**Sleep Spirals: Novel Visualization of Childhood Circadian Rhythms and Physical Activity**

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**Introduction:** Advances in wrist-worn sensor technology and data analytics allow physical activity, sleep and circadian rhythms to be monitored unobtrusively over long time periods. This technology has important applications in the treatment of obesity, since reduced physical activity, sleep disruption and disrupted circadian rhythms are components of both the pathogenesis and morbidity of this condition. Visualization of the patterns and levels of daily physical activity over long time periods can be used to inform children with obesity and to provide them with tangible evidence of the effect of interventions. We describe a novel data visualization for communicating longitudinal patterns in physical activity to children and their parents.

**Methods:** Following ethical approval daily physical activity was monitored in 29 children presenting for treatment of obesity at a tertiary clinic (Table 1). Data were acquired over 7 days, and daily locomotor activity was visualized by plotting a spiral polar bar chart, with the magnitude of acceleration indicated by a colour heatmap. For comparison, each dataset was also plotted using conventional methods for visualizing daily locomotor activity data.

Table 1: Demography of participants

|  |  |
| --- | --- |
| **Age (mean ± sd)** | 14 ± 1 |
| **Gender**  Male (n,%)  Female (n,%) | 6, 21%  23, 79% |
| **Physical Activity**  Subjective report (min/week) | 68.4 ± 21.7 |

**Results:** The sleep spirals were a simple method for conveying information on physical activity through colour change, and on circadian rhythms through visual patterns. Sleep spirals capture trends in physical activity and circadian rhythms in a single data plot.

**Conclusion:**  Sleep spirals are a novel method that could be used to educate children about their activity levels and circadian rhythms. They have potential application for engaging children in their treatment, and for conveying the impact of interventions in modifying the rhythmicity and level of physical activity.

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