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Correlates of tummy time in infants aged 0–12 months old: A systematic review

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ABSTRACT

Background: Tummy time, defined as an infant being placed on their stomach whilst they are awake and supervised, has been shown to have a positive effect on infant development and head shape. Tummy time can be influenced by a number of factors. Using a social ecological model, categories of potential variables can be examined to determine their influence on behaviours such as tummy time. The purpose of this systematic review was to examine potential correlates of tummy time in infants from birth to 12 months old.

Methods: Electronic databases were originally searched between March to December 2016. Included studies needed to be peer-reviewed, written in English, and meet *a priori* study criteria. The population was apparently healthy infants aged from birth to 12 months old. The article needed to contain an objective or subjective measure of tummy time as a dependent variable and examine the association between a demographic, psychological, behavioral, and/or environmental variable and tummy time. For this study, tummy time could include the ability of the infant to move whilst being positioned on their stomach, for example, the infant's ability to roll from back to front, or lift their head when lying on their stomach (prone positioning ability), or the capacity, time spent, age started, or parent attitudes/behaviours regarding the infant being placed on their stomach. The outcomes were the relationships between potential correlates and tummy time. Risk of bias was assessed at the individual study level using the Cochrane risk of bias assessment for observational studies.

Results: 15 articles representing 2372 unique participants from 7 countries were included. Correlates that were positively correlated with tummy time were age, prone sleeping, spending greater than 15 minutes whilst awake in tummy time when 2 months old, amount of time in the bath, order of achievement of prone extension and prone on elbow positions and parents/carers setting aside time for tummy time. Risk of bias of the included studies ranged from low to high.

Conclusions: Specific demographic, environmental and behavioral variables were found to be positively and negatively associated with tummy time. This evidence could assist future research regarding interventions to promote tummy time, enhance motor development, increase infant

Abbreviations: IOM, Institute of Medicine; PROSPERO, International Prospective Register of Systematic Reviews; PRISMA, preferred reporting items for systematic reviews and meta-analyses; PICO, population intervention control outcome; GRADE, grading of recommendations, assessment, development, and evaluation; MEDLINE, medical literature analysis and retrieval system online; CINAHL, cumulative Index of nursing and allied health literature; Scopus, bibliographic database for academic journal articles; PsycINFO, psychological information database; HRE, head righting – extension; AWBTS, active weight bearing through shoulders; AIMS, Alberta infant motor scale; AAP, American Academy of Pediatrics

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physical activity and contribute to future tummy time recommendations for parents and health care providers.

1. Background

Tummy time, defined as awake and supervised positioning on the stomach, is included in the National Academy of Medicine (IOM, 2011) and both the Canadian (Tremblay et al., 2012) and Australian Early Years (Australian Government Department of Health, 2014) physical activity recommendations for infants. As tummy time has been included in these recommendations it can be assumed that it is an important component of physical and motor development in infancy. These recommendations suggest that tummy time should be provided daily to an infant less than 6 months of age. Identifying factors that influence tummy time is therefore important in assisting parents/carers, health professionals, and early childhood educators meet these guidelines

Tummy time provides an opportunity for the infant to stimulate and enhance their motor development. Infants can be placed on their tummy from birth for short periods of supervised play. When an infant is on their tummy they are given the opportunity to practice lifting up their head, lifting up and turning their head, moving their legs and pushing up with their arms. Tummy time strengthens the infant's head, neck, shoulder and trunk muscles they will need to master motor skills such as rolling, sitting, crawling and pushing up to sit. There are some studies that have demonstrated a positive effect between tummy time and motor development (Dudek-Shriber & Zelazny, 2007; Monson et al., 2003; Majnemer and Barr, 2005Russell et al., 2009; Salls et al., 2002). However, studies that have explored factors that influence tummy time are limited. Some potential examples of tummy time correlates may be age, sex, sleeping position, type of positioning and handling from carer, home set up, amount of time placed prone, low birth weight, gestational age, mental health issue of the carer and tolerance by the infant. In addition, studies that investigate an infant's ability to move when on their stomach (prone positioning ability) have not been systematically reviewed. This could include the ability to roll from front to back, ability to lift their head, ability to push up with their arms, and ability to move their arms and/or legs, Combining tummy time and prone positioning ability in the search strategy will be important to ensure as many studies as possible are captured. A study using the combination of these terms is yet to be conducted. As such, both the infant's ability to move in prone (prone positioning ability) and the infant's capacity, time spent, age started, or parent attitudes/behaviours regarding the infant being placed on their stomach will be defined in this study as 'tummy time'. A number of systematic reviews have been conducted addressing the correlates of pre-school-aged children's physical activity (Hinkley et al., 2008) and sedentary behaviour (Hinkley et al., 2010). In contrast, reviews investigating correlates of infant behaviour or positioning practices are limited. Identifying what influences tummy time will be important for the development of evidence-based interventions. In addition, it will also highlight how these correlates relate to infant health indicators. Therefore, the purpose of this systematic review is to examine the correlates of objectively and subjectively measured tummy time in infants (aged 0–12 months) across observational study designs.

2. Methods

2.1. Protocol and registration

This review was registered with the international prospective register of systematic reviews PROSPERO network (http://www.crd.york.ac.uk/prospero/): Registration no. CRD42016036931. This review followed the PRISMA statement for reporting systematic reviews and meta-analyses (Moher, Liberati, Tetzlaff, Altman & Group, 2009).

2.2. Inclusion and exclusion criteria

For an article to be included in this review, it had to be peer-reviewed, published or in press, written in English, and meet *a priori* determined population, intervention/exposure, comparator/control, and outcome (PICO) study criteria (Schardt, Adams, Owens, Keitz, & Fontelo, 2007) from the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) framework (Guyatt et al., 2011a; Guyatt et al., 2011b Guyatt et al., 2011c). Conference abstracts, book chapters, and dissertations were excluded.

2.2.1. Population

The population was apparently healthy (i.e., general population, including overweight/obese, but not studies that only included infants with a diagnosed medical condition with the exception of studies relating to prematurity, sudden infant death syndrome or low birth weight) infants from the ages of 0 to12 months. For studies using a longitudinal design, the age criterion applied to at least one measurement time point during the study. Observational studies and only the control group (i.e., not experienced any form of intervention) from experimental studies were reviewed and were required to have a minimum sample size of 20 participants. An article was included if it: (1) included human infants aged from birth to 12 months old; (2) contained quantitative research and had been published in an English-language, peer-reviewed journal; (3) contained a measure of tummy time and/or prone positioning ability as a dependent variable (all defined in this study as tummy time); (4) examined the association between a demographic, psychological, behavioral, and/or environmental variable and tummy time.