, healthy eating[19] and exercising habits[20]). In addition, recent epidemiological evidence from Canada showed that adolescent girls who are engaged in PA have lower probability of reporting being in fair/poor health.[21]

The aims of this study are to verify if, in a group of adolescent girls undergoing a school-based PA intervention (1) the number of years of participation in the intervention is related with healthy lifestyle habits, body weight status, and perceived health, and if (2) perceived health is related to healthy lifestyle habits and body weight status. The hypotheses are that (1) a longer participation in the intervention is related to better perceived health and healthier lifestyle habits such as meeting the PA and screen time recommendations, but not associated with body weight status, and (2) perceived health is positively related to healthy lifestyle habits.

Methods

Study Design, Intervention Protocol, and Participants

The cross-sectional data presented in this article were drawn from the Spring 2018 evaluation of the FitSpirit intervention (https://www.fitspirit.ca/). FitSpirit is a girls-only intervention that offers 4 types of activities to the participants, and each school decides which combination of them they put forward every year: (1) speaking engagements and various sports or PA given by inspiring women, (2) weekly PA sessions, (3) an 8- to 10-week turnkey running program, and (4) a celebration day at the end of the school year to explore new activities in a noncompetitive environment. Most schools start their FitSpirit activities around February but can decide to run yearlong activities. Hence, in this quasi-experimental study, the type and number of activities implemented varies from one school to another and participation rates are not computed. This is to respect the very nature of the FitSpirit flexible approach that promotes positive PA experiences.

Our study was designed on the basis of a potential sample of 12 000 adolescent girls coming from the Canadian schools located in the provinces of Quebec and Ontario partnering with FitSpirit. School boards and professionals learn about the organization through advertisement. FitSpirit partner schools make their registration at the beginning of each school year. Then, a member of the FitSpirit team helps schools publicize the activities of the school year and student girls enroll by themselves in the intervention for the year.

For the research component conducted in 2018, five subjects per school were stratified and selected randomly through a draw among the girls who have enrolled in FitSpirit. The selection was made by the FitSpirit leader of each school, drawing at random 5 research consent forms among all forms received. All participants with research consent were included in the draw, regardless of their school level. After the registration period and at the end of the school year, FitSpirit sent an email inviting the randomly selected girls to fill an online questionnaire.

The sample of the present study includes 272 Canadian adolescent girls aged 12 to 17 years old. The ethics approval was obtained from the *Comité d'éthique de la recherche en santé* (CERES, #16160, 21/12/2016) of the Université de Montréal. Participants (14 years and older) or their parents (13 years and younger) provided consent.

Instruments and Procedures

Data was collected at the end of the school year which corresponds to the end of the FitSpirit intervention (May/June 2018). The online questionnaire was available in both French and English (questions and scales used for the present analyses are presented as

supplementary material, available online). A group of experts worked in collaboration to develop the questionnaire (see acknowledgments). Based on the results and the experience gained during a pilot study ran in 2017, the questionnaire included questions about sociodemographic information (age), anthropometric profile (height and body mass), moderate-to-vigorous physical activity (MVPA) level, screen time, sleep duration, fruits and vegetables consumption, and perceived health. These questions were adapted from the Canadian Health Measures Survey[17] and were used elsewhere.[22] Details are described below.

Outcome Measures

The reported number of years of participation in the intervention was divided into 3 categories: 1 year, 2 years, and 3 or more years. Body mass index (BMI) was calculated based on self-reported height and body mass. Healthy body weight, overweight, and obesity categories were identified using *z*-score based on the World Health Organization method.[23] Girls self-reported their MVPA levels. Total minutes per week were used to calculate a proxy of their daily amount of MVPA.[14] Screen time was the total hours and minutes per week self-reported. Sleep duration was obtained by the hours and minutes per night reported by the girls. These variables were analyzed based on the Canadian 24-Hour Movement Guidelines for children and youth[8]: at least 60 minutes of MVPA; no more than 2 hours of recreational screen time; 9 to 11 hours of uninterrupted sleep at ages 5 to 13 years, and 8 to 10 hours at ages 14 to 17 years. The fruits and vegetables consumption questions included how many days per week (0-7) and how many servings were consumed.[24] The adherence to dietary guidelines for consumption of fruits and vegetables was assessed using the 2007 Canada's Food Guide recommendations for age and sex.[25] Participants had 5 options to describe their perceived health: excellent, very good, good, fair, and poor. For the analyses, categories of perceived health were grouped into "very good/excellent" and "good/fair/poor."

Data Analyses

First, participants were regrouped into number of years of participation categories (1 year, 2 years, and 3 or more years) and perceived health (very good/excellent vs good/fair/poor). Variables of lifestyle habits were MVPA, screen time, sleep duration, and vegetables and fruits consumption. The concept of healthy lifestyle habits was defined as following the recommendations for these variables. The relationship between body weight status and lifestyle variables between categories (years of participation and perceived health) were performed using χ^2 test or Fishers' exact test, depending on the sample size in each category. ANOVA was performed to compare the lifestyle variables between the years of participation categories. The significance level was set at 5%. Data met the assumption of normality, and values presented are percentages, means (standard deviation or standard error, when specified). The Statistical Package for Social Sciences (SPSS) version 24.0 was used to analyze the data (IBM SPSS Statistics, Version 24.0).

Results

The mean age of the 272 adolescent girls was 14.7 ± 1.5 years. Descriptive data are presented in Table 1. Overall, 22.5% of the girls were classified in the overweight or obesity categories. Only 12.1% of girls met the recommendation for MVPA, while 34.9% and 60.7% met the screen time and sleep recommendations, respectively. Regarding the daily servings of vegetables and fruits, 35.4% of the girls met the recommendation. Based on their perception, 58.9% of girls described their health as very good/excellent, while 41.1% reported their health as good/fair/poor (Table 1).

There was a higher percentage of girls with 3 or more years of participation in FitSpirit who met the MVPA recommendation in comparison with those with 1 year (Δ% = 16.2%) and 2 years (Δ% = 12.9%) of participation (Table 1). Regarding sleep duration, higher percentages of girls with 2 years and 3 or more years of participation in FitSpirit met the recommendations (Δ% = 22.0% and Δ% = 17.0%, respectively), compared to those with 1 year of participation (Table 1). No differences were found between the years of participation for BMI categories, screen time, vegetables and fruits consumption, and perceived health variables (Table 1).

The average minutes of MVPA per week were also significantly different between the years of participation categories, as presented in Figure 1a. Girls with 3 or more years in FitSpirit presented higher levels of MVPA than girls with 1 and 2 years of participation (Figure 1a). However, there were no such differences in other lifestyle habits, such as screen time, sleep, and vegetable and fruit consumption. When comparing minutes of MVPA per week by age groups, older girls showed a tendency toward more MVPA than younger ones, but not significantly (Figure 1b).

The differences of lifestyle habits and BMI between perceived health categories are shown in Table 2. Regarding BMI, within the healthy body weight category, there was a higher percentage of girls who classified as healthy body weight perceived their health as very good/excellent than to those who reported good/fair/poor (Δ% = 15.1%; Table 2). Moreover, there were significantly more girls with obesity who reported their health as good/fair/poor than very good/excellent (Δ% = 12.8%; Table 2). Concerning healthy lifestyle habits, there was a higher percentage of girls not meeting the recommendations among those who reported their health as good/fair/poor when compared to those who reported their health excellent/very good ($P < .05$; MVPA Δ% = 8.7%, screen time Δ% = 13.5%, sleep Δ% = 14.3%, and vegetables and fruits Δ% = 12.5%; Table 2). Perceived health was significantly related to BMI ($\chi^2 = 13.53$, $P < .001$). Also, all lifestyle variables were

Table 1.

Relationship Between Years of Participation in FitSpirit Intervention and Healthy Lifestyle Habits and Perceived Health[a].

Variable	Total sample (n = 272)		Years of participation			
	Frequency	%	1 year (n = 176)	2 years (n = 69)	≥3 years (n = 27)	χ^2 test; *P* value
BMI classification						
Healthy	211	77.6%	79.0%	72.5%	81.5%	$\chi^2 = 1.76$; $P = .70$
Overweight	35	12.9%	12.5%	14.5%	11.1%	
Obesity	26	9.6%	8.5%	13.0%	7.4%	
MVPA						
Follow recommendation	33	12.1%	9.7%	13.0%	25.9%†§	**$\chi^2 = 5.88$; $P < .05$**
Don't follow	239	87.9%	90.3%	87.0%	74.1%†§	
ST						
Follow recommendation	95	34.9%	37.5%	27.5%	37.0%	$\chi^2 = 2.22$; $P = .45$
Don't follow	177	65.1%	62.5%	72.5%	63.0%	
Sleep						
Follow recommendation	165	60.7%	53.4%†*	75.4%	70.4%	**$\chi^2 = 11.19$; $P < .01$**
Don't follow	107	39.3%	46.6%†*	24.6%	29.6%	
V/F intake						
Follow recommendation	92	35.4%	36.7%	31.3%	37.0%	$\chi^2 = 0.64$; $P = .73$
Don't follow	168	64.6%	63.3%	68.8%	63.0%	
Perceived health						
Very good/excellent	155	58.9%	55.2%	66.2%	65.4%	$\chi^2 = 2.82$; $P = .13$
Good/fair/poor	108	41.1%	44.8%	33.8%	34.6%	

Abbreviations: BMI, body mass index; MVPA, moderate-to-vigorous physical activity; ST, screen time; V/F, vegetables and fruits.
[a]Recommendations: at least 60 minutes of MVPA; no more than 2 hours of recreational screen time; 9 to 11 hours of uninterrupted sleep at ages 5 to 13 years, and 8 to 10 hours at ages 14 to 17 years; at least 7 servings of V/F per day.
*Differences in healthy lifestyle recommendations between 1 year and 2 years of participation in FitSpirit.
†Differences in lifestyle recommendations between 1 year and 3 or more years of participation in FitSpirit.
§Differences in lifestyle recommendations between 2 years and 3 or more years of participation in FitSpirit.
Bold indicates that there is a significant relationship between the tested variable and the number of years of participation in FitSpirit (χ^2 test).

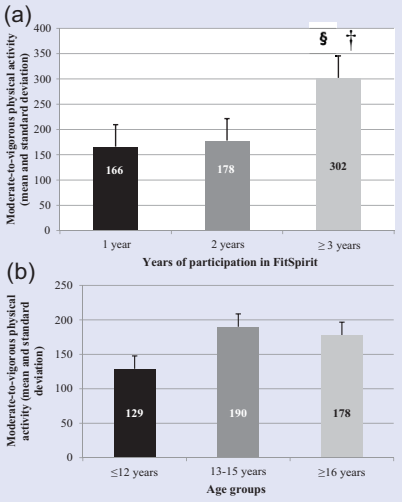
significantly related to perceived health (MVPA $\chi^2 = 4.41$, $P = .03$, screen time $\chi^2 = 5.06$, $P = .02$; sleep $\chi^2 = 5.50$, $P = .02$; and vegetables and fruits $\chi^2 = 4.12$, $P = .04$).

Discussion

This study assessed whether the number of years of participation in the FitSpirit intervention was associated with having a healthy BMI and achieving lifestyle recommendations as well as enhanced perceived health. It also explored if perceived health was related to healthy lifestyle habits and BMI.

Figure 1.

Participants' means minute per week of moderate-to-vigorous physical activity (a) by number of years of participation in FitSpirit and (b) by age groups. †Significant differences between 1 year and 3 years of participation in FitSpirit; §Significant differences between 2 years and 3 years of participation in FitSpirit (one-way ANOVA).



As hypothesized, girls who participated in 3 or more years of the FitSpirit program were more likely to meet the recommendations for MVPA and sleep duration. In addition, meeting healthy lifestyle recommendations and having a healthy body weight status was associated with better perceived health in this sample of adolescent girls.

Concerning recommendations for MVPA, in our sample, there was a high percentage of girls who did not meet MVPA recommendations (87.9%). This is similar to what is seen in the general population, where 85.9% of Canadian adolescent girls do not meet an average of 60 minutes a day.[8] Based on previous evidence, there is usually a decline in PA among girls during adolescence and some studies showed that this decline is difficult to prevent.[15,26] However, in our study, participants who accumulated more years of participation in FitSpirit, who were also the older ones, showed a higher likelihood of meeting the PA recommendations. This finding suggests that programs can prevent declines in PA through adolescence, hence the crucial need to maintain such effective programs.

Regarding the effects of a school-based girl-only intervention, Ofosu et al[12] showed an increase their participants' PA level after a 2-year follow-up. Similarly, our findings show that longer duration in the FitSpirit intervention is related to higher PA level among adolescent girls. This could be explained by the supportive environmental component that offers an after school-based program combined with having girls take part to PA separately from boys.[15] The meta-analysis by Pearson et al[15] showed that PA interventions might be effective among younger adolescent girls in girl-only school settings, as well as in an extracurricular school-based environment. In this regard, Okely et al[26] reported that participants from their intervention requested to have separate girl-only sport and physical education classes to improve girls PA participation.

Though the FitSpirit intervention is not designed to address other lifestyle habits than PA, we hypothesized that increased PA participation could have a ripple effect and improve other habits, such as sleep, screen behavior, eating habits, and perceived health. Our data showed an association between the number of years of participation in FitSpirit and the likelihood of meeting sleep recommendations. However, there was no association with the recommendations for screen time and for vegetables and fruits consumption, and with perceived health. The literature shows that sustained PA may positively affect adolescent sleep quality and duration.[27,28] This can explain the association observed in our study. There is very limited evidence on the potential effects of PA intervention on other healthy lifestyle habits among adolescent girls. More studies are warranted, especially knowing that sedentary behavior is known to increase with time during adolescence.[20] On a different note, the lack of association between years of participation and perceived health can be explained by the fact that a high percentage of girls reported having a very good/excellent perceived health. Being involved in an intervention promoting PA and surrounded by their peers' social support may have improved their health perception in a way that is independent of the number of years of participation in FitSpirit.

Regarding body weight status, our findings showed no difference in the BMI status between years of participation in the intervention. Body weight is influenced by multiple variables, including psychological, biological, environmental, and lifestyle factors such as nutrition.[12,29] Hence, it is not surprising that participation in an after-school PA intervention is not directly associated with body weight status since FitSpirit is not designed as a weight control intervention. Regarding the relation between body weight status and perceived health, our study found that more girls with obesity reported their health as good/fair/poor than excellent/very good. Notably, body weight status seems to influence the perception of health among adolescent girls, which reveals the great importance that adolescents give to their body image.[30] A recent study showed that 67% of adolescent girls experience body dissatisfaction, desiring a smaller body size.[30] The concept of health, as defined by the World Health Organization,[31] is a state of complete physical, mental, and social well-being, overweight/obesity is clearly associated with this concept. In light of these findings, it appears that perceived health and body weight status should be considered in future PA interventions among adolescent girls.

Perceived health is strongly related to lifestyle habits in our sample of adolescent girls. Our findings show that among those who met all the recommendations, a higher percentage of girls reported their health as very good/excellent. This result can indicate that having healthy lifestyle habits is related to better perceived health. The study of Jembere et al[32] shows that

Table 2.

Differences in Healthy Lifestyle Habits and BMI Between Perceived Health Categories[a].

Variable	Perceived health		
	Excellent/very good (n = 155)	Good/fair/poor (n = 108)	χ^2 test; *P* value
BMI classification			
Healthy (n = 206)	84.5%[†]	69.4%[†]	**$\chi^2 = 13.529$; $P < .001$**
Overweight (n = 33)	11.6%	13.9%	
Obese (n = 24)	3.9%[†]	16.7%[†]	
MVPA recommendation			
Follow	16.1%[x]	7.4%[x]	**$\chi^2 = 4.412$; $P = .03$**
Don't follow	83.9%[y]	92.6%[y]	
ST recommendation			
Follow	41.3%[x]	27.8%[x]	**$\chi^2 = 5.060$; $P = .02$**
Don't follow	58.7%[y]	72.2%[y]	
Sleep recommendation			
Follow	67.1%[x]	52.8%[x]	**$\chi^2 = 5.497$; $P = .02$**
Don't follow	32.9%[y]	47.2%[y]	
V/F recommendation			
Follow	40.9%[x]	28.4%[x]	**$\chi^2 = 4.119$; $P = .04$**
Don't follow	59.1%[y]	71.6%[y]	

Abbreviations: BMI, body mass index; MVPA, moderate-to-vigorous physical activity; ST, screen time; V/F, vegetables and fruits.
[a]Recommendations: at least 60 minutes of MVPA; no more than 2 hours of recreational screen time; 9 to 11 hours of uninterrupted sleep at ages 5 to 13 years, and 8 to 10 hours at ages 14 to 17 years; at least 7 servings of V/F per day.
[†]Differences between perceived health categories within a BMI category.
[x]Differences in proportions of following the lifestyle recommendations between perceived health very good/excellent and good/fair/poor categories.
[y]Differences in proportions of not following the lifestyle recommendations between perceived health very good/excellent and good/fair/poor categories.
Bold indicates that there is a significant relationship between the tested variable and perceived health (χ^2/Fisher's exact test)

adolescents are able to perceive and distinguish unhealthy lifestyles from healthy lifestyles. Additionally, they recognize habits such as PA, getting adequate sleep and appropriate nutrition as health advancing behaviors.[32] Accordingly, it can be assumed that daily attitudes play an important role in the adoption and maintenance of healthy habits. In agreement with this assumption, our results suggest that FitSpirit intervention possibly brings perceived health benefits by improving the lifestyle variables. The Canadian Community Health Survey indicated that good lifestyle choices, such as regular PA practice and adequate duration of sleep, were associated with a higher probability of reporting excellent/good health in a sample composed principally of adults.[21] However, such an association was not as clear in the adolescent population.[18,21] Moreover, regular PA has been suggested as a factor reducing the likelihood of perceiving health as fair/poor because moderate participation in PA is sufficient to generate health benefits.[21] The study of Novak et al[33] showed that participating in MVPA more frequently was associated with good self-rated health in adolescents. Besides the regular PA practice benefits on their health perception, the peers' social support existing in this girl-only intervention can also be a great strategy to influence the health behavior change.[6]

Strengths and Limitations

One strength of this study is the large number of participants evaluated. Also, the specific nature of the study informs the development of school-based PA

intervention designed for adolescent girls, a population known to have a very low level of PA participation. This study is one of few that assess self-reported health and healthy lifestyle habits in response to a PA intervention. This is very innovative in this specific population and it provides additional arguments to better promote PA among adolescent girls. This study also evaluates girls in real-life settings, that is, their school environment, while they participate in a real-life intervention with their peers. This increases the external validity of the study.

The limitation coming from the quasi-experimental nature of this study is the lack of between-school consistency in the implementation of activities. Participation rates could indeed be a moderator of the results presented, but such analyses were not possible. In addition, its cross-sectional design that does not allow the inference of causality. On one hand, one can argue that the results can be partly due to some selection bias where the FitSpirit intervention would have attracted and retained the most active girls and those with healthiest lifestyle. On the other hand, it is unknown whether the girls who participated for 3 or more years in the program would have remained active without the FitSpirit intervention. Another limitation comes from the fact that the variables measured are self-reported, hence subjective. This can influence the interpretation of the data. However, the questions used have been validated for the age group of the population studied. This helps ensure that the questions measure properly the variables.

It can be concluded that girls who accumulated more years of participation in FitSpirit attained more recommendations for MVPA and sleep duration compared to those with few years of participation. Also, it was found that better perceived health in this sample was related to a healthy body weight status, high levels of MVPA, low screen time, high sleeping durations, and high vegetable and fruit consumption. Taken together, these findings suggest that multiple participations in FitSpirit may increase PA levels in adolescent girls and improve the adoption of healthy lifestyle habits. This could also lead to a better perceived health, which was shown to be related to BMI status and lifestyle in this sample.

These findings highlight the importance of a school-based girl-only intervention to increase PA levels. Also, our results show that perceived health in adolescent girls is related to healthy body weight status and healthy lifestyle choices, such as following PA, screen time, and sleep recommendations. Future research should continue to focus on the effective strategies to promote and increase PA among adolescent girls, and should include a sufficiently higher number of participants and longer follow-up periods.

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Declaration of Conflicting Interests

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Ethical Approval

Ethics approval was obtained from the *Comité d'éthique de la recherche en santé* (CERES, #16160, 21/12/2016) of the *Université de Montréal.*

Informed Consent

Participants (14 years and older) or their parents (13 years and younger) provided consent.

Trial Registration

Not applicable, because this article does not contain any clinical trials.

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Supplemental Material

Supplemental material for this article is available online.

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