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BRIEF REPORT

Compliance of the 24-Hour Movement Guidelines in 9- to 11-Year-Old Children From a Low-Income Town in Chile

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Background: The purpose was to determine the proportion of 9- to 11-year-old children meeting the 24-hour movement guidelines (24-HMG) in a low-income town from Chile. **Methods**: Physical activity, sedentary behavior (recreational screen), and sleep times were measured with both questionnaire and accelerometer in 258 children from third to sixth grade. Meeting the 24-HMG was defined as having ≥60 minutes per day of moderate to vigorous physical activity, ≤2 hour day of screen time, and 9 to 11 hours of sleep per night. Compliance rates were calculated as self-reported 24-HMG, with all estimations based on questionnaires, and mixed 24-HMG, in which physical activity and sleep were determined with an accelerometer and sedentary behavior was determined with a questionnaire. **Results**: About 198 children (10.1 [0.8] y, range 9–11 y) provided valid data for estimating self-reported 24-HMG, and 141 for mixed 24-HMG. Only 3.2% and 0.7% met the 24-HMG when using the self-reported and mixed methods, respectively. When assessing individual recommendations, 13.1% and 3.7% of the sample were physically active based on the self-report and accelerometer, respectively. About a quarter met the sedentary behavior recommendations, while around 50% met the sleep recommendations with both self-reported and mixed methods. **Conclusions**: An extremely low percentage of the participants met the 24-HMG. Multicomponent initiatives must be implemented to promote healthy movement behaviors in Chilean children.

Keywords: screen time, sleep, sedentary behavior, health behavior, motor activity

Evidence has shown that movement behaviors, including physical activity (PA), sedentary behavior (SB), and sleep time (SLEEP), are highly relevant for comprehensive and healthy development during childhood.[1] The protective effects of PA against noncommunicable diseases and promoting a wide range of mental, cognitive, and social benefits in children have been strongly supported by the evidence.[2–4] Also, in the last decade, several studies have reported the adverse effects on health associated with sitting too much, particularly accompanied by prolonged exposure to screens.[5–7] Good quality and time of sleep have been related to positive outcomes on cardiometabolic and emotional health, academic achievement, quality of life, and well-being.[8,9] While, low sleep quality and reduced sleep duration have been associated with obesity and diabetes.[10,11]

Canada and Australia have developed 24-hour movement guidelines (24-HMG) for children and adolescents.[1,12] These guidelines include the following recommendations for optimal health benefits in children aged 5–17 years: (1) accumulate at least 60 minutes of moderate to vigorous PA (MVPA) per day and incorporate vigorous PA and strengthening exercises at least 3 days per week, (2) spend ≤2 hours per day of recreational screen time, and (3) have 9 to 11 hours of uninterrupted sleep per night for those aged 5–13 years and 8 to 10 hours per night for those aged 14–17 years, with regular bed and wake-up times.[1] By meeting these recommendations, children have shown a protective effect against cardiometabolic risk factors,[13,14] improved psychological well-being,[15] and better overall health.[16] These new recommendations set a global challenge for researchers from different countries, as they have reinforced the need for understanding how these movement behaviors are prevalent and interrelated to each other. By ignoring the interaction of these behaviors and limiting attention to isolated recommendations, the potential overall benefits may be restricted.[17]

Unfortunately, few Latin American children and adolescents accumulate 60 or more minutes of MVPA each day, so they are physically inactive.[18–20] Also, few countries in the region have reported accelerometer data on other movement behaviors, such as sedentary and sleeping time.[21] For example, only Colombia and Brazil have reported data on the 24-HMG in children aged 9–11 years.[14] In Chile, not only there is a a lack of data on movement behaviors for some age groups, particularly those attending primary education,[19,22] but also, Chilean children are among those with the worst PA indicators in the world.[21,23] Also, transitions in movement behaviors may appear in earlier stages,[24,25] before adolescence, when about 1 out of 5 is inactive and a half do not comply with screen-time recommendations.[18] Therefore, it is highly relevant for Chile and the Latin American region to have more available data to better understand movement behaviors and provide more comprehensive and tailored recommendations for this age group in different socioecological contexts, considering, among other aspects, poverty, and culture. For this reason, the aim of this study was to describe the proportion of 9- to 11-year-old children meeting the 24-HMG derived from both self-reported and accelerometer data from Carahue, a low-income town in the south of Chile.

Methods

Participants

A total of 258 participants from fourth to sixth grade (expected age ranges from 9 to 11 y) from schools located in rural and urban areas

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of Carahue, Chile, were recruited. Carahue is among the poorest cities in Chile, with 24.4% of people living in poverty, evidencing a large gap when compared with 8.6% overall poverty in Chile.[26] Also, this town has 42.0% of aboriginal people, which largely contrasts with the 9.9% in Chile.[27]

The schools were stratified by type (public/subsidized or private) and then randomly selected from a list of all available schools (n = 15) provided by the council.[28] The randomization was conducted with an Excel (Microsoft, Redmond, WA) function. After the school selection (n = 9), each school principal was contacted for permission to conduct the study (all agreed). The number of group classes chosen per school was proportional to the school size (ranging from 1 to 3 groups). All children from the selected group class were invited to participate; there were no exclusion criteria. Then, each child's legal representative at school (ie, caregivers) signed the informed consent, and children signed an assent to participate in the study. The study was approved by the scientific ethics committee of the Universidad de La Frontera (094/2015 CEC).

Measures

The team of researchers visited the schools to provide the questionnaires to be completed by the students and place the accelerometers. Demographic data were provided from official records by the school principal. However, when necessary, the caregivers provided the missing demographic data in a questionnaire that was sent to each household in a sealed envelope. At the school visit, height (Seca 213; Seca GmbH & Co. KG, Hamburg, Germany) and weight (Tanita TBF-300 A; Tanita Corporation, Tokyo, Japan) were measured to estimate body mass index (BMI, body mass/height^2) and BMI *z* scores.[29] The following BMI z scores were used to classify nutritional status: < –2SD (thin), –2SD to +1SD (normal), > +1SD (overweight), and > +2SD (obesity).[29]

Self-reported data on movement behaviors were collected in the first school visit, using adapted questions from the US Youth Risk Behavior Surveillance System and the International Study of Childhood Obesity, Lifestyle, and the Environment (ISCOLE).[30] Children answered the questionnaires by themselves in a room with their classmates. The procedure was supervised and supported by at least 3 members of the research group and one schoolteacher. PA was measured with the following question: *"During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day? (Add up all the time you spent in any kind of physical activity that increased your heart rate and made you breathe hard some of the time.)"* The participant had to select an option from 0 to 7 days.

Recreational screen time was used as a proxy of SB, as studies suggest that this specific sedentary activity captures in a better way the association with health outcomes than total sitting time in children.[6] Screen time was measured by asking (1) *"On a school day, how many hours did you watch TV?"* (2) *"On a school day, how many hours did you play video or computer games or use a computer for something that was not school work?"* (3) *"On a weekend day, how many hours did you watch TV?"* and (4) *"On a weekend day, how many hours did you play video or computer games or use a computer for something that was not school work?"*

The answers for each question were coded as the following: I did not watch TV or play video/computer games or use a computer other than for school work (0); <1 hour (0.5); 1 hour (1); 2 hours (2); 3 hours (3); 4 hours (4); ≥5 hours (5).

TV viewing and videogames or computer/tablet/mobile phone uses were added to estimate the total screen time on both school and weekend days, separately. Then, the average screen time was calculated using the following formula: (screen time on school day × 5 + screen time on weekend × 2)/7.[28]

Self-reported sleeping time was derived from the time difference between when the child turned out the light/went to sleep and the waking time during the last week for both school and weekend days.[28] The participants answered the following questions: (1) *During the past week, what time have you usually turned out the light and gone to sleep on school days?* (2) *During the past week, at what time have you usually woken up in the morning on school days?* (3) *During the past week, what time have you usually turned out the light and gone to sleep on weekend days?* and (4) *During the past week, at what time have you usually woken up in the morning on weekend days?* Then, the average sleeping time was calculated using the following formula: (sleeping time on school day × 5 + sleeping time on weekend × 2)/7.

Each participant wore an ActiGraph GT3X+ accelerometer (AG; ActiGraph LLC, Pensacola, FL) on the waist for 24 hours for 7 consecutive days. The children were asked to remove the AG during water-based activities (showering or swimming). This device allows one to measure the time spent in different movement behaviors, including PA at different intensities (light, moderate, and vigorous), SB, and sleeping, by using specific algorithms and cut points for this purpose.[31,32]

Seven days after the first school visit, the research team made a second visit to collect the AGs for the analysis. The accelerometer data were downloaded and filtered using ActiLife (version 6.13.3; ActiGraph LLC). First, an automated filter was applied for detecting sleeping time.[31] Then, a filter for detecting nonwear periods was applied.[33] The remaining data were identified as waking wear time. The data were valid for analysis if the participants wore the AG for ≥10 waking hours on at least 4 days, including a weekend day,[33] with their respective sleeping periods. Movement behaviors were classified using AG cut points developed by Evenson et al[32] (area under the receiving operating characteristic curve: sedentary: 0.90[34]–0.98[32]; light PA: 0.70[34]; moderate PA: 0.74[34]–0.85,[32] and vigorous PA: 0.83[32]–0.90[34]). After classifying every measured minute (epoch), the total time spent per day in each behavior was calculated.

Data Preparation and Statistical Analysis

All data preparation and analyses were conducted in Stata (version 15.1; StataCorp LLC, College Station, TX). Only children aged 9–11 years were included in the analysis. Two methods were used to estimate movement behavior compliance: (1) self-reported and (2) mixed (self-reported and accelerometry). To assess the compliance of the 24-HMG based on self-reported data, each participant was classified as meeting the PA recommendations if they reported doing ≥60 minutes of MVPA on all 7 days.[1] Also, the participants were categorized as meeting SB guidelines if they spent on average of ≤2 hours on recreational screen time per day,[1] while children were classified as meeting the sleeping recommendations if they slept, on average, 9 to 11 hours per night.[1] After this, each participant was classified as meeting the 24-HMG with self-reported data if they met 3 recommendations.[1] The mixed methodology to evaluate compliance of the 24-HMG was derived from accelerometer data only for PA and SLEEP, as the SB recommendations for children are based on reported screen time.[14] Each participant was classified as physically active if they accrued ≥60 minutes of MVPA on each valid day from the accelerometer.[1,14] The participants who completed 9 to 11 hours of sleep per night on average were classified as meeting the sleeping recommendations.[1,14] SB guideline compliance was based on the same recommendation as the self-reported method (average ≤2 h on recreational screen time per day). Each participant was classified as meeting the 24-HMG based on mixed methodology if they met the 3 aforementioned recommendations. Different combinations of movement behavior compliance were classified as specific (MVPA + SB; MVPA + SLEEP; SB + SLEEP) and general (meeting at least 1, at least 2, or all 3 recommendations of the 24-HMG). Continuous variables are presented as the mean or median based on distributional properties, while categorical variables are presented in percentages. The proportion of participants meeting the PA, SB, and SLEEP and 24-HMG were compared according to sex using the chi-square test. The proportion of participants meeting the 24-HMG were also graphically represented using Geogebra.[35] The level of significance was set at $P < .05$.

Results

In total, 198 out of 258 children (49.5% male) were included for the analysis based on self-reported behaviors, from which 141 (47.5% male) provided valid data for estimations based on accelerometry. About 10 children were excluded due to age range (younger than 9 y old = 1, and older than 11 y old = 9). Other participants were not included in the analysis due to incomplete reports (n = 50) or invalid accelerometer data (n = 57). No differences regarding sex and nutritional status were found between those excluded and included in the study, as well as those with incomplete and complete data. The mean age was 10.1 (0.8) years, and about 70% were overweight (Table 1). Behaviors measured with questionnaires showed no differences between boys and girls. When comparing behaviors as measured with an accelerometer, the boys were more active (61.4 [23.3] vs 43.0 [18.8] min/d of MVPA, $P = .0002$) and slightly less sedentary than the girls (6.4 [1.0] vs 6.9 [1.4] h/d SB, $P = .0498$).

Table 2 shows the proportion of participants meeting the MVPA, SB, and SLEEP guidelines and combinations of these recommendations, including the 24-HMG. A low percentage met both the self-reported (13.1%) and device-measured (3.7%) PA recommendations. About a quarter of the children met the SB recommendations, while the SLEEP recommendations were met by about half of the children, with both self-reported and device-derived data. When comparing between sexes, no differences were observed between the proportion meeting any of the individual recommendations for both self-reported and device-measured behaviors (Table 2).

The highest compliance among the specific combinations with both methods was observed for SB + SLEEP, followed by MVPA + SLEEP and MVPA + SB (Table 2). When observing the combinations of general recommendations, 72.2% and 63.8% of the sample met at least one recommendation with self-reported and mixed methods, respectively, while less than 20% met at least 2 of the recommendations. The only difference by sex was found for those meeting at least 2 movement recommendations in which more boys than girls (18.5% vs 11.0%, $P = .004$) were compliant. An extremely low percentage met the 24-HMG with both self-reported (3.5%) and mixed (0.7%) methods. Figures 1 and 2 illustrate the proportion of children meeting each of the 3 recommendations and their combinations.

When comparing compliance of movement recommendations for both self-reported and mixed methods by age, only SLEEP as measured with an accelerometer differed between 9-, 10-, and 11-year-old children with 56.8%, 55.6%, and 30.6% ($P = .016$), respectively.

Discussion

This study showed the percentage of children aged 9–11 years in Carahue, a low-income town from the south of Chile who met the 24-HMG using data derived from self-reports only and a combined estimation that included SB based on self-reported recreational screen time and accelerometer-measured MVPA and sleep. In general terms, the compliance of the 24-HMG was very low when using both self-reported (3.5%) and mixed (0.7%) methodologies. When comparing the compliance of individual or combined recommendations of movement behaviors, no major differences were observed between sexes. About half of the participants met the sleeping recommendations with both self-reported and mixed methods, while a quarter and less than 15% met the SB and PA recommendations, respectively. More than one half of the participants

Table 1 Sample Characteristics

Variables	Total (N = 198)	Boys (n = 98)	Girls (n = 100)	*P*
Age, y (SD)	10.1 (0.8)	10.1 (0.8)	10.0 (0.8)	.7115
Nutritional status, %				
Normal	32.8	33.7	32.0	.678
Overweight	39.9	41.8	38.0	
Obese	27.3	24.5	30.0	
BMI (kg/m^2), mean (SD)	22.1 (4.3)	22.0 (4.0)	22.2 (4.7)	.7954
Self-reported physical behaviors				
Physically active days, mean (SD)	3.2 (2.1)	3.2 (2.2)	3.2 (2.0)	.9385
Screen time, mean h/d (SD)	2.5 (1.8)	2.6 (2.0)	2.4 (1.6)	.5407
Sleeping time, mean h/d (SD)	9.8 (1.4)	9.8 (1.5)	9.9 (1.3)	.5424
Accelerometer-measured physical behaviors				
MVPA, mean min/d (SD)	50.7 (22.6)	61.4 (23.3)	43.0 (18.8)	.0002
SB, mean h/d (SD)	6.7 (1.3)	6.4 (1.0)	6.9 (1.4)	.0498
Sleeping time, h/d (SD)	9.4 (1.4)	9.5 (1.5)	9.3 (1.3)	.3158

Abbreviations: BMI, body mass index; MVPA, moderate to vigorous physical activity; SB, sedentary behavior.

Table 2 Proportion of Participants Meeting the MVPA, Screen Time, and Sleep Guidelines and Combinations of These Recommendations

	Self-reported				Mixed method[a]			
Movement behaviors	Total (n = 198)	Boys (n = 98)	Girls (n = 100)	*P*	Total (n = 141)	Boys (n = 67)	Girls (n = 74)	*P*
Individual recommendations, %								
MVPA	13.1	15.3	11.0	.370	3.7	5.9	2.1	.377
SB, [b]	27.3	25.5	29.0	.581	–	–	–	–
SLEEP	54.0	55.1	53.0	.767	47.1	49.2	45.2	.636
None	27.8	25.5	30.0	.481	36.2	35.4	37.0	.197
Specific combinations, %								
MVPA + SB	4.6	4.1	5.0	.756	0.7	1.5	0	.292
MVPA + SLEEP	6.0	6.1	7.0	.803	1.4	3.0	0	.134
SB + SLEEP	14.7	14.3	15.0	.887	8.5	9.0	8.1	.857
General combinations, %								
Met at least 1	72.2	74.5	70.0	.499	63.8	64.6	63.0	.694
Met at least 2	18.7	18.4	19.0	.830	14.5	18.5	11.0	.004
Met 3 (24-HMG)	3.5	3.1	4.0	.518	0.7	1.5	0	.143

Abbreviations: 24-HMG, 24-hour movement guidelines; MVPA, moderate to vigorous physical activity; SB, sedentary behavior, SLEEP, sleep duration. Note: Meeting the recommendations was defined as ≥60 minutes per day for MVPA, ≤2 hour per day for screen time, and between 9 and 11 hour/night for sleep.
[a]Mixed method: PA and SLEEP were obtained from accelerometer, but SB was derived from self-report.
[b]SB was based on self-reported screen time as described in the 24-HMG recommendations.

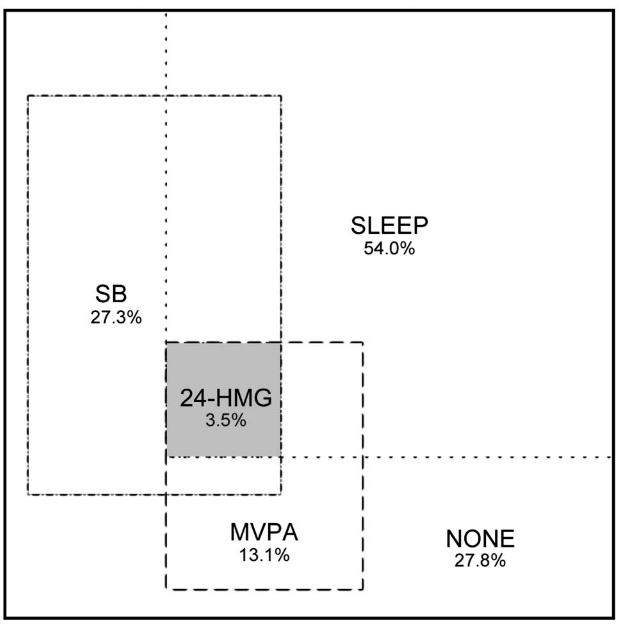

Figure 1 — Diagram showing the proportion of participants meeting the physical activity (MVPA), sedentary behavior (SB), sleep and no guidelines (NONE), and combinations of these guidelines using self-report. MVPA indicates moderate to vigorous physical activity; SB, sedentary behavior; 24-HMG, 24-hour movement guidelines.

met at least one of the specific recommendations for each behavior with self-reported (72.2%) and mixed (63.8%) methods.

The ISCOLE study also analyzed the data derived from the self-report and accelerometry in children aged 9–11 years from 12 countries, and it showed a higher proportion of 24-HMG compliance compared with our study (7.2% vs 0.7%).[14] This difference with our study may be partially explained, as the authors defined children as physically active if there was an accumulation of ≥60 minutes of MVPA on each measured and valid day, while ISCOLE used the overall amount of MVPA per day for classifying children as physically active. Studies have shown that these definitions may lead to different estimations.[36] When comparing the average MVPA per day, our sample was still less active than the overall shown by ISCOLE (50.7 vs 60.3 min/d). The current sample was only more active than children from China (44.7 min/d), India (48.9 min/d), and the USA (50.1 min/d). When comparing with countries that measured behaviors with the same procedures, (SB and SLEEP), children from the United Kingdom (26.8%) and Brazil (23.9%) showed similar figures for SB with our study.[14] Only China (59.1%) and India (62.0%) reported a higher proportion of children meeting the SLEEP recommendations than the sample in our study.[14] No differences were observed when comparing the compliance of movement behavior guidelines between boys and girls. However, as shown in Table 1, overall, the boys accumulated more MVPA and less SB than the girls, as measured by accelerometers. Thus, the boys accumulated more MVPA than the girls on most days, without reaching ≥60 minutes on each day to be classified physically active. In our study, the girls tended to report less screen time than the boys (2.4 vs 2.6 h/d, $P = .5407$). Still, the girls were more sedentary than the boys, as recorded by accelerometers (6.9 vs 6.4 h/d, $P = .0498$). These differences in SB may be explained by the nature of the sedentary activities preferred by the boys (eg, more time spent on TV and videogames) and the girls (more time spent reading or listening to music, talking to friends).[37,38] Unfortunately, time spent in other sedentary activity types and preferences was not assessed in this study.

When comparing the compliance rates derived from the self-report only, some countries have shown a similar or lower prevalence of the 24-HMG than our sample.[15,39] However, the combination of these proportions is diverse. For example, Canadian children are more active (36.0%), but fewer children met the SB (11.6%) recommendations compared with the children included in our report.[39] Another study showed that children from South

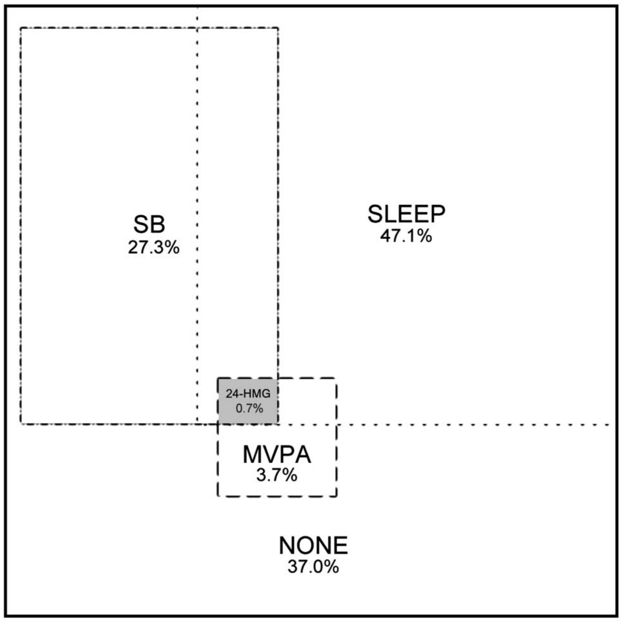

Figure 2 — Diagram showing the proportion of participants meeting the physical activity (MVPA), sedentary behavior (SB), sleep and no guidelines (NONE), and combinations of these guidelines using mixed methods. Note: Mixed method: accelerometer for PA and SLEEP, with self-report for screen time. MVPA indicates moderate to vigorous physical activity; PA, physical activity; SB, sedentary behavior; 24-HMG, 24-hour movement guidelines.

Korea are less active (5.0%), but sleep more (67.6%) than the children from this sample.[15] These variations in combinations have also been measured with mixed methods in countries such as the USA (2.1%) and China (1.5%). For example, children from the United States are more active and sleep more than children from Carahue, Chile, whereas Chinese children sleep less and are less exposed to screens than our sample.[14] These differences, as similarly shown with self-reported data, reinforce the need for considering and reporting all 3 behaviors and their combinations to provide a better picture of these figures. The understanding of these compositions is relevant, as decision makers may be able to develop specific actions based on the findings from other countries. Future studies in Chile may use novel approaches, such as compositional data analysis, to explore combinations of these behaviors with potential outcomes.[40]

To the best of our knowledge, this is the first study that has reported the compliance of the 24-HMG in a Chilean sample. Although this study was conducted in one of the poorest towns in Chile, facing a large poverty gap with other Chilean cities, individual compliance percentages for PA, SB, and SLEEP are comparable with previous reports in Chilean samples from other cities.[18,22] In Chile, not only are a large proportion of children physically inactive, but they also spent a large amount of time in sedentary activities, including screen time.[19,22] Although the percentage of children meeting the SLEEP recommendations in our study was very similar or even larger than that of other countries,[14] it is worrying that about only half of the sample meets this guideline. Studies have suggested that sleeping is closely related with the PA patterns and amounts accumulated throughout a day or week, and vice versa.[41] For example, children may be too tired to move or not active enough and, consequently, too tired to sleep. Not only the amount of sleeping time may affect PA, but also sleep quality.[42,43] Therefore, future studies may include sleep quality in their reports to better understand these complex associations.

Social and environmental determinants may explain differences with other countries. Chile in the last "Report card on physical activity for children and youth" was among the countries with the worst PA-related indicators.[21,44] For example, Chile in "Active transportation" and "Family and peers" had the lowest scores when compared with the other 48 countries of the global matrix, suggesting the reinforcement of complex and supportive strategies at different levels and other sectors.[21,23] Despite being classified as a very high-income country with a very high development index, Chile, in these groups, is among those with the lowest gross national income per capita, the highest income inequality, and the highest child poverty rate.[23] In Carahue, for example, the overall years of education in adults are lower when compared with the whole country (8.1 vs 11.1 y of education),[45] and this, in turn, may limit employment opportunities.[46] Therefore, caregivers may be struggling with income, so they may have to work longer hours[47] or far from home due to temporary jobs,[48] limiting the time to spend with their families in leisure activities or participating in organized sports. This hard situation could be faced by thousands of families in other cities or urban areas in Chile.

Effective and specific-context strategies with a complex system approach are urgent for promoting healthier behaviors in Chilean children,[49] and particularly in this setting. Although movement behavior data are comparable with other studies in Chile, children from Carahue are more overweight and obese (67.2%) when compared with the regional (63.1%) and national (60.1%) data.[50] As the behaviors included in the 24-HMG are interconnected and they may have implications in nutritional status and other outcomes,[14,16] initiatives should be comprehensive, tailored, and realistic for these environments. There is a need for understanding and changing factors at other levels, not only individual, and to provide a better structure to enhance healthier behaviors, particularly in hostile settings where poverty exists for a quarter of the population. A common characteristic among effective strategies for promoting healthier behaviors in children is the inclusion of multilevel approaches. Initiatives should not only be implemented in school settings,[49] but also in neighborhoods,[51] parks, or sport facilities.[52,53] Changes in the built environment are also relevant to provide more opportunities for being active.[54] Other sectors and policies are also needed to drive a movement for promoting healthier behaviors, such as regulations for reducing speed limits in streets, facilitating more active transport modalities (eg, walking and cycling),[21,55] and improving working conditions for those with lower incomes.

Strengths and Limitations

This study is the first that has reported compliance of the 24-HMG in Chilean children. A major strength of this study was the use of the self-report and accelerometers to measure movement behaviors that favor comparability with other international studies. The authors included a novel graphical approach for presenting the 24-HMG with a squared Venn diagram, as other studies have used circular designs.[14,15] Our graphs show the percentages and combinations based on the actual proportions of behaviors, while the commonly used Venn diagrams based on circles of the same size do not necessarily represent these compositions. Despite our efforts to facilitate participation and adherence to the protocol, a large proportion of children could not provide valid data, especially for the accelerometers. The participants were asked to wear the accelerometer 24 hours per day and 7 days per week, but 28.8% did not wear the device for the minimum time required for our analysis. The compliance rate should be considered for future studies when estimating sample size. The questions used in this study, or similar versions, have been used in large international studies, including the Global School-Based Survey, [30,56] but the validity for these methods has not been reported in Chilean children. Concurrent validity and reliability were not tested in this study, as the questionnaires were completed only in the first visit before wearing the accelerometer for a week. Although the current data are comparable with previous reports for isolated behaviors from other cities,[22] extrapolations to other regions from Chile should be avoided, as the study was conducted in a town with particular characteristics of poverty and an aboriginal population. Therefore, future studies involving movement behaviors are needed to have a national perspective and assess potential inequities.

Conclusions

A very low proportion of children aged 9–11 years met the 24-HMG using both self-reported and mixed methodologies in Carahue, Chile. About half of the participants met the sleeping time recommendations, while only about 25% and less than 15% met the SB and PA recommendations, respectively. There is an urgent need to strengthen the message and implement multilevel strategies to address this issue, as the current results have positioned Chile among those countries with the lowest compliance rates for these recommendations.

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