

Movement Behaviors and Depression Among Ukrainian School-Age Children During the War: A Compositional Data Analysis

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Background:

Depression is a significant mental health issue affecting children and adolescents impacted by war. This study utilized Compositional Data Analysis (CoDA) to investigate the relationships between depression symptoms and daily movement behaviors, including light physical activity (LPA), moderate-to-vigorous physical activity (MVPA), sedentary behavior (SB), and sleep, among youth in Ukraine from 2022 to 2024.

Methods:

A series of cross-sectional surveys were conducted in 2022-2024 using the RCADS-P-25. The sample included children and adolescents aged 8 to 18 years (N = 3570) who had been exposed to war-related stressors. Movement behaviors (LPA, MVPA, SB, and sleep) were assessed as compositional data to model their interdependent nature accurately. Covariates such as age, sex, body mass index, and migration features were controlled for in the analysis. The CoDA technique was employed to evaluate the relative contributions of LPA, MVPA, SB, and sleep to depression symptoms.

Results:

The study indicated (Fig. 1) that the percentage of Ukrainian schoolchildren with potential depressive symptoms was $29.1 \pm 1.4\%$ in 2022, three months after the full-scale invasion began. This included $8.0 \pm 0.8\%$ with borderline symptoms and $21.0 \pm 1.2\%$ with clinical symptoms. The corresponding figures for 2023 and 2024 were $27.8 \pm 1.1\%$ (with $8.3 \pm 0.7\%$ showing borderline symptoms and $19.6 \pm 1.0\%$ with clinical symptoms) and $16.9 \pm 1.1\%$ ($7.1 \pm 0.7\%$ with borderline symptoms and $9.8 \pm 0.8\%$ with clinical symptoms), respectively.

Differences in daily activities and sleep patterns were noted among groups of children with varying levels of depressive symptoms (Fig. 2). Notably, the most significant deviations from the average were found in the group of children showing potential clinical symptoms of depression. In this group, the duration of MVPA was 14.4% lower than that of the overall sample.

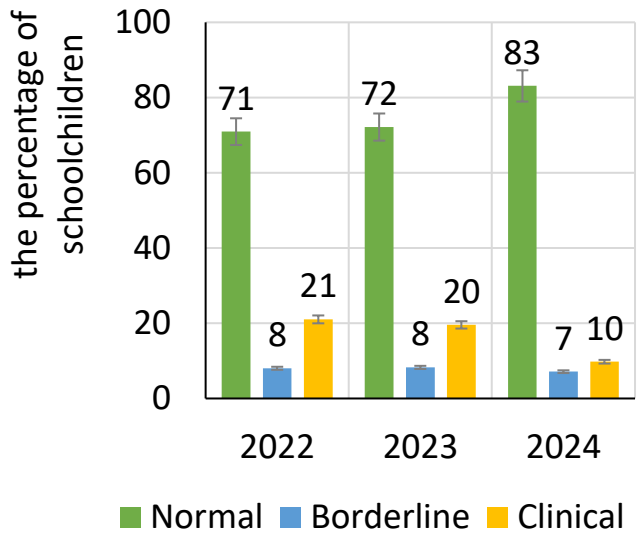


Figure 1. The percentage of Ukrainian school-age children with potential borderline and clinical depression symptoms from 2022 to 2024

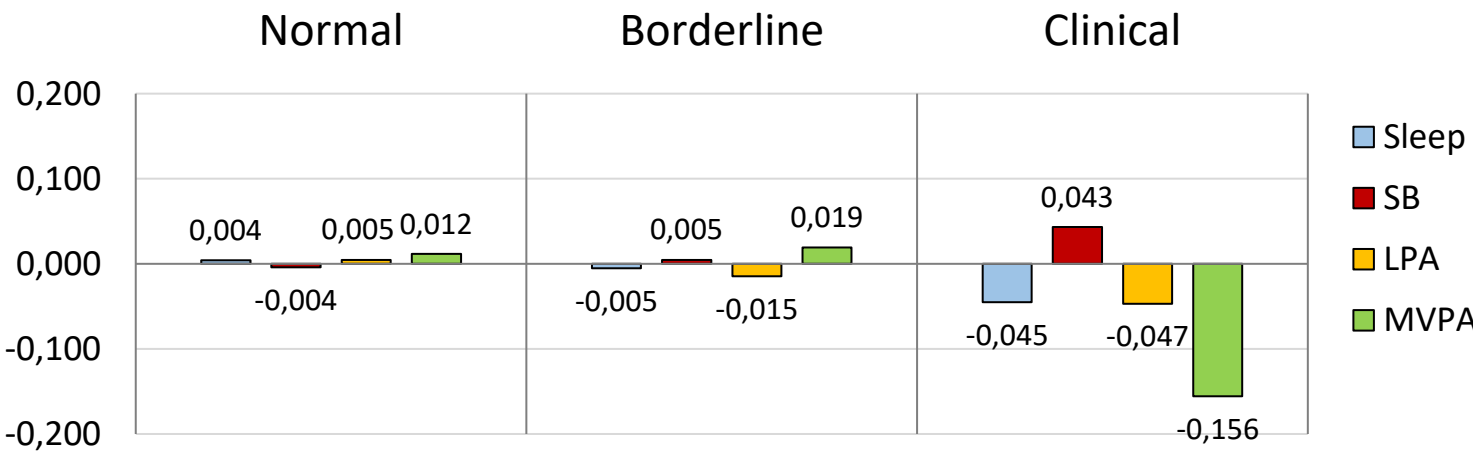


Figure 2. Logarithmic ratios of time spent on different activities over a 24-hour period, categorized by levels of depressive symptoms

CoDA Regression Model

The findings revealed a significant relationship between the composition of movement behaviors and the severity of depression symptoms. Higher levels of MVPA relative to LPA, SB, and sleep were associated with lower depression scores ($\beta_c = -0.05$; $p = 0.002$), while a more significant proportion of SB in daily activity composition was linked to higher depression severity ($\beta_c = 0.37$; $p < 0.001$). The influence of sleep within this composition was also associated with lower depression scores ($\beta_c = -0.28$; $p < 0.001$). The effect of LPA was statistically insignificant ($\beta_c = 0.03$; $p = 0.075$).

Conclusion:

The results emphasize the importance of considering the composition of movement behaviors when assessing the risk of depression among war-affected school-age children. Interventions to achieve optimal PA, SB, and sleep balance may benefit this population's mental health. Further studies are necessary to explore causal pathways.