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Factors Affecting the Sleep of One-Year-Olds: A Pilot Study using Objective Monitoring of New Zealand Infants

A thesis presented in partial fulfilment of the requirements for the degree of

Master of Science in Psychology

at Massey University, Wellington, New Zealand.

Rosemary H. Gibson
2009
Abstract

Sleep takes time to mature and in infancy the structure and cycle of sleep differs greatly to that of adults. Data concerning normative sleep of infants is lacking due to few studies using objective measures. Factors affecting infants’ sleep are both intrinsic and extrinsic in nature. The causes of problematic sleep are not well understood. This study aimed to pilot a methodology involving 1 week of actigraphy monitoring of 1-year-olds, as well as collecting normative data concerning sleep and sleep ecology through questionnaires and diaries. Potential factors contributing to sleep quantity, quality and maturation were investigated. Sleeping problems were reported in 35% of the sample of 52 Wellington infants. Current breastfeeding, time awake at night, and poor evening mood were all associated with problem sleep. Short sleep duration and more instances of being put to bed were also significant predictors of reporting problem sleep. Infants were typically rated in a poorer mood and exhibited more bedtime problems at the weekend. Longer sleep onset latencies and poorer sleep efficiency were identified by actigraphy on weekend evenings. The timing of sleep did not differ between genders or between week days and weekends, or childcare and non-childcare days. Mixed model analysis of variance indicated that the maturation and quality of sleep were significantly correlated with age and stages of cognitive and motor development. Sleep duration did not correlate with ponderal index, possibly due to the young age group as well as underrepresentation of short sleeping or overweight infants. Results support previous studies in western societies and autonomous sleeping is common. Potential mechanisms behind relationships between sleep and feeding, temperament and development are
discussed. Strengths and limitations of methods and procedures are assessed. Actigraphic recording of 1-year-olds is demonstrated to be a useful and reliable tool for studying sleep of infants and the results contribute to normative data. Future studies in NZ should consider recruiting a more representative sample and incorporate a longitudinal design to further assess the relationships highlighted here and in previous research.

(331 words)
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Table of Contents

Abstract ............................................................................................................. i
Aknowledgements ........................................................................................... iii
Table of contents ............................................................................................. v
List of Tables .................................................................................................... ix
List of Figures .................................................................................................. xiii
List of Terms and Abbreviations ....................................................................... xvi

1. Introduction .................................................................................................. 1

1.1 Overview: Why is the Sleep of Infants Important? ..................................... 1

1.2 The Maturation of Sleep ........................................................................... 2
1.2.1 The Development of the Sleep/Wake Cycle: A Two Process Model ....... 2
1.2.2 Development of Sleep Stages and Architecture ...................................... 6

1.3 Measuring Infants Sleep ......................................................................... 11
1.3.1 Objective Measures ............................................................................... 11
1.3.2 Subjective Measures of Sleep ............................................................... 16

1.4 What is ‘Normal’ Sleep in Infants? ............................................................ 18

1.5 Sleep Problems in Infancy ...................................................................... 23
1.5.1 Problems of Sleep Onset and Maintenance ........................................... 25
1.5.2 Healthcare Gaps in Identifying Sleep Problems in Infancy .................... 27

1.6 Predictors and Impact of Sleep Problems in Infancy and Childhood .......... 27
1.6.2 The Distal Extrinsic Context: Culture, Environment and Family ......... 29
1.6.3 Proximal Extrinsic Context: Parental Factors ...................................... 36
1.6.4 Intrinsic Context: Individual Differences between Infants and Across Time ................................................................. 38
1.6.5 Mediating Context: Parent-Infant Interactions and Relationships ....... 43
1.6.6 Conclusions from the Transactional System Model ............................. 45

1.7 Sleep as a Risk Factor for Weight Gain ................................................... 46
1.7.1 Rise in the Prevalence of Obesity ......................................................... 46
1.7.2 Weight and Sleep Duration in Children ................................................. 46
1.7.3 Mechanisms Behind the Sleep/Weight Relationship ............................ 49
1.7.4 Conclusions Concerning Sleep and Weight .......................................... 52

1.8 Aims of this Thesis .................................................................................. 53
2. Methods ..................................................................................................... 55

2.1 Measures ................................................................................................... 55
  2.1.1 Questionnaire ....................................................................................... 55
  2.1.2 The Ages and Stages Questionnaire (ASQ) ........................................ 58
  2.1.3 Actigraphy .......................................................................................... 61
  2.1.4 Sleep Diaries ....................................................................................... 63
  2.1.5 Feedback Questionnaire ...................................................................... 67

2.2 Ethics ......................................................................................................... 68
  2.2.1 Recruitment of Participants ................................................................. 68

2.3 Procedure ................................................................................................ 69
  2.3.1 Use of the Actigraph .......................................................................... 69
  2.3.2 Use of the Daily Diary ....................................................................... 72
  2.3.3 Use of the Questionnaires and Measurements of Body Size .......... 73
  2.3.4 Completion of the Home Visit ............................................................ 73

2.4 Data Analysis .......................................................................................... 74
  2.4.1 Analysis of Parental Reports ............................................................... 74
  2.4.2 Analysis of Diaries ............................................................................ 77
  2.4.3 Analysis of the Ages and Stages Questionnaire .............................. 78
  2.4.4 Analysis of Actigraphy Data ............................................................... 78
  2.4.5 Defining Actigraphy Variables ........................................................... 83
  2.4.6 Statistical Analysis of Actigraphy Data ............................................. 87
  2.4.7 Mixed ANCOVAs of Actigraphy Variables .................................... 89
  2.4.8 Analysis of Parental Feedback ............................................................ 94

3. Results ......................................................................................................... 95

3.1 Description of the Sample Based on Questionnaire Data ................. 95
  3.1.1 Sample Characteristics ..................................................................... 95
  3.1.2 Body Habitus .................................................................................... 96
  3.1.3 Infants Sleep .................................................................................... 101
  3.1.4 Problem Sleep ................................................................................ 105

3.2 Description of the Sample Based on Sleep Diary Data .................. 108
  3.2.1 Diary Data of Parentally-Defined Problem Sleepers ....................... 110
  3.2.2 Diary Data Over Weekends and Childcare Days ............................ 111

3.3 Developmental Progress ....................................................................... 113

3.4 Description of the Sample Based on Actigraphy Data .................... 115
  3.4.2 Sleep Propensity .............................................................................. 122
  3.4.3 Sleep and Body Habitus ................................................................. 124
3.4.4 Actigraphy of Parentally-Defined Problem Sleepers versus Non-ProBLEM Sleepers ................................................. 127
3.4.5 Actigraphic Sleep Measures and Diary Ratings .................. 129
3.4.6 Actigraphic Sleep Measures and Developmental Progress ...... 136
3.5 Mixed ANCOVAs for Actigraphy Variables ............................. 138
3.6 Parental Feedback on Study Procedures ................................ 143
3.6.1 Comments ....................................................................... 144

4. Discussion .......................................................................................... 146

4.1 The Sample of Infants and the Ecology of Sleep: Recruitment and Parental Reports .................................................. 147
4.1.1 Limitations of Recruitment .................................................... 147
4.1.2 Sleep Ecology ............................................................... 149

4.2 How are NZ Infants Sleeping? ......................................................... 151
4.2.1 Objective versus Subjective Data ......................................... 151
4.2.2 Sleeping like a (Normal) Infant? .......................................... 152

4.3 Problem Sleep .................................................................................. 154
4.3.1 Defining Problem Sleep ....................................................... 154
4.3.2 Factors Associated with Parentally-Defined Problem Sleepers .. 156

4.4 Relationships between Sleep, Mood and Temperament, and Day of the Week ............................................................. 160
4.4.1 Sleep, Mood and Temperament ............................................. 160
4.4.2 Sleep and Mood Changes across the Week ............................ 162
4.4.3 Sleep and Mood Changes with Childcare .............................. 163

4.5 Sleep, Age and Developmental progress ....................................... 164
4.5.1 Stage of Development and the Maturation of Sleep ................... 164
4.5.2 Maturation of Sleep and Age ............................................... 167

4.6 Sleep and Body Habitus ................................................................. 168

4.7 Piloting a Method: Strengths and Limitations ................................. 170
4.7.1 Using Actigraphy to Measure the Sleep of One-Year-Olds ...... 170
4.7.2 Using Sleep Diaries to Measure the Sleep of One-Year-Olds .... 173
4.7.3 Limitations of the Questionnaires .......................................... 176

4.8 Conclusions ..................................................................................... 178
<table>
<thead>
<tr>
<th>Appendix A</th>
<th>Tools used in Data Collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 Sleep Questionnaire</td>
<td>198</td>
</tr>
<tr>
<td>A2 Ages and Stages Questionnaire</td>
<td>205</td>
</tr>
<tr>
<td>A3 Sleep Diary</td>
<td>211</td>
</tr>
<tr>
<td>A4 Feedback Questionnaire</td>
<td>213</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Appendix B</th>
<th>Ethics, Advertisements, and Information Pack</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1 Letter of Ethical Approval</td>
<td>216</td>
</tr>
<tr>
<td>B2 Information Pack for Parents</td>
<td>217</td>
</tr>
<tr>
<td>B3 Advertisements</td>
<td>222</td>
</tr>
<tr>
<td>B4 Actigraph and Sleep Diary Protocol for Parents</td>
<td>224</td>
</tr>
<tr>
<td>B5 Example of a Feedback Letter and Actigraph Output</td>
<td>226</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Appendix C</th>
<th>Analysis and Additional Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 Tests of Normality</td>
<td>229</td>
</tr>
<tr>
<td>C2 Protocol for Manual Scoring of Actigraphy Data</td>
<td>231</td>
</tr>
<tr>
<td>C3 Additional Figures and Tables of Results</td>
<td>232</td>
</tr>
</tbody>
</table>
List of Tables

Table 1.1  Sample Electroencephalographic Tracings Obtained from Adults during Wakefulness, NREM Stages (1-4) and REM sleep........ 8
Table 1.2  Normative Data Concerning the Sleep Quantity and Quality of Infants (Average and SD or range where available)............. 19
Table 2.1  Example for Calculating the Actiware® Definition for the 1 Minute Epoch of 19:00......................................................... 80
Table 2.2  Descriptions of the Variables Calculated from the Actigraphy Records and used for Statistical Analysis..................... 84
Table 2.3  Dependent and Independent Variables for the Mixed Model ANCOVAs Related to Developmental Progress.................. 92
Table 2.4  Dependent and Independent Variables for the Mixed Model ANCOVAs Related to Ponderal Index ([√weight/length]100).................. 93
Table 3.1  Descriptive Statistics for Body Habitus Results (Questionnaire Data).............................................................................. 97
Table 3.2  The Distribution of the Usual Place of Sleep (as Reported by Parents)............................................................................... 102
Table 3.3  Distribution of How Infants were Usually Settled to Sleep (as Reported by Parents)..................................................... 102
Table 3.4  Distribution of the Infants' Usual Sleeping Position (as Reported by Parents)................................................................. 102
Table 3.5  Descriptive Statistics for Sleep Timing Variables as Reported by Parents in the Sleep Questionnaire.............................. 102
Table 3.6  Variables from the Questionnaire by Normality of Distribution............................................................................... 104
Table 3.7  Descriptive Statistics of Parentally-Defined Snorers (n = 8) and Non-Snorers (n = 27).............................................................. 106
Table 3.8  Categories for Dichotomised Questionnaire Variables............. 107
Table 3.9  Comparisons of Parentally-Defined Problem Sleepers and Other Infants (Chi-Square Analysis)........................................ 107
Table 3.10 Comparison of Questionnaire Data for Sleep Timings (By Parental Report) Between Problem Sleepers (n = 18) and Non-Problem Sleepers (n = 38, Mann-Whitney Test)................................................ 109
Table 3.11 Frequency Distributions of Answers to Daily Diary Questions........................................................................ 109
Table 3.11 Categorisation of Daily Diary Ratings........................................... 110
Table 3.12 Comparisons of Daily Diary Ratings for Problem Sleepers (Parentally-Defined) And Non-Problem Sleepers (Chi-Square Analysis). ...................................................................................... 110
| Table 3.13 | Percentage of Study Days that were Weekends, or Infants were in Another Person’s Care (as Defined by the Sleep Diary). | 111 |
| Table 3.14 | Changes in Daily Diary Ratings between Days With and Without Childcare (McNemar Test, n = 34 \(^a\)). | 112 |
| Table 3.15 | Changes in Daily Diary Ratings between Week Days (Monday to Friday) and Weekend Days (Saturday and Sunday, McNemar Test, n = 52 \(^a\)). | 112 |
| Table 3.16 | Relationships between Age (Months) and ASQ Results (Linear Regression Analysis). | 113 |
| Table 3.17 | Developmental Scores on the Five Domains of the ASQ Comparing Boys (n = 33) and Girls (n = 19, Mann-Whitney Test). | 114 |
| Table 3.18 | Percentage of Infants Falling Below the Developmental Thresholds for Each ASQ Domain. | 114 |
| Table 3.19 | Actigraphy Variables. | 116 |
| Table 3.20 | Descriptive Statistics for Actigraphic Sleep Data. | 117 |
| Table 3.21 | Comparisons of Actigraphic Sleep Variables for High (n = 27) and Low (n = 25) Pondera Index Infants (Mann-Whitney Test). | 128 |
| Table 3.22 | Comparisons of Actigraphic Sleep Variables for Parentally-defined Problem Sleepers (n = 18) and Non-Problem Sleepers (n = 38, Mann-Whitney Test). | 128 |
| Table 3.23 | Comparisons of Actigraphic Sleep Variables for Infants Rated as Very vs. Somewhat Alert (as Rated Daily by Parents, Mann-Whitney Test). | 130 |
| Table 3.24 | Comparisons of Actigraphic Sleep Variables for Infants Rated as Good vs. Somewhat-Bad Mood in the Morning (as Rated Daily by Parents, Mann-Whitney Test). | 131 |
| Table 3.25 | Comparisons of Actigraphic Sleep Variables for Infants Rated as Very Tired vs. Somewhat-Not Tired at Bedtime (as Rated Daily by Parents, Mann-Whitney Test). | 132 |
| Table 3.26 | Comparisons of Actigraphy Data on Childcare (19.5% of Days) to Non-Childcare (80.5% of Days) Days (Wilcoxon Signed-Rank Tests). | 134 |
| Table 3.27 | Comparisons of Actigraphy Data on Weekends to Weekdays (Wilcoxon Signed-Rank Tests). | 135 |
| Table 3.28 | Relationships between Sleep Variables and Developmental Scores on the ASQ (Spearman’s Rank Correlation). | 136 |
| Table 3.29 | Comparing Actigraphic Sleep Measures between Infants Above and Below ASQ Thresholds. | 137 |
Table 3.30 Results from the Mixed Model ANCOVAs Examining Relationships Between Night Sleep Duration and Developmental Progress, Age, and Gender................................................................. 139

Table 3.31 Results from the Mixed Model ANCOVAs Examining Relationships Between Sleep Efficiency During the Night Time Sleep Interval, Developmental Stage, Age, and Gender................. 139

Table 3.32 Results from the Mixed Model ANCOVAs Examining Relationships Between Sleep Duration Per 24-hrs and Developmental stage, Age and Gender................................................. 140

Table 3.33 Results from the Mixed Model ANCOVAs Examining Relationships Between the Percentage of Sleep Occurring at Night and Developmental Stage, Age and Gender................. 142

Table 3.34 Results of the Mixed Model ANCOVAs for Sleep Variables and Ponderal Index ((\sqrt{weight/length})100)...................................................... 142

Table 3.35 Feedback on Recruitment: “How Did You Hear About This Study?”............................................................................................. 143

Table 3.36 Frequencies and Percentages of How Parents Found Data Collection................................................................................................. 143

C1 Kolmogorov-Smirnov Tests of Normality Results for Questionnaire Data................................................................. 229

C2 Kolmogorov-Smirnov test of Normality Results for Actigraphy Variables................................................................................................. 230

C3 A comparison of Ponderal Index Between Girls (n = 18) and Boys (n = 33,Mann-Whitney Test)................................................................. 233

C4 Distribution of Parentally-Defined Problem Sleepers by Gender (Chi-Square Analysis)................................................................. 233

C5 Relationship between being Tired at Bedtime and being Problematic at Bedtime (as Rated in the Daily Diaries, Chi-Square Analysis)................................................................................. 233

C6 Developmental Scores on the Five Domains of the Ages and Stages Questionnaire Comparing Babies Parentally Defined as Problem Sleepers (n = 18) and Non-Problem Sleepers (n = 38, Mann-Whitney Test)................................................................................................. 236

C7 Comparisons of Boys (n = 33) and Girls (n = 18) Actigraphic Sleep Results (Mann-Whitney Test)................................................................. 238

C8 Relationship between Age (Months) and Sleep Timing and Efficiency (Actigraphy data, Linear Regression Analysis).... 239

C9 Relationship between Ponderal Index of Babies and Actigraphic Sleep Variables (Linear Regression Analysis)................................. 239

C10 Comparisons of Actigraphic Sleep Variables for Infants Rated as High vs. Typical-Low levels of Activity (as Rated Daily by Parents, Mann-Whitney Test)................................................................. 240
Comparisons of Actigraphic Sleep Variables for Infants Rated as having no Bedtime Problems vs. Some to Many Bedtime Problems (as Rated Daily by Parents, Mann-Whitney Test). 241

Comparisons of Actigraphic Sleep Variables for Infants Rated as being in a Good Mood at Bedtime vs. a Moderate to Bad Mood at Bedtime (as Rated Daily by Parents, Mann-Whitney Test). ................................................................. 242
List of Figures

**Figure 1.1.** The circadian wake drive (process C) and the homeostatic sleep drive (process S) working together to produce the sleep/wake cycle of an adult (sleep indicated by the black bars, Fagioli, et al., 2002, p. 109). ................................................................. 5

**Figure 1.2.** The two process model of the sleep/wake cycle in infancy (sleep is indicated by the black bars. The faster decrease of process S (sleep pressure) during sleep allows wake-ups to occur even when the alerting signal (process C) is low at night. Conversely, the more rapid build-up of sleep pressure allows sleep onset to occur even when the alerting signal is high during the day (Fagioli, et al., 2002, p. 109). ................................................................. 5

**Figure 1.3.** The percentage of infants sleeping throughout the 24-hour day: the development of the sleep/wake cycle from newborn to 1 year of age (Sadeh, 2001, p. 21). ................................................................. 6

**Figure 1.4.** Diagram of the adult NREM/REM cycle across the night (Gander, 2003, p. 44). ................................................................. 8

**Figure 1.5.** The slow, irregular frequency of quiet sleep in a newborn infant (M. S. Scher, 2006, p. 495). ................................................................. 10

**Figure 1.6.** The mixed frequency of active sleep in a newborn infant (M. S. Scher, 2006, p. 495). ................................................................. 10

**Figure 1.7.** Infant sleep from a transactional perspective: Intrinsic and extrinsic factors affecting infant sleep (Sadeh & Anders, 1993, p. 20). ................................................................. 28

**Figure 1.8.** The potential mechanisms through which short sleep could cause obesity (Taheri, 2006, p. 883). ................................................................. 50

**Figure 2.1.** The *Mini Mitter Actiwatch-64™* (source- www.cpapaustralia.com.au). ................................................................. 62

**Figure 2.2.** Specialist band with bumble bee motif ................................................................. 64

**Figure 2.3.** Participating infant with actigraph and band in place ................................................................. 64

**Figure 2.4.** An example of 1 week of actigraphy recording from a participating infant. ................................................................. 79

**Figure 2.5.** Actiware® 5 algorithm for calculating the sum of activity counts for a 1 minute sampling epoch in order to score as sleep or wake. ................................................................. 79

**Figure 2.6.** A screenshot of 24 hours of infant actigraphy indicating the variables of interest and their relationships to one another. ................................................................. 85

**Figure 3.1.** Frequency distribution of weeks of gestation of infants (n = 49). ................................................................. 97

**Figure 3.2.** Frequency distribution of infants’ weight at birth (n = 49). .... 97
Figure 3.3. Frequency distribution of infants’ weight at the time of study (n = 52). .................................................. 97
Figure 3.4. Ponderal index by gender (boys n = 33, girls n = 18). .................................................. 100
Figure 3.5. Frequency distribution of bedtime at night (parental report, N = 52). .................................................. 103
Figure 3.6. Frequency distribution of time to settle at night (parental report, n = 51). .................................................. 103
Figure 3.7. Frequency distribution of time spent awake during the night from 10 p.m.-6 a.m. (parental report, n = 50). .................................................. 103
Figure 3.8. Frequency distribution of nights snoring (parental report, n = 35). .................................................. 105
Figure 3.9. Frequency distribution of the amount of childcare (sleep diary data, N = 52). .................................................. 111
Figure 3.10. Frequency distribution of the number of days of valid actigraphy per infant (N = 52). .................................................. 115
Figure 3.11. Frequency distribution for average number of rest intervals by day (7a.m.-7p.m.) and night time (7p.m.-7a.m.). .................................................. 118
Figure 3.12. Frequency distribution for the number of rest intervals per 24-hrs. .................................................. 118
Figure 3.13. Frequency distribution for the average time in bed per 24-hrs (total duration of rest intervals, hrs) and time asleep per 24-hrs (total duration of sleep intervals, hrs). .................................................. 119
Figure 3.14. Frequency distribution for average duration of day sleep (hrs, 7a.m.-7p.m.). .................................................. 119
Figure 3.15. Frequency distribution for average duration of night sleep (hrs, 7p.m.-7a.m.). .................................................. 119
Figure 3.16. Frequency distribution for the average bedtime (time infants were put to bed/beginning of rest interval) and the average time of sleep onset (times infants fell asleep at night/beginning of sleep interval). .................................................. 120
Figure 3.17. Frequency distribution for the average sleep onset latency (time between being put to bed and falling asleep) for the first night time sleep. .................................................. 120
Figure 3.18. Frequency distribution for the average wake-rise time (the time between when infants’ wake and when they are taken out of bed) in the morning. .................................................. 120
Figure 3.19. Frequency distribution for the average final wake up time in the morning. .................................................. 121
Figure 3.20. Frequency distribution of the average sleep efficiency during night time rest and sleep intervals. .................................................. 121
Figure 3.21. Frequency distribution of the percentage of total sleep time (24-hrs) which occurred at night (7p.m-7 a.m.). .................................................. 123
Figure 3.22. Scatterplot illustrating the relationship between age and the percentage of total sleep time occurring at night (7 p.m.-7 a.m.). ................................................................. 123

Figure 3.23. The percentages of infants asleep across the 24-hr day (n = 46). ......................................................................................................................... 124

Figure 3.24. Scatterplot illustrating the relationship between ponderal index and sleep duration per 24-hrs (hrs). ................................................................. 125

Figure 3.25. Scatterplot illustrating the relationship between ponderal index and duration of night time sleep (hrs, 7 p.m.-7 a.m.). ................................. 125

Figure 3.26. Scatterplot illustrating the relationship between ponderal index and the percentage of sleep occurring at night (7 p.m.-7 a.m.). ................................................................. 125

Figure 3.27. Histogram showing the bimodal split of high (n = 27) and low (n = 25) ponderal index. ......................................................................................................... 127
### List of Terms and Abbreviations

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active interval</td>
<td>Used in actigraphy. The times spent out of bed in active wake, as defined by sleep diary data</td>
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<tr>
<td>ANOVA</td>
<td>Analysis of covariance</td>
</tr>
<tr>
<td>ASQ</td>
<td>Ages and Stages Questionnaire</td>
</tr>
<tr>
<td>AW64</td>
<td>Actiwatch™ MiniMitter 64, brand of actigraph</td>
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<tr>
<td>BISQ</td>
<td>Brief Infant Sleep Questionnaire</td>
</tr>
<tr>
<td>BMI</td>
<td>Body mass index (kg/m(^2))</td>
</tr>
<tr>
<td>Brain Plasticity</td>
<td>The capacity to adapt and learn in response to internal and external needs</td>
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<tr>
<td>Circadian</td>
<td>Latin for ‘about a day’. Refers to the self sustaining rhythms that have a periodicity of approximately 24-hours</td>
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<tr>
<td>CPHR</td>
<td>Centre for Public Health Research</td>
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<tr>
<td>EEG</td>
<td>Electroencephalography</td>
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<tr>
<td>EMG</td>
<td>Electromyography</td>
</tr>
<tr>
<td>EOG</td>
<td>Electrooculography</td>
</tr>
<tr>
<td>Excluded interval</td>
<td>Used in actigraphy. The times when data is deemed invalid for analysis</td>
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<tr>
<td>ICSD</td>
<td>International Classification of Sleep Disorders</td>
</tr>
<tr>
<td>K-complex</td>
<td>EEG phenomena characteristic of stage two sleep</td>
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<tr>
<td>Log(_{10})</td>
<td>Log to the base 10</td>
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<tr>
<td>NREM</td>
<td>Non-rapid eye movement sleep</td>
</tr>
<tr>
<td>OSA</td>
<td>Obstructive sleep apnoea</td>
</tr>
<tr>
<td>Pākehā</td>
<td>Person of predominantly European descent; not Māori</td>
</tr>
<tr>
<td>Plunket</td>
<td>A NZ society set up to support parents of children from 0-5 years of age</td>
</tr>
<tr>
<td>Process C</td>
<td>The signal of alertness from the internal circadian clock</td>
</tr>
<tr>
<td>Process S</td>
<td>The homeostatic drive for sleep</td>
</tr>
<tr>
<td><strong>PSG</strong></td>
<td>Polysomnography, the gold standard measure of sleep using EEG, EMG and EOG channels</td>
</tr>
<tr>
<td><strong>Ponderal index</strong></td>
<td>Measurement of body status ($\sqrt[3]{\text{weight/length}} \times 100$)</td>
</tr>
<tr>
<td><strong>REM</strong></td>
<td>Rapid eye movement sleep</td>
</tr>
<tr>
<td><strong>Rest interval</strong></td>
<td>Used in actigraphy. The time spent in bed, as defined by sleep diary data</td>
</tr>
<tr>
<td><strong>CSN</strong></td>
<td>Suprachiasmatic nuclei</td>
</tr>
<tr>
<td><strong>SES</strong></td>
<td>Socioeconomic status</td>
</tr>
<tr>
<td><strong>SIDS</strong></td>
<td>Sudden infant death syndrome</td>
</tr>
<tr>
<td><strong>Sleep cycle</strong></td>
<td>The cycle of NREM/REM sleep stages throughout the sleep period</td>
</tr>
<tr>
<td><strong>Sleep interval</strong></td>
<td>Used in actigraphy. The time spent asleep whilst in bed, defined by the Actiware® software</td>
</tr>
<tr>
<td><strong>Sleep spindle</strong></td>
<td>EEG phenomena characteristic of stage two sleep</td>
</tr>
<tr>
<td><strong>SQRT</strong></td>
<td>Square root transformation</td>
</tr>
<tr>
<td><strong>Sleep/wake cycle</strong></td>
<td>The cycle of sleep and wake throughout the 24 hour day</td>
</tr>
<tr>
<td><strong>SWRC</strong></td>
<td>Sleep/Wake Research Centre, Massey University, Wellington</td>
</tr>
<tr>
<td><strong>SWS</strong></td>
<td>Slow wave sleep (stages three and four)</td>
</tr>
<tr>
<td><strong>Threshold for wake</strong></td>
<td>The number of activity counts per minute of actigraphy required to define wakefulness</td>
</tr>
</tbody>
</table>