

## Supplemental Online Content

Ledoux AA, Sicard V, Bijelic V, et al. Optimal volume of moderate-to-vigorous physical activity postconcussion in children and adolescents. *JAMA Netw Open*. 2024;7(2):e2356458. doi:10.1001/jamanetworkopen.2023.56458

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**eFigure.** LOESS Curve of Unadjusted Observed and Imputed Distribution With 95% CI of Cumulative Moderate to Vigorous Physical Activity (cMVPA) and Health and Behavior Inventory (HBI) at 1, 2, and 4 Weeks

This supplemental material has been provided by the authors to give readers additional information about their work.

**eTable 1.** Additional Variables Included in the Imputation Model

| <b>Variable</b>       | <b>MinValue</b> | <b>MaxValue</b> | <b>ImputationMethod</b> |
|-----------------------|-----------------|-----------------|-------------------------|
| symptom               | 0.00            | 2.00            | 2lonly.pmm              |
| randomization         | 0.00            | 1.00            | 2lonly.pmm              |
| site                  | 0.00            | 2.00            | 2lonly.pmm              |
| sex                   | 0.00            | 1.00            | 2lonly.pmm              |
| calc_age              | 10.01           | 17.86           | 2lonly.pmm              |
| mechanism_injury      | 0.00            | 11.00           | 2lonly.pmm              |
| Lost of consciousness | 0.00            | 1.00            | 2lonly.pmm              |
| seizure               | 0.00            | 1.00            | 2lonly.pmm              |
| amnesia_before        | 0.00            | 1.00            | 2lonly.pmm              |
| amnesia_hurt          | 0.00            | 1.00            | 2lonly.pmm              |
| amnesia_after         | 0.00            | 1.00            | 2lonly.pmm              |
| headache              | 0.00            | 1.00            | 2lonly.pmm              |
| pain_scale_response   | 1.00            | 10.00           | 2lonly.pmm              |
| pain_upset            | 0.00            | 4.00            | 2lonly.pmm              |
| noise                 | 0.00            | 1.00            | 2lonly.pmm              |
| fatigue               | 0.00            | 1.00            | 2lonly.pmm              |
| disorientation        | 0.00            | 1.00            | 2lonly.pmm              |
| nauseous              | 0.00            | 1.00            | 2lonly.pmm              |
| vomiting              | 0.00            | 1.00            | 2lonly.pmm              |
| dizziness             | 0.00            | 1.00            | 2lonly.pmm              |
| vision                | 0.00            | 2.00            | 2lonly.pmm              |
| balance               | 0.00            | 1.00            | 2lonly.pmm              |
| light                 | 0.00            | 1.00            | 2lonly.pmm              |
| ment_foggy            | 0.00            | 1.00            | 2lonly.pmm              |
| slow_down             | 0.00            | 1.00            | 2lonly.pmm              |
| concentrating         | 0.00            | 1.00            | 2lonly.pmm              |
| remembering           | 0.00            | 1.00            | 2lonly.pmm              |
| irritable             | 0.00            | 1.00            | 2lonly.pmm              |
| sad                   | 0.00            | 1.00            | 2lonly.pmm              |
| emotional             | 0.00            | 1.00            | 2lonly.pmm              |
| nervousness           | 0.00            | 1.00            | 2lonly.pmm              |
| sleep_less            | 0.00            | 2.00            | 2lonly.pmm              |
| sleep_more            | 0.00            | 2.00            | 2lonly.pmm              |
| trouble_sleep         | 0.00            | 2.00            | 2lonly.pmm              |

| Variable              | MinValue | MaxValue | ImputationMethod |
|-----------------------|----------|----------|------------------|
| additional_injuries   | 0.00     | 1.00     | 2lonly.pmm       |
| prev_concussion       | 0.00     | 1.00     | 2lonly.pmm       |
| past_headaches        | 0.00     | 1.00     | 2lonly.pmm       |
| dx_migraines          | 0.00     | 1.00     | 2lonly.pmm       |
| answer_slowly         | 0.00     | 1.00     | 2lonly.pmm       |
| bess_able             | 0.00     | 2.00     | 2lonly.pmm       |
| learning_disabilities | 0.00     | 1.00     | 2lonly.pmm       |
| attention_disorder    | 0.00     | 1.00     | 2lonly.pmm       |
| other_dev_disorder    | 0.00     | 1.00     | 2lonly.pmm       |
| dx_anxiety            | 0.00     | 1.00     | 2lonly.pmm       |
| dx_depression         | 0.00     | 1.00     | 2lonly.pmm       |
| dx_sleep_disorder     | 0.00     | 1.00     | 2lonly.pmm       |
| dx_other_psych        | 0.00     | 1.00     | 2lonly.pmm       |
| annual_income         | 0.00     | 5.00     | 2lonly.pmm       |
| mother_education      | 0.00     | 9.00     | 2lonly.pmm       |
| father_education      | 0.00     | 9.00     | 2lonly.pmm       |
| bess_double_errors    | 0.00     | 10.00    | 2lonly.pmm       |
| bess_tandem_errors    | 0.00     | 10.00    | 2lonly.pmm       |
| activities_60_mins    | 0.00     | 3.00     | 2lonly.pmm       |
| activities_breath     | 0.00     | 4.00     | 2lonly.pmm       |
| activities_watch_tv   | 0.00     | 5.00     | 2lonly.pmm       |
| activities_computer   | 0.00     | 5.00     | 2lonly.pmm       |

**Notes.** activities\_60\_mins = Health Canada Physical Activity Survey, over a typical week prior to the concussion, number of days the child is physically active for more than 60 min per day (none, 1 day, 2-3 days, 4 days or more); activities\_breath = Health Canada Physical Activity Survey, over a typical week prior to the concussion, hours a week the child take part in physical activity that makes them out of breath or warmer than usual outside of school while participating in lessons or league or team sports (never, less than 1 per week, 2 to 3 hours per week, 4 to 6 hours per week, 7 or more hours per week); activities\_watch\_tv = Health Canada Physical Activity Survey, over a typical week prior to the concussion, on average, how many hours a day does the child watch TV or videos or play video games (doesn't watch TV or videos or play video games, less than 1 hours per day, 1 to 2 hours a day, 3 to 4 hours a day, 5 to 6 hours a day, 7 or more hours a day); activities\_computer = activities\_watch\_tv = Health Canada Physical Activity Survey, over a typical week prior to the concussion, on average, how many hours a day does the child spend on a computer/cellphone (working, playing games, emailing, chatting, surfing the Internet; doesn't use a computer, less than 1 hour per day, 1 to 2 hours a day, 3 to 4 hours a day, 5 to 6 hours a day, 7 or more hours a day); annual\_income = household annual income (\$25,000 or less; \$25,0001-\$50,000; \$50,001-\$75,000; \$75,001-\$100,000; more than \$100,000; does not wish to answer); answer\_slowly = question to the parent, since the injury, does the child answer questions slowly? (yes or no); bess = Balance Error Scoring System; bess\_able = whether or not the patient is able to complete the BESS; calc\_age = age in years with decimals; concentrating = difficulty concentrating; dx = diagnosis; father\_education = highest level of education of the father/legal guardian (high school not completed; secondary [high school] diploma or equivalency certificate; registered apprenticeship or other trades certificate or diploma; university degree – bachelor degree; master's degree; doctorate; other; NA [e.g., single parent, deceased, etc.]; does not wish to answer); loc = loss of consciousness; mechanism\_injury = circumstances of

injury (occupant in motor vehicle collision, motorcycle accident, motorized recreation vehicle accident, pedestrian struck by auto, bike struck by auto, bike collision or fall while riding, fall from an elevation, fall down stairs, sport, fall from standing/walking/running, ran into stationary object, other mechanism); ment\_foggy = feeling mentally foggy; mother\_education = highest level of education of the father/legal guardian (high school not completed; secondary [high school] diploma or equivalency certificate; registered apprenticeship or other trades certificate or diploma; university degree – bachelor degree; master’s degree; doctorate; other; NA [e.g., single parent, deceased, etc.]; does not wish to answer); pain\_scale response = headache pain scale at ED visit, rating from 0 to 10; pain\_upset = headache pain scale at ED visit, rating from 0 (does not bother or upset you at all) to 4 (bothers or upsets you very much); prev\_concussion = previous concussion (yes or no); randomization = randomized control trial randomization group (experimental or control); remembering; difficulty remembering; slow\_down = feeling slowed down; symptom = average daily log symptom rating (0=a lot, 1=a little, 2=a lot) during the study. Signs (e.g., loc, amnesia, seizure) and symptoms (e.g., headache, fatigue, dizziness, etc) refer to those at those at time of injury. Premorbid developmental or mental health diagnoses are binary variables (yes or no).

**eTable 2.** HBI Scores Through Time

| Variable          | Analytic sample (Actual sample), Median (IQR) | Data without or insufficient Actual data, Median (IQR) | Missing information (Analytic sample), frequency (%) |
|-------------------|---|--|--|
| Retrospective HBI | 12.5 (6.0, 19.0)                              | 14.0 (7.0, 20.0)                                       | 1 (0.4)  |
| HBI at ED         | 21.0 (15.0, 31.0)                             | 25.0 (18.0, 31.2)                                      | 1 (0.4)  |
| HBI at Week 1     | 18.0 (10.0, 29.0)                             | 20.0 (13.0, 32.0)                                      | 27 (10.1)  |
| HBI at Week 2     | 14.0 (5.0, 23.0)                              | 15.0 (7.5, 23.0)                                       | 25 (9.4)   |
| HBI at Week 4     | 10.0 (1.5, 19.0)                              | 14.0 (3.5, 21.0)                                       | 84 (31.5)  |

Notes. HBI = Health and Behaviour Inventory; IQR = Interquartile range; ED = Emergency Department.

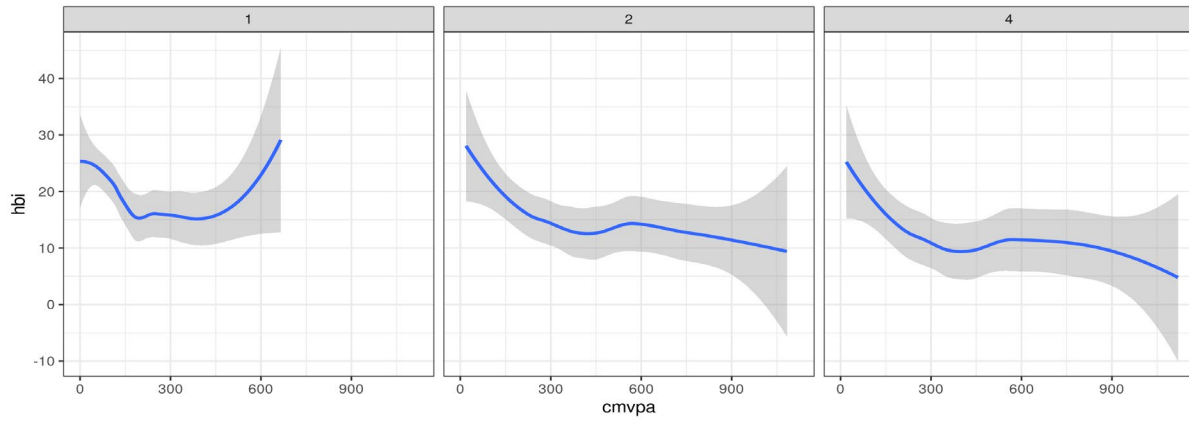
**eTable 3.** Contrast for Exploratory Analysis

| Week                  | Contrast cMVPA p25-p75 |        | Estimate (SE) [95%CI]       | p.value |
|-----------------------|------------------------|--------|-----------------------------|---------|
| 1 <sub>cog.</sub> HBI | 90.75                  | 235.75 | -2.20 (0.78) [-3.72, -0.67] | 0.005   |
| 2 <sub>cog.</sub> HBI | 235.75                 | 589.50 | -1.35 (0.82) [-2.95, 0.25]  | 0.10    |
| 4 <sub>cog.</sub> HBI | 235.75                 | 589.50 | 0.25 (0.82) [0.82, 0.25]    | 0.10    |
| 1 <sub>som.</sub> HBI | 90.75                  | 264.25 | -2.15 (0.51) [-3.15, -1.15] | < 0.001 |
| 2 <sub>som.</sub> HBI | 235.75                 | 589.50 | -1.39 (0.53) [-2.43, -0.35] | 0.009   |
| 4 <sub>som.</sub> HBI | 235.75                 | 589.50 | -1.39 (0.53) [-2.43, 0.35]  | 0.009   |

Notes. 95%CI = 95% Confidence Interval; cMVPA = Cumulative Moderate-to-Vigorous Physical Activity; Cog. HBI = Cognitive score on the Health Behaviour Inventory (HBI); p25 = 25<sup>th</sup> percentile; p75 = 75<sup>th</sup> percentile; Som. HBI = Somatic score on the HBI.

**eFigure 1.** LOESS Curve of Unadjusted Observed and Imputed Distribution With 95% CI of Cumulative Moderate to Vigorous Physical Activity (cMVPA) and Health and Behaviour Inventory (Hbi) at 1, 2, and 4 Weeks

Observed data



Imputed data

