Health-Related Quality of Life and Lifestyle Behavior Clusters in School-Aged Children from 12 Countries

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Objective To evaluate the relationship between children's lifestyles and health-related quality of life and to explore whether this relationship varies among children from different world regions.

Study design This study used cross-sectional data from the International Study of Childhood Obesity, Lifestyle and the Environment. Children (9-11 years) were recruited from sites in 12 nations (n = 5759). Clustering input variables were 24-hour accelerometry and self-reported diet and screen time. Health-related quality of life was self-reported with KIDSCREEN-10. Cluster analyses (using compositional analysis techniques) were performed on a site-wise basis. Lifestyle behavior cluster characteristics were compared between sites. The relationship between cluster membership and health-related quality of life was assessed with the use of linear models.

Results Lifestyle behavior clusters were similar across the 12 sites, with clusters commonly characterized by (1) high physical activity (actives); (2) high sedentary behavior (sitters); (3) high screen time/unhealthy eating pattern (junk-food screenies); and (4) low screen time/healthy eating pattern and moderate physical activity/sedentary behavior (all-rounders). Health-related quality of life was greatest in the all-rounders cluster.

Conclusions Children from different world regions clustered into groups of similar lifestyle behaviors. Cluster membership was related to differing health-related quality of life, with children from the all-rounders cluster consistently reporting greatest health-related quality of life at sites around the world. Findings support the importance of a healthy combination of lifestyle behaviors in childhood: low screen time, healthy eating pattern, and balanced daily activity behaviors (physical activity and sedentary behavior). *(J Pediatr 2017;183:178-83).*

Trial registration ClinicalTrials.gov: NCT01722500.

Health-related quality of life (HRQoL) is an important indicator of children's physical, mental, and social wellbeing.[1,2] Self-reported HRQoL is studied widely among children with chronic diseases or specific health conditions (eg, Law et al[3]). In addition, studies have begun to investigate the relationship between HRQoL and lifestyle behaviors, such as physical activity (PA) and diet.[4-8]

The HRQoL of children has been associated positively with PA, sleep, and healthy diet and negatively associated with screen time.[4-8] These studies have examined lifestyle behaviors as individual entities, without considering their interdependence.[9] The relationship between patterns of lifestyle behaviors and the HRQoL of children has, to our knowledge, only been investigated in 2 previous studies.[10,11] These studies suggest that HRQoL differs across lifestyle clusters, yet the results should be considered in the context of certain limitations. First, clusters were based on time use only and did not consider other lifestyle behaviors. Second, the closed nature and subsequent multicollinearity of time use was not accounted for in the statistical analyses.

BMI	Body mass index
FFQ	Food Frequency Questionnaire
HRQoL	Health-related quality of life
ISCOLE	International Study of Childhood Obesity, Lifestyle and the Environment
PA	Physical activity

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This study used data from the International Study of Childhood Obesity, Lifestyle and Environment (ISCOLE), which was funded by The Coca-Cola Company. The funder had no role in study design, data collection and analysis, decision to publish, or preparation of this manuscript. The authors declare no conflicts of interest.

http://dx.doi.org10.1016/j.jpeds.2016.12.048

Notably, previous research on the HRQoL of children and lifestyle behaviors has been conducted almost exclusively in high-income nations. It generally is accepted that there are discrepancies in the way children from different cultures rate their own health and well-being.[12] Two recent multinational studies of children's subjective well-being found that although there tended to be a positive correlation between a country's socioeconomic status and subjective well-being, differences in well-being were most likely linked to individual-level factors (home situation) and area-level factors (school), rather than country-level factors (gross domestic product, Human Development Index).[12,13]

Observation of secular trends in children's PA, sedentary behavior, and diets has identified a progressive "Westernization" in many low-middle income nations, particularly in urban environments.[14-16] Specifically, a decline in PA, increase in screen time, and an increasing intake of "junk" foods have been reported widely in low-middle income nations.[15,17] An understanding of children's lifestyle behavior patterns and the links with HRQoL is crucial for policy development and proactive planning.

This study aims to (1) describe the HRQoL of children across sites in 12 different nations; (2) explore how school-aged children cluster in lifestyle behavior groups by the use of a comprehensive range of behaviors and by the application of compositional analysis techniques; and (3) explore the associations between HRQoL and membership of clusters.

Methods

Data from the cross-sectional International Study of Childhood Obesity, Lifestyle and the Environment (ISCOLE) were used (ClinicalTrials.gov: NCT01722500). A detailed description of the ISCOLE protocol can be found in the work of Katzmarzyk et al.[18]

Participants were recruited from schools in study sites spread across 12 countries (Australia, Brazil, Canada, China, Colombia, Finland, India, Kenya, Portugal, South Africa, England, and the US). From these schools, children aged 9-11 years were invited to participate.

A sex-balanced sample of approximately 500 children from each site contributed to the final sample of 7372. Participants were excluded if they had incomplete data for HRQoL (n = 74), as well as accelerometry (n = 1185), screen time (n = 2), eating pattern (n = 102), and sociodemographic covariate data (n = 250), yielding a final sample of 5759 children (3168 girls and 2591 boys). Excluded participants were more likely to be male ($P < .001$), have parents of lower education ($P < .001$), and have more siblings ($P < .001$) than included participants. Excluded participants also differed from included participants by greater screen time ($P < .001$), body mass index (BMI) z score ($P < .001$), and greater unhealthy eating pattern ($P < .001$).

Ethical approval was obtained from the institutional review board of the Pennington Biomedical Research Center in Baton Rouge, Louisiana, by the ISCOLE coordinators. Site-specific ethical approval also was received at each participating study site. Parental written informed consent and child assent were obtained as required by local review boards.

Child participants completed the KIDSCREEN-10[19] to provide a global measure of their HRQoL. The KIDSCREEN-10 is the brief form of a measure originally developed in Europe, using a participatory approach across 13 countries, with and for children aged 8-18 years. The KIDSCREEN instrument has been validated in numerous low- and middle-income countries and is used widely around the world.[20-23] The KIDSCREEN-10 is composed of 10 questions related to respondents' PA, energy and fitness, moods and emotions, social and leisure participation, social and family relationships, cognitive capacity, and school experience. Responses are recorded on a 5-point response scale and reversed where necessary to ensure that greater scores indicate better HRQoL. In countries in which the KIDSCREEN-10 had not been used previously, the questions were translated systematically to the local language following rigorous procedures outlined by Kidscreen.[24] Items for each participant were summed and used to calculate Rasch person-variables, which subsequently were transformed into T values with a mean of 50 and a SD of approximately 10.[19]

Daily activities (light, moderate, and vigorous PA; sedentary behavior; and sleep) were measured objectively by 24-hour, 7-day accelerometry. Participants were instructed to wear an ActiGraph GT3X+ accelerometer (ActiGraph LLC, Pensacola, Florida) on their right hip. The mean daily wear-time was 22.8 hours. To be included, participants were required to have ≥10 hours per day waking wear time (on at least 4 days, including at least 1 weekend day) and ≥160 minutes total sleep period for at least 3 nights (including 1 weekend night).[25] Activity was sampled at 80 Hz and downloaded in 1-second epochs, which were aggregated into 60-second epochs to estimate nocturnal sleep duration via a previously published algorithm.[26] Waking-wear time was processed in 15-second epochs to determine time vigorous, moderate, and light PA and sedentary behavior, as defined by Evenson et al.[27] Each component (sedentary behavior; light, moderate, and vigorous PA; and sleep) was weighted for weekdays:weekend days at 5:2.

Participants reported typical weekday and weekend day non-school time spent (1) watching television and (2) playing computer or video games in categories of none, <1, 1, 2, 3, 4, and ≥5 hours. Both television and video/computer time were combined to form a continuous variable representing "screen time." Typical weekday and weekend day screen time were weighted at 5:2 to create an average daily screen time score, which was then normalized by a square root transformation.

Child participants' responses to a Food Frequency Questionnaire (FFQ) of moderate reliability and low-to-moderate validity were used to assess eating patterns.[18,28] A total of 23 food categories were included in the FFQ, with examples of foods given for each category. Some food items were not available in some countries; therefore, examples were adapted according to the country's norm (for instance, under the "fried foods" category, "chicken wings" were given as one of the examples in the US and "empanadas" in Colombia). Principal component analyses that used FFQ food groups as input variables were interpreted to identify 2 factors: (1) a healthy eating