Examining Relations between Child Sleep Habits and Executive Functioning

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Introduction

- Children experience significant developments in sleep habits and cognitive functioning over the first three years of life.
- In particular, notable advances are made in higher-order cognitive processes known as executive functions.
- Executive functioning is largely governed by the prefrontal cortex and includes cognitive processes such as impulse control, working memory, and planning, among others (Garon et al., 2008; Zelazo et al., 1997).
- Previous experimental research has indicated that greater amounts of sleep at night serve to facilitate aspects of executive functioning in children (Sadeh et al., 2003).
- The present study was conducted to examine associations between general sleep behaviors in preschoolers in relation to measures of executive functioning associated with working memory (Diamond et al., 1997) and planning (Bauer et al., 1999).

Method

Participants
- Twenty-five children (mean age = 26 months, 13 days) participated in a two-session study held in university testing space.
- The first session occurred after children napped, whereas the second session was held the next day before children napped (in the majority of cases).

Procedure
- Questionnaires: Parents completed questionnaires that inquired about demographic information and the general sleep behaviors.
- At the second session, children completed tasks associated with working memory and planning.
- Working memory: Children were presented with three novel boxes that varied in color.
- A researcher hid a toy in each box and allowed the child to search.
- The researcher put up an opaque barrier and scrambled the boxes. Children were allowed to search again.
- Searching continued until the child found all of the hidden toys or made 5 consecutive errors. Two blocks were administered.
- Planning: An elicited imitation task was used to assess planning.
- After a brief baseline period, a researcher demonstrated how to complete the last step of a 3-step sequence; immediate imitation was permitted.
- The researcher then demonstrated the entire 3-step sequence; immediate imitation was permitted.

Working Memory
- Dependent measures concerned the average number of trials required to complete the task, perseverative reaches to boxes of the same color and at the same location, and the average trial on which the first error was made for children who found all toys on both blocks.
- Greater nighttime sleep duration was negatively associated with perseverative reaches to boxes of the same color.
- More frequent night wakings were negatively associated with the average trial on which the first error was made.

Planning
- Dependent measures concerned the number of target actions and pairs of actions produced at baseline, after the goal-state model, and after the full model.
- Although children showed evidence of planning when considering target actions and pairs of actions, associations were not found in relation to sleep habits.

Discussion

- The data suggest that children were quite successful on the included measures of executive functioning between 24 and 30 months of age.
- Children found the three hidden toys with little difficulty (n = 3 who did not succeed on both blocks) and were effective at planning their actions when only the last step of a 3-step sequence was modeled for them.
- General sleep habits were only associated with performance on the working memory task.
- Shorter nighttime sleep duration was associated with more perseverative reaches to boxes of the same color, and more frequent night wakings were related to the commission of errors at earlier trials.
- These findings suggest that aspects of general sleep habits are associated with aspects of executive functioning.
- Future work should be done to examine which aspects of sleep architecture contribute to enhanced performance on measures of executive functioning in preschoolers.

References


