



# Research Snapshot

*Centre for Lifespan Development Research*

## Sleep

*The connection to social functioning & behaviours*

### Are you getting enough sleep – What is this research about?

Sleep is a very important part of daily life, however, many people in today's society are not getting enough sleep – sometimes due to lifestyle choices, ageing, medical/sleep disorders, or even the type of work that they do (e.g., shift work). Insufficient sleep or *sleep deprivation (SD)* can be problematic, with many sleepy individuals experiencing issues with mental, physical, and emotional functioning. Overall, SD leads to reduced alertness, slowed response times, poor mood, and difficulty paying attention and remembering information.

## Brock University

SD may have a particular impact on how individuals process information and the resulting social behaviours. Specifically, research has shown that sleepy children tend to experience more conduct disorders and sleepy adults tend to have more mood disruptions. Dr. Cote has suggested that SD may create a state of emotional imbalance or instability, where it is possible to have both blunted behaviour (because of diminished vigilance and attention overall), with situational or context-driven reactivity. Overall, it appears that SD may lead to an emotional imbalance that impacts how people process emotional information, an important factor in healthy social functioning. To investigate this topic further Dr. Cote has implemented experimental examinations of SD and emotional processing of facial expressions and pictures.

### How did they do it?

In order to conduct their research Dr. Cote and colleagues have used methods that look at brain activity, such as examining Event-Related Potentials (ERPs – a measurement of the brain's response to stimuli) through electroencephalography (EEG – a technique that measures electrical activity in the brain) among well-rested individuals as compared to individuals who have been sleep deprived or sleep restricted. Specifically, Dr. Cote and colleagues have investigated the impact that SD may have on individuals' neural processing of emotionally expressive faces (e.g., happy, sad, fearful and angry faces), a very important part of daily social interactions (note that faces were shown to participants as either regular “full face” or “morphed face” where the emotion was made harder to read).

### Results

In their work, Dr. Cote and colleagues have discovered that SD may lead to a greater amount of brain reactivity among sleepy individuals when processing subtle angry or fearful facial expressions as compared to well-rested individuals. This greater brain activity may indicate that additional mental resources are being utilized when SD individuals are tasked with interpreting *threat-related* faces.

Additionally, Dr. Cote has found that SD may lead to impairment in accurately categorizing and processing *sad* facial expressions.



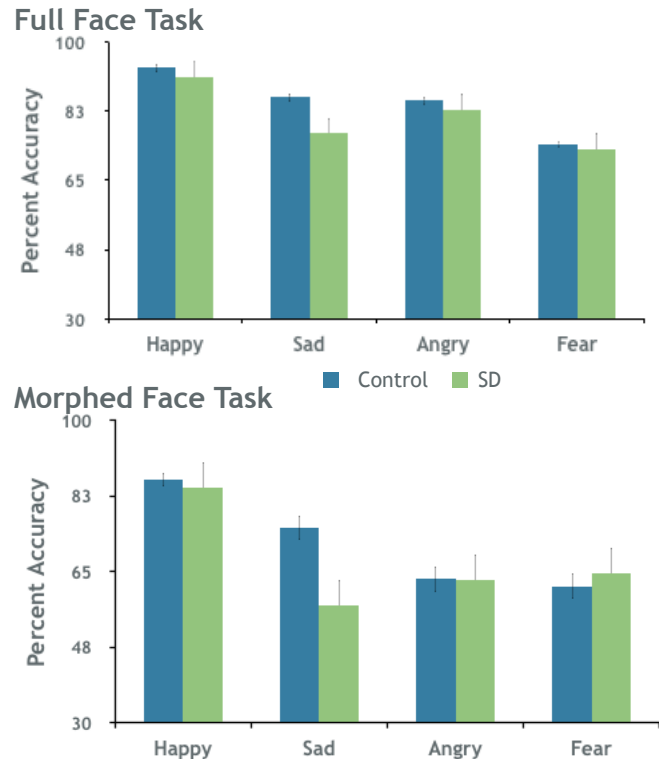
As shown in Figure 1, accuracy for recognizing facial expressions was lower among the SD group for both full and morphed faces for sad faces in particular. Specifically, in the full face task the average accuracy score for SD individuals was found to be about 9% lower for sad faces than found with well-rested individuals. In the morphed face task the average accuracy score for SD individuals was found to be about 18% lower for sad faces than found with well-rested individuals.

Overall, Dr. Cote's research has shown that SD may uniquely impair individuals' perception of emotional facial expressions and emotional information, with specific mental and behavioural implications. These SD-related impairments tend to manifest as emotional imbalances and may relate to changes in social behaviours and diminish the amount of cognitive resources available for effective processing of other important information when in an SD state.

### So what – Where can this research be used?

**Social Behaviour & Decision-making** – Given the above research and the fact that a large portion of today's society is sleep deprived, sleepy individuals may have a diminished ability to accurately recognize and respond to the emotional cues around them, affecting their social behaviour (i.e., SD individuals may appear to have a lack of empathy or may develop mood disorders in the long-term). Additionally, sleep deprived individuals may pay more attention to emotional information, reducing the cognitive resources available for efficient processing of other information – in turn impacting their decision-making abilities and behaviour. Anyone who interacts with sleepy

**Figure 1: Percent accuracy for controls versus SD group**



individuals or groups (i.e., children, adolescents and those working shifts in hospital settings) may want to take Dr. Cote's research into consideration when designing interventions or interpreting behaviours.

**Mental Health** – In terms of chronic SD, the excessive attention that sleepy individuals may place on negative emotional information may lead to long-term consequences, such as the development of mood disorders/mental health. As such, Dr. Cote's findings around emotional dysregulation may be particularly relevant for any clinician or practitioner who works with psychiatric conditions that include an SD component, as there may be strong rationale for sleep therapies to control emotional and behavioural symptoms in these conditions.

### Want to read more on this research?

Find it online here: <http://link.springer.com/article/10.1007/s00221-013-3780-1>

**Citation:** Cote, K. A., Mondloch, C. J., Sergeeva, V., Taylor, M., & Semplonius, T. (2014). Impact of total sleep deprivation on behavioural neural processing of emotionally expressive faces. *Experimental brain research*, 232(5), 1429–1442. doi: 10.1007/s00221-013-3780-1

**Research video:** <https://youtu.be/syLF01YZKtE>

### Want More Information?

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