

# Movement Behaviour Questionnaire (MBQ)

## User guide for administration and scoring

### Version 1.0 (for REDCap administration)

This manual provides general information on using the Movement Behaviour Questionnaire (MBQ) and a description of the scoring system. This manual is a supplement to the REDCap data dictionary (available upon request: [s.trost@uq.edu.au](mailto:s.trost@uq.edu.au)).

## Introduction

- The MBQ is a validated “fit-for-purpose” rapid assessment tool for measuring movement behaviours in children aged 0 – 5 years.
- The behaviours assessed by the MBQ include active play, tummy time (MBQ-B only), restrained time (MBQ-B only), screen time and sleep.
- The MBQ is available in four versions: MBQ-B (open version), MBQ-B (closed version), MBQ-C (open version), and MBQ-C (closed version).
- The psychometrics of the MBQ-B and MBQ-C have been evaluated and are described below.

### Psychometric properties of the MBQ

As part of the EPOCH CRE, a study was conducted to evaluate the test-retest reliability and concurrent validity of the open-ended and closed-ended versions of the MBQ-B and MBQ-C. A total of 300 parent-child dyads completed the 10-day study protocol (MBQ-B: N=85; MBQ-C: N=215). To assess validity, children wore an accelerometer on the non-dominant wrist (ActiGraph GT3X+) for 7 days and parents completed 2 x 24-hour activity diaries recording screen time and sleep on two separate days. For babies (i.e., not yet walking), parents completed 2 x 24-hour activity diaries recording tummy time, active play, restrained time, screen time, and sleep on days 2 and 5 of the 7-day monitoring period. To assess test-retest reliability, parents were randomised to complete either the open- or closed-ended versions of the MBQ on day 7 and on day 10. Test-retest intraclass correlation coefficients (ICC's) were calculated using generalized linear mixed models and validity was assessed via Spearman correlations.

Test-retest reliability for the MBQ-B was good to excellent with ICC's ranging from 0.80 – 0.94 and 0.71 – 0.93 for the open- and closed-ended versions, respectively. For both versions, significant positive correlations were observed between 24-hour diary and MBQ-B reported tummy time, active play, restrained time, screen time, and sleep ( $\rho = 0.39 - 0.87$ ). Test-retest reliability for the MBQ-C was moderate to excellent with ICC's ranging from 0.68 – 0.98 and 0.44 – 0.97 for the open- and closed-ended versions, respectively. For both the open- and closed-ended versions, significant positive correlations were observed between 24-hour diary and MBQ-C reported screen time and sleep ( $\rho = 0.44 - 0.86$ ); and between MBQ-C reported and device-measured time in total active play and energetic play ( $\rho = 0.27 - 0.42$ ).

## User information

### Which MBQ should I use?

- MBQ-B: For babies who are yet to reach their walking milestone.
- MBQ-C: For children who can walk.
- Open-ended version (responses are provided in hours and minutes per day): Useful for research applications to collect data for statistical purposes.
- Closed answer version (response options are selected within a range): End users may prefer to administer the MBQ with closed answer responses; useful for clinical or primary care settings where the MBQ Index scoring system allows for patient feedback.

## What are the differences between the MBQ-B and MBQ-C?

- The MBQ-B includes a tummy time item for babies who are yet to reach their rolling milestone, once babies can roll an active play item encompasses broader physical activities – thus, the MBQ is suitable from birth.
- The MBQ-B includes an item on restrained time.
- The MBQ-C assesses physical activity and screen time separately for weekdays and weekend days and calculates a weighted daily average for daily total active play, energetic play, passive screen time, and interactive screen time.
- The MBQ-C assesses sleep routine in addition to sleep duration.

## Scoring information

### Calculation of outcome variables

- The REDCap data dictionary includes calculated outcome variables for each health behaviour, which are hidden from users.
- Administrators can view scores for the outcome variables on REDCap directly or when data is exported to Excel or a statistical program. Note: The data export includes responses to all MBQ items in addition to the calculated outcome variables.
- The REDCap data dictionary also includes indicator variables for adherence to guidelines for each behaviour and the 24-hour movement guidelines (active play, screen time and sleep behaviours).
- The table below lists the outcome variables calculated from items in the MBQ-B and MBQ-C, respectively.

Behaviour	MBQ-B Outcome Variables	MBQ-C Outcome Variables
Active play	<ul style="list-style-type: none"> <li>- Tummy time (for babies not rolling)</li> <li>- Guideline adherence for tummy time</li> <li>- Active play (for babies rolling)</li> <li>- Guideline adherence for active play</li> </ul>	<ul style="list-style-type: none"> <li>- Weekday total active play</li> <li>- Weekday energetic play</li> <li>- Weekend day total active play</li> <li>- Weekend day energetic play</li> <li>- Weighted average of energetic play</li> <li>- Weighted average of total active play</li> <li>- Guideline adherence</li> </ul>
Restrained time	<ul style="list-style-type: none"> <li>- Restrained bout time</li> <li>- Daily restrained time</li> <li>- Guideline adherence</li> </ul>	NA
Screen time <sup>1, 2, 3</sup>	<ul style="list-style-type: none"> <li>- Passive screen time</li> <li>- Interactive screen time</li> <li>- Total screen time</li> <li>- Guideline adherence</li> </ul>	<ul style="list-style-type: none"> <li>- Weekday passive screen time</li> <li>- Weekday sedentary passive screen time</li> <li>- Weekday interactive screen time</li> <li>- Weekday sedentary interactive screen time</li> <li>- Weekend day passive screen time</li> <li>- Weekend day sedentary passive screen time</li> <li>- Weekend day interactive screen time</li> <li>- Weekend day sedentary interactive screen time</li> </ul>

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		<ul style="list-style-type: none"> <li>- Weighted average of passive screen time</li> <li>- Weighted average of sedentary passive screen time</li> <li>- Weighted average of interactive screen time</li> <li>- Weighted average of sedentary interactive screen time</li> <li>- Weighted average of total screen time</li> <li>- Weighted average of total sedentary screen time</li> <li>- Guideline adherence</li> </ul>
Sleep	<ul style="list-style-type: none"> <li>- Day sleep (i.e., napping)</li> <li>- Night sleep</li> <li>- Total sleep</li> <li>- Guideline adherence</li> </ul>	<ul style="list-style-type: none"> <li>- Day sleep (i.e., napping)</li> <li>- Night sleep</li> <li>- Total sleep</li> <li>- Sleep routine</li> <li>- Guideline adherence</li> </ul>
24-hour Movement Guidelines	<ul style="list-style-type: none"> <li>- Guideline adherence</li> </ul>	<ul style="list-style-type: none"> <li>- Guideline adherence</li> </ul>

<sup>1</sup> Passive screen time is defined as ‘watching’ television programs, videos/internet clips or movies on a television, computer, or portable/mobile device such as iPad, tablet, or smartphone.

<sup>2</sup> Interactive screen time is defined as ‘playing’ games, looking at photos, or video chatting (e.g. FaceTime, Zoom, Skype) on a screen-based device such as a computer or laptop, video game console, iPad, tablet, or smartphone.

<sup>3</sup> Sedentary screen time is defined as screen time that is done whilst seated/lying down i.e., calculated by the difference between MBQ items for (1) total screen time and (2) screen time whilst standing.

#### Truncation of extreme values on the open-ended versions of the MBQ.

- Implausible or extreme values for the following outcome variables are truncated to the 95<sup>th</sup> percentile from the validation study dataset.

MBQ	Outcome variable	Truncated value
MBQ-B (open version)	Total tummy time	180 minutes per day
MBQ-B (closed version)	Total tummy time	180 minutes per day
MBQ-B (open version)	Total active play	480 minutes per day
MBQ-B (open version)	Total restrained time	360 minutes per day
MBQ-B (closed version)	Total restrained time	360 minutes per day
MBQ-C (open version)	Weekday total active play	480 minutes per day
MBQ-C (open version)	Weekend day total active play	480 minutes per day
MBQ-C (open version)	Weekday energetic play	360 minutes per day
MBQ-C (open version)	Weekend day energetic play	360 minutes per day

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## 1. MBQ-B (open version)

### 1.1. Calculation of outcome variables – variable names and description.

Variable name	Description
<b>TUMMY TIME AND ACTIVE PLAY</b>	
baby_o_tummytime	Total tummy time in minutes per day for babies who are yet to roll. For babies who can roll, this variable will be set to missing.
baby_o_tummytime_180	Total tummy time. Extreme values (> 180 minutes) truncated to 180 minutes per day. If total tummy time <= 180 minutes, this variable will equal 'baby_o_tummytime'.
baby_o_tummytime_guide	Adherence with tummy time guideline for babies who are yet to roll of at least 30 minutes of tummy time per day. 1 = Yes, 0 = No. For babies who can roll, this variable will be set to missing.
baby_o_totalact	Total active play in minutes per day for babies who can roll. For babies who are yet to roll, this variable will be set to missing.
baby_o_totalact_480	Total active play for babies who can roll. Extreme values (> 480 minutes) truncated to 480 minutes per day. If total active play <= 480 minutes, this variable will equal 'baby_o_totalact'.
baby_o_act_guide	Adherence with active play guideline for babies who can roll of at least 30 minutes of active play per day. 1 = Yes, 0 = No. For babies who are yet to roll, this variable will be set to missing.
<b>RESTRAINED TIME</b>	
baby_o_restrained_bout	Restrained time in minutes per bout per day.
baby_o_restrained_total	Total restrained time in minutes per day.
baby_o_restrained_total_360	Total restrained time. Extreme values (> 360 minutes) truncated to 360 minutes per day. If total restrained time is <= 360 minutes this variable will equal 'baby_o_restrained'
baby_o_restrained_guide	Adherence with restrained time guideline of not more than 1 hour at a time of restrained time (such as in a stroller, car seat or highchair). 1 = Yes, 0 = No.
<b>SCREEN TIME</b>	
baby_o_swatch	Passive screen time in minutes per day.
baby_o_pwatch	Interactive screen time in minutes per day.
baby_o_totalscreen	Total screen time; the sum of 'baby_o_swatch' and 'baby_o_pwatch'.
baby_o_screen_guide	Adherence with screen time guideline of no screen time for babies/children under 2 years. 1 = Yes, 0 = No.

<b>SLEEP</b>	
baby_o_sleep_night	Time spent in night sleep in minutes per day.
baby_o_sleep_day	Time spent in day sleep in minutes per day.
baby_o_sleep_total	Total sleep in minutes per day; the sum of 'baby_o_sleep_night' and 'baby_o_sleep_day'.
baby_o_sleep_guide	Adherence with guideline for sleep of at least 14 hours per day for babies until 3 months, at least 12 hours per day for babies aged 4 to 11 months, or at least 11 hours per day for babies/children aged 12 months or older. 1 = Yes, 0 = No.
<b>Adherence with 24-hour movements guidelines</b>	
baby_o_24guide	<p>Adherence with the 24-hour movement guidelines. 1 = Yes, 0 = No.</p> <p><b>For babies who are yet to roll:</b></p> <p>This condition would be true (1) if the baby met all 3 recommendations for tummy time, screen time, and sleep (based on age):</p> <ol style="list-style-type: none"> <li>1. baby_o_tummytime_guide = '1' AND</li> <li>2. baby_o_screen_guide = '1' AND</li> <li>3. baby_o_sleep_guide = '1'</li> </ol> <p><b>For babies who can roll:</b></p> <p>This condition would be true (1) if the baby met all 3 recommendations for active play, screen time, and sleep (based on age):</p> <ol style="list-style-type: none"> <li>1. baby_o_act_guide = '1' AND</li> <li>2. baby_o_screen_guide = '1' AND</li> <li>3. baby_o_sleep_guide = '1'</li> </ol>

## 2. MBQ-B (closed version)

### 2.1. Calculation of outcome variables – variable names and description.

Variable name	Description
<b>TUMMY TIME AND ACTIVE PLAY</b>	
baby_c_tummytime	Total tummy time in minutes per day for babies who are yet to roll. For babies who can roll, this variable will be set to missing.  Product of the frequency of tummy time 'baby_close_1a' and the duration of tummy time 'baby_close_1b'. Duration is based on the mid-point of each response category for 'baby_close_1b' where 1 = 2.5, 2 = 7.5, 3 = 12.5, 4 = 18, 5 = 23, 6 = 28, or the maximum value for 7 = 30.
baby_c_tummytime_180	Total tummy time. Extreme values (> 180 minutes) truncated to 180 minutes per day. If total tummy time <= 180 minutes, this variable will equal 'baby_c_tummytime'.
baby_c_tummytime_guide	Adherence with active play guideline for babies who are yet to roll of at least 30 minutes of tummy time per day. 1 = Yes, 0 = No. For babies who can roll, this variable will be set to missing.
baby_c_totalact	Total active play in minutes per day for babies who can roll. For babies who are yet to roll, this variable will be set to missing.  Duration is based on the mid-point of each response category for 'baby_close_2' where 1 = 7.5, 2 = 22.5, 3 = 45, 4 = 75, 5 = 105, or the maximum value for 6 = 120.
baby_c_act_guide	Adherence with active play guideline for babies who can roll of at least 30 minutes of active play per day. 1 = Yes, 0 = No. For babies who are yet to roll, this variable will be set to missing.
<b>RESTRAINED TIME</b>	
baby_c_restrained_bout	Restrained time in minutes per bout per day.  Duration is based on the mid-point of each response category for 'baby_close_3b' where 1 = 7.5, 2 = 22.5, 3 = 37.5, 4 = 52.5, 5 = 75, 6 = 105, or the maximum value for 7 = 120.
baby_c_restrained_total	Total restrained time in minutes per day.  Product of the frequency of restrained time 'baby_close_3a' and the duration of restrained time 'baby_c_restrained_bout'.
baby_c_restrained_total_360	Total restrained time. Extreme values (> 360 minutes) truncated to 360 minutes per day. If total restrained time is <= 360 minutes this variable will equal 'baby_c_restrained'
baby_c_restrained_guide	Adherence with restrained time guideline of not more than 1 hour at a time of restrained time (such as in a stroller, car seat or highchair). 1 = Yes, 0 = No.

<b>SCREEN TIME</b>	
baby_c_swatch	Passive screen time in minutes per day. Duration is based on the minimum possible value where 0 = 0, or the mid-point of each response category for 'baby_close_4' where 1 = 7.5, 2 = 22.5, 3 = 45, 4 = 75, 5 = 105, or the maximum value for 6 = 120.
baby_c_pwatch	Interactive screen time in minutes per day. Duration is based on the minimum possible value where 0 = 0, or the mid-point of each response category for 'baby_close_5' where 1 = 7.5, 2 = 22.5, 3 = 45, 4 = 75, 5 = 105, or the maximum value for 6 = 120.
baby_c_totalscreen	Total screen time in minutes per day; the sum of 'baby_c_swatch' and 'baby_c_pwatch'.
baby_c_screen_guide	Adherence with screen time guideline of no screen time for babies/children under 2 years. 1 = Yes, 0 = No.
<b>SLEEP</b>	
baby_c_sleep_night	Total night sleep in minutes per day. Duration is based on the minimum possible value where 1 = 300, or the mid-point of each response category for 'baby_close_6' where 2 = 420, 3 = 540, 4 = 660, 5 = 780, or the maximum value for 6 = 840.
baby_c_sleep_day	Total day sleep in minutes per day. Duration is based on the minimum possible value where 1 = 30, or the mid-point of each response category for 'baby_close_7' where 2 = 90, 3 = 150, 4 = 210, or the maximum value for 5 = 240.
baby_c_sleep_total	Total sleep in minutes per day; the sum of 'baby_c_sleep_night' and 'baby_c_sleep_day'.
baby_c_sleep_guide	Adherence with guideline for sleep between 14 and 17 hours per day for babies until 3 months, between 12 and 16 hours per day for babies aged 4 to 11 months, or between 11 and 14 hours per day for babies/children aged 12 months or older. 1 = Yes, 0 = No.
<b>Adherence with 24-hour movements guidelines</b>	
baby_c_24guide	Adherence with the 24-hour movement guidelines. 1 = Yes, 0 = No.  <b>For babies who are yet to roll:</b> This condition would be true (1) if the baby met all 3 recommendations for tummy time, screen time, and sleep (based on age): 1. baby_c_tummytime_guide = '1' AND 2. baby_c_screen_guide = '1' AND 3. baby_c_sleep_guide = '1'  <b>For babies who can roll:</b> This condition would be true (1) if the baby met all 3 recommendations for active play, screen time, and sleep (based on age): 1. baby_c_act_guide = '1' AND 2. baby_c_screen_guide = '1' AND 3. baby_c_sleep_guide = '1'

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### 3. MBQ-C (open version)

#### 3.1. Calculation of outcome variables – variable names and description.

Scoring variable	Description
<b>PHYSICAL ACTIVITY</b>	
child_o_totalact_wd	Weekday total physical activity in minutes per day.
child_o_totalact_wd_480	Weekday total physical activity. Extreme values (> 480 minutes) truncated to 480 minutes per day. If weekday total physical activity <= 480 minutes, then this variable will equal 'child_o_totalact_wd'.
child_o_mvpa_wd	Weekday energetic play in minutes per day.
child_o_mvpa_wd_360	Weekday energetic play. Extreme values (> 360 minutes) truncated to 360 minutes per day. If weekday energetic play <= 360 minutes, then this variable will equal 'child_o_mvpa_wd'.
child_o_totalact_we	Weekend day total physical activity in minutes per day.
child_o_totalact_we_480	Weekend day total physical activity. Extreme values (> 480 minutes) truncated to 480 minutes per day. If weekend day total physical activity <= 480 minutes, then this variable will equal 'child_o_totalact_we'.
child_o_mvpa_we	Weekend day energetic play in minutes per day.
child_o_mvpa_we_360	Weekend day energetic play. Extreme values (> 360 minutes) truncated to 360 minutes per day. If weekend day MVPA <= 360 minutes, then this variable will equal 'child_o_mvpa_we'.
child_o_totalact_ave	Weighted average of total physical activity in minutes per day.
child_o_mvpa_ave	Weighted average of energetic play in minutes per day.
child_o_act_guide	Adherence with physical activity guideline for children of at least 3 hours of total physical activity per day, including 1 hour of energetic play. 1 = Yes, 0 = No.
<b>SCREEN TIME</b>	
child_o_swatc_h_wd	Weekday passive screen time in minutes per day.
child_o_swatc_act_wd	Weekday passive screen time while standing in minutes per day.
child_o_swatc_h_we	Weekend day passive screen time in minutes per day.
child_o_swatc_act_we	Weekend day passive screen time while standing in minutes per day.
child_o_swatc_sed_wd	Weekday SEDENTARY passive screen time in minutes per day; subtraction of 'child_o_swatc_h_wd' – 'child_o_swatc_act_wd'
child_o_swatc_sed_wd_adj	If weekday passive screen time while standing exceeds total passive screen time, 'child_o_swatc_h_wd' will be used to calculate the weighted average for SEDENTARY passive screen time ('child_o_swatc_sed_ave'). If passive screen time while standing is less than total passive screen time, then this variable will equal 'child_o_swatc_sed_wd'.

child_o_swatc_h_sed_we	Weekend day SEDENTARY passive screen time in minutes per day; subtraction of 'child_o_swatc_h_we' – 'child_o_swatc_h_act_we'
child_o_swatc_h_sed_we_adj	If weekend day passive screen time while standing exceeds total passive screen time, 'child_o_swatc_h_we' will be used to calculate the weighted average for SEDENTARY passive screen time ('child_o_swatc_h_sed_ave'). If passive screen time while standing is less than total passive screen time, then this variable will equal 'child_o_swatc_h_sed_we'
child_o_swatc_h_ave	Weighted average of passive screen time.
child_o_swatc_h_sed_ave	Weighted average of SEDENTARY passive screen time.
child_o_pwatch_wd	Weekday interactive screen time in minutes per day.
child_o_pwatch_act_wd	Weekday interactive screen time while standing in minutes per day.
child_o_pwatch_we	Weekend day interactive screen time in minutes per day.
child_o_pwatch_act_we	Weekend day interactive screen time while standing in minutes per day.
child_o_pwatch_sed_wd	Weekday SEDENTARY interactive screen time s in minutes per day; subtraction of 'child_o_pwatch_wd' – 'child_o_pwatch_act_wd'
child_o_pwatch_sed_wd_adj	If weekday interactive screen time while standing exceeds total interactive screen time, 'child_o_pwatch_wd' will be used to calculate the weighted average for SEDENTARY passive screen time ('child_o_pwatch_sed_ave'). If interactive screen time while standing is less than total interactive screen time, then this variable will equal 'child_o_pwatch_sed_wd'
child_o_pwatch_sed_we	Weekend day SEDENTARY interactive screen time in minutes per day; subtraction of 'child_o_pwatch_we' – 'child_o_pwatch_act_we'
child_o_pwatch_sed_we_adj	If weekend day interactive screen time while standing exceeds total interactive screen time, 'child_o_pwatch_we' will be used to calculate the weighted average for SEDENTARY passive screen time ('child_o_pwatch_sed_ave'). If interactive screen time while standing is less than total interactive screen time, then this variable will equal 'child_o_pwatch_sed_we'
child_o_pwatch_ave	Weighted average of interactive screen time.
child_o_pwatch_sed_ave	Weighted average of SEDENTARY interactive screen time.
child_o_total_sum_screen	Total screen time; the sum of weighted averages for passive and interactive screen time ('child_o_swatc_h_ave' and 'child_o_pwatch_ave').
child_o_total_sed_screen	Total SEDENTARY screen time; the sum of weighted averages for SEDENTARY passive and interactive screen time ('child_o_swatc_h_sed_ave' and 'child_o_pwatch_sed_ave')
child_o_screen_guide	Adherence with screen time guideline of no screen time for children under 2 years or no more than 1 hour per day of sedentary screen time for children aged 2 to 5 years. 1 = Yes, 0 = No.

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<b>SLEEP</b>	
child_o_sleep_night	Time spent in night sleep in minutes per day.
child_o_sleep_day	Time spent in day sleep in minutes per day.
child_o_sleep_total	Total sleep in minutes per day; the sum of 'child_o_sleep_night' and 'child_o_sleep_day'.
child_o_sleep_guide	Adherence with guideline for sleep of at least 11 hours per day for children aged less than 3 years or at least 10 hours per day for children aged 3 years or older. 1 = Yes, 0 = No.
<b>Adherence with 24-hour movements guidelines</b>	
child_o_24guide	<p>Adherence with the 24-hour movement guidelines. 1 = Yes, 0 = No.</p> <p>This condition would be true (1) if the child met all 3 recommendations for physical activity, screen time (based on age), and sleep (based on age):</p> <ol style="list-style-type: none"> <li>1. 'child_o_act_guide' = '1' AND</li> <li>2. 'child_o_screen_guide' = '1' AND</li> <li>3. 'child_o_sleep_guide' = '1'</li> </ol>

## 4. MBQ-C (closed version)

### 4.1. Calculation of outcome variables – variable names and description.

Variable name	Description
<b>PHYSICAL ACTIVITY</b>	
child_c_totalact_wd	Weekday total physical activity in minutes per day. Duration is based on the minimum possible value where 0 = 0, or the mid-point of each response category for 'child_close_1a' where 1 = 15, 2 = 45, 3 = 90, 4 = 150, 5 = 210, or the maximum value for 6 = 240.
child_c_mvpa_wd	Weekday energetic play in minutes per day. Duration is based on the minimum possible value where 0 = 0, or the mid-point of each response category for 'child_close_1b' where 1 = 7.5, 2 = 22.5, 3 = 45, 4 = 75, 5 = 105, or the maximum value for 6 = 120. NOTE. If 'child_close_1b' is missing because of skip logic applied to 'child_close_1a', a value of 0 is assigned.
child_c_totalact_we	Weekend day total physical activity in minutes per day. Duration is based on the minimum possible value where 0 = 0, or the mid-point of each response category for 'child_close_2a' where 1 = 15, 2 = 45, 3 = 90, 4 = 150, 5 = 210, or the maximum value for 6 = 240.
child_c_mvpa_we	Weekend day energetic play in minutes per day. Duration is based on the minimum possible value where 0 = 0, or the mid-point of each response category for 'child_close_2b' where 1 = 7.5, 2 = 22.5, 3 = 45, 4 = 75, 5 = 105, or the maximum value for 6 = 120. NOTE. If 'child_close_2b' is missing because of skip logic applied to 'child_close_2a', a value of 0 is assigned.
child_c_totalact_ave	Weighted average of total physical activity in minutes per day.
child_c_mvpa_ave	Weighted average of energetic play in minutes per day.
child_c_act_guide	Adherence with physical activity guideline for children of at least 3 hours of total physical activity per day, including 1 hour of energetic play. 1 = Yes, 0 = No.
<b>SCREEN TIME</b>	
child_c_swatc_h_wd	Weekday passive screen time in minutes per day. Duration is based on the minimum possible value where 0 = 0, or the mid-point of each response category for 'child_close_3a' where 1 = 7.5, 2 = 22.5, 3 = 45, 4 = 75, 5 = 105, 6 = 150, or the maximum value for 7 = 240.

child_c_swatch_act_wd	<p>Weekday passive screen time while standing in minutes per day.</p> <p>Duration is based on the minimum possible value where 0 = 0, or the mid-point of each response category for 'child_close_3b' where 1 = 7.5, 2 = 22.5, 3 = 45, 4 = 75, 5 = 105, 6 = 150, or the maximum value for 7 = 240.</p> <p>NOTE. If 'child_close_3b' is missing because of skip logic applied to 'child_close_3a', a value of 0 is assigned.</p>
child_c_swatch_we	<p>Weekend day passive screen time in minutes per day.</p> <p>Duration is based on the minimum possible value where 0 = 0, or the mid-point of each response category for 'child_close_4a' where 1 = 7.5, 2 = 22.5, 3 = 45, 4 = 75, 5 = 105, 6 = 150, or the maximum value for 7 = 240.</p>
child_c_swatch_act_we	<p>Weekend day passive screen time while standing in minutes per day.</p> <p>Duration is based on the minimum possible value where 0 = 0, or the mid-point of each response category for 'child_close_4b' where 1 = 7.5, 2 = 22.5, 3 = 45, 4 = 75, 5 = 105, 6 = 150, or the maximum value for 7 = 240.</p> <p>NOTE. If 'child_close_4b' is missing because of skip logic applied to 'child_close_4a', a value of 0 is assigned.</p>
child_c_swatch_sed_wd	Weekday SEDENTARY passive screen time in minutes per day; subtraction of 'child_c_swatch_wd' – 'child_c_swatch_act_wd'
child_c_swatch_sed_we	Weekend day SEDENTARY passive screen time in minutes per day; subtraction of 'child_o_swatch_we' – 'child_o_swatch_act_we'
child_c_swatch_ave	Weighted average of passive screen time.
child_c_swatch_sed_ave	Weighted average of SEDENTARY passive screen time.
child_c_pwatch_wd	<p>Weekday interactive screen time in minutes per day.</p> <p>Duration is based on the minimum possible value where 0 = 0, or the mid-point of each response category for 'child_close_5a' where 1 = 7.5, 2 = 22.5, 3 = 45, 4 = 75, 5 = 105, 6 = 150, or the maximum value for 7 = 240.</p>
child_c_pwatch_act_wd	<p>Weekday interactive screen time while standing in minutes per day.</p> <p>Duration is based on the minimum possible value where 0 = 0, or the mid-point of each response category for 'child_close_5b' where 1 = 7.5, 2 = 22.5, 3 = 45, 4 = 75, 5 = 105, 6 = 150, or the maximum value for 7 = 240.</p> <p>NOTE. If 'child_close_5b' is missing because of skip logic applied to 'child_close_5a', a value of 0 is assigned.</p>
child_c_pwatch_we	<p>Weekend day interactive screen time in minutes per day.</p> <p>Duration is based on the minimum possible value where 0 = 0, or the mid-point of each response category for 'child_close_6a' where</p>

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	1 = 7.5, 2 = 22.5, 3 = 45, 4 = 75, 5 = 105, 6 = 150, or the maximum value for 7 = 240.
child_c_pwatch_act_we	Weekend day interactive screen time while standing in minutes per day.  Duration is based on the minimum possible value where 0 = 0, or the mid-point of each response category for 'child_close_6b' where 1 = 7.5, 2 = 22.5, 3 = 45, 4 = 75, 5 = 105, 6 = 150, or the maximum value for 7 = 240.  NOTE. If 'child_close_6b' is missing because of skip logic applied to 'child_close_6a', a value of 0 is assigned.
child_c_pwatch_sed_wd	Weekday SEDENTARY interactive screen time in minutes per day; subtraction of 'child_c_pwatch_wd' – 'child_c_pwatch_act_wd'
child_c_pwatch_sed_we	Weekend day SEDENTARY interactive screen time in minutes per day; subtraction of 'child_c_pwatch_we' – 'child_c_pwatch_act_we'
child_c_pwatch_ave	Weighted average of interactive screen time.
child_c_pwatch_sed_ave	Weighted average of SEDENTARY interactive screen time.
child_c_total_sum_screen	Total screen time; the sum of weighted averages for passive and interactive screen time ('child_c_swatsh_ave' and 'child_c_pwatch_ave').
child_c_total_sed_screen	Total SEDENTARY screen time; the sum of weighted averages for SEDENTARY passive and interactive screen time ('child_c_swatsh_sed_ave' and 'child_c_pwatch_sed_ave').
child_c_screen_guide	Adherence with screen time guideline of no screen time for children under 2 years or no more than 1 hour per day of sedentary screen time for children aged 2 to 5 years. 1 = Yes, 0 = No.
<b>SLEEP</b>	
child_c_sleep_night	Total night sleep in minutes per day.  Duration is based on the minimum possible value where 1 = 360, or the mid-point of each response category for 'child_close_7' where 2 = 420, 3 = 540, 4 = 660, 5 = 780, or the maximum value for 6 = 840.
child_c_sleep_day	Total day sleep in minutes per day.  Duration is based on the minimum possible value where 0 = 0, or the mid-point of each response category for 'child_close_8' where 1 = 30, 2 = 90, 3 = 150, 4 = 210, or the maximum value for 5 = 240.
child_c_sleep_total	Total sleep in minutes per day; the sum of 'child_c_sleep_night' and 'child_c_sleep_day'.
child_c_sleep_guide	Adherence with guideline for sleep of at least 11 hours per day for children aged less than 3 years or at least 10 hours per day for children aged 3 years or older. 1 = Yes, 0 = No.

**Adherence with 24-hour movements guidelines**

child\_c\_24guide

Adherence with the 24-hour movement guidelines. 1 = Yes, 0 = No.

This condition would be true (1) if the child met all 3 recommendations for physical activity, screen time (based on age), and sleep (based on age):

1. 'child\_c\_act\_guide' = '1' AND
2. 'child\_c\_screen\_guide' = '1' AND
3. 'child\_c\_sleep\_guide' = '1'

## 5. MBQ Index

The MBQ Index (MBQI) is calculated from responses to the closed version of the MBQ-B and MBQ-C. Scores on the MBQI reflect a child’s overall compliance with public health recommendations for physical activity, screen time, and sleep. Scores are calculated for each health behaviour and a summary score is calculated by averaging scores in each domain. Scores can range from 0 to 100, with scores from 0 – 24 considered “well below recommended levels”, 25 – 49 “below recommended levels, 50 – 74 “working towards recommended levels” and, 75 – 100 “meeting or exceeding recommended levels”. Apart from screen time (where zero screen time receives a score of 100), a score of 75 reflects meeting the minimum level stated in the recommendation.

Clinicians and allied health professionals working in health care settings may use the MBQI as a tool for monitoring obesity-related behaviours and providing personalised feedback and/or counselling to improve children’s physical activity, screen time, and sleep behaviours. The MBQI may also be used for behaviour change interventions involving goal setting, monitoring, and reinforcement. Public health agencies may find the MBQI a useful tool for increasing awareness about children’s movement behaviours and social market campaigns targeting healthy lifestyle behaviours and early prevention of childhood obesity.

### 5.1. MBQ-B: Calculation of MBQ Index variables – variable names and description.

Variable name	Description
<b>TUMMY TIME AND ACTIVE PLAY</b>	
baby_tummytime_index	MBQ Index for tummy time. If ‘baby_c_tummytime’ > 40 Then ‘baby_tummytime_index’ = 100 Else ‘baby_tummytime_index’ = (‘baby_c_tummytime’ / 40) * 100
baby_totalact_index	MBQ Index for active play. If ‘baby_c_totalact’ > 40 Then ‘baby_totalact_index’ = 100 Else ‘baby_totalact_index’ = (‘baby_c_totalact’ / 40) * 100
<b>RESTRAINED TIME</b>	
baby_restrained_index	MBQ Index for restrained time. If baby_close_3b = . Then ‘baby_restrained_index’ = . Else if baby_close_3b = 1 then ‘baby_restrained_index’ = 100 Else if baby_close_3b = 2 then ‘baby_restrained_index’ = 95 Else if baby_close_3b = 3 then ‘baby_restrained_index’ = 85 Else if baby_close_3b = 4 then ‘baby_restrained_index’ = 75 Else if baby_close_3b = 5 then ‘baby_restrained_index’ = 50 Else if baby_close_3b = 6 then ‘baby_restrained_index’ = 25 Else if baby_close_3b = 7 then ‘baby_restrained_index’ = 0

<b>SCREEN TIME</b>	
baby_swatch_index	<p>MBQ Index for passive screen time.</p> <p>If baby_close_4 = . Then 'baby_swatch_index' = .  Else if baby_close_4 = 0 then 'baby_swatch_index' = 100  Else if baby_close_4 = 1 then 'baby_swatch_index' = 75  Else if baby_close_4 = 2 then 'baby_swatch_index' = 50  Else if baby_close_4 = 3 then 'baby_swatch_index' = 25  Else if baby_close_4 = 4 then 'baby_swatch_index' = 10  Else if baby_close_4 = 5 then 'baby_swatch_index' = 5  Else if baby_close_4 = 6 then 'baby_swatch_index' = 0</p>
baby_pwatch_index	<p>MBQ Index for interactive screen time.</p> <p>If baby_close_5 = . Then 'baby_pwatch_index' = .  Else if baby_close_5 = 0 then 'baby_pwatch_index' = 100  Else if baby_close_5 = 1 then 'baby_pwatch_index' = 75  Else if baby_close_5 = 2 then 'baby_pwatch_index' = 50  Else if baby_close_5 = 3 then 'baby_pwatch_index' = 25  Else if baby_close_5 = 4 then 'baby_pwatch_index' = 10  Else if baby_close_5 = 5 then 'baby_pwatch_index' = 5  Else if baby_close_5 = 6 then 'baby_pwatch_index' = 0</p>
<b>SLEEP</b>	
baby_sleep_index_raw	<p>Total sleep – MBQ Index raw score.</p> <p><b>For babies until 3 months.</b>  'baby_sleep_index_raw' = (('baby_c_sleep_total' – 300)/ 720) *100  (Index = 100 when Total Sleep is 17 hours or more)</p> <p><b>For babies aged 4 to 11 months.</b>  'baby_sleep_index_raw' = (('baby_c_sleep_total' – 300)/ 560) *100  (Index = 100 when Total Sleep is 14.3 hours or more)</p> <p><b>For babies aged 12 months or older.</b>  'baby_sleep_index_raw' = (('baby_c_sleep_total' – 300)/ 480) *100  (Index = 100 when Sleep is 13 hours or more)</p>
baby_sleep_index	<p>MBQ Index for total sleep.</p> <p>If 'baby_sleep_index_raw' &gt; 100 then 'baby_sleep_index' = 100  Else 'baby_sleep_index_raw' &lt;= 100, 'baby_sleep_index' will equal 'baby_sleep_index_raw'.</p>

<b>MBQ INDEX – SUMMARY SCORE</b>	
baby_index_summary	<p>MBQ Index summary score is based on the average of index scores for each behaviour.</p> <p><b>For babies who are yet to roll:</b></p> <p>Mean ('baby_tummytime_index', 'baby_restrained_index', 'baby_swatch_index', 'baby_pwatch_index', 'baby_sleep_index')</p> <p><b>For babies who can roll:</b></p> <p>Mean ('baby_totalact_index', 'baby_restrained_index', 'baby_swatch_index', 'baby_pwatch_index', 'baby_sleep_index')</p>

## 5.2. MBQ-C: Calculation of MBQ Index variables – variable names and description.

Variable name	Description
<b>PHYSICAL ACTIVITY</b>	
child_totalact_index	<p>MBQ Index for physical activity.</p> <p>'child_totalact_index' = (( 'child_c_totalact_ave' / 240) * 100</p>
child_mvpa_index	<p>MBQ Index for energetic play.</p> <p>If 'child_c_mvpa_ave' &gt; 80 Then 'child_mvpa_index' = 100 Else 'child_mvpa_index' = ('child_c_mvpa_ave' / 80) * 100</p>
<b>SCREEN TIME</b>	
child_swatch_index	<p>MBQ Index for passive screen time.</p> <p>'child_swatch_index' = (1 - ('child_c_swatch_ave' / 240)) * 100</p>
child_swatch_sed_index	<p>MBQ Index for SEDENTARY passive screen time.</p> <p>'child_swatch_sed_index' = (1 - ('child_c_swatch_sed_ave' / 240)) * 100</p>
child_pwatch_index	<p>MBQ Index for interactive screen time.</p> <p>'child_pwatch_index' = (1 - ('child_c_pwatch_ave' / 240)) * 100</p>
child_pwatch_sed_index	<p>MBQ Index for SEDENTARY interactive screen time.</p> <p>'child_pwatch_sed_index' = (1 - ('child_c_pwatch_sed_ave' / 240)) * 100</p>
<b>SLEEP</b>	
child_sleep_index_raw	<p>Total sleep – MBQ Index raw score.</p> <p><b>For children younger than 3 years.</b></p> <p>'child_sleep_index_raw' = (( 'child_c_sleep_total' - 300) / 480) * 100</p> <p>(Index = 100 when Total Sleep is 13 hours or more; 75 when Total Sleep is 11 or more)</p>

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	<p><b>For children 3 years or older.</b></p> <p>'child_sleep_index_raw' = (( 'child_c_sleep_total' - 240) / 480) *100</p> <p>(Index = 100 when Total Sleep is 12 hours or more; 75 when Total Sleep is 10 hours or more)</p>
child_sleep_index	<p>MBQ Index for total sleep.</p> <p>If 'child_sleep_index_raw' &gt; 100 then 'child_sleep_index' = 100</p> <p>Else 'child_sleep_index_raw' &lt;= 100, 'child_sleep_index' will equal 'child_sleep_index_raw'.</p>
child_sleep_routine_index	<p>MBQ Index for sleep routine.</p> <p>'child_c_sleep_routine_index' = ('child_close_9' /4) * 100</p>
<b>MBQ INDEX – SUMMARY SCORE</b>	
child_index_summary	<p>MBQ Index summary score is based on the average of index scores for each behaviour.</p> <p>Mean ('child_totalact_index', 'child_mvpa_index', 'child_swatch_index', 'child_swatch_sed_index', 'child_pwatch_index', 'child_pwatch_sed_index', 'child_sleep_index', 'child_sleep_routine_index')</p>