

Tired Australian magpies sing less, sing later and are less motivated

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Credit: Robin Johnsson

Sleep deprived Australian magpies are tired and unmotivated, just like humans, according to new research from La Trobe University in Melbourne which has found that, after a poor night's sleep, the common

black and white songbird shifts their normal singing from twilight to midday, have a reduced song bandwidth and struggle with cognitive tasks.

While it is known that sleep helps maintain brain functioning and flexibility in behavior in humans and animals, there has been little research into the impact of poor sleep in birds. From an [evolutionary perspective](#), birds are particularly interesting because they are the only group of (non-mammalian) animals to show unequivocal mammal-like sleep states of alternating non-[rapid eye movement](#) (NREM) and REM sleep.

The La Trobe University researchers studied the impact of sleep deprivation in the Australian magpie, (*Cracticus tibicen*), a ubiquitous and conspicuous [JL1] songbird, known for their [social nature](#), advanced cognitive abilities, and complex vocal behaviors.

The study, led by Associate Professor John Lesku and published in Nature's *Scientific Reports*, investigated how sleep deprivation over the full-night (12 h) or half-night (6 h) affects cognitive performance in adult Australian [magpies](#), relative to that after a night of undisturbed sleep.

According to Dr. Lesku, prior to each treatment, the birds were trained on an associative learning task and, on the day after experimental treatment (recovery day), the birds were tested on a reversal learning task. "To glean whether sleep loss affected song output, we also conducted impromptu song recordings for three days," he said.

"Ultimately, sleep-deprived magpies were slower to attempt the reversal learning task, less likely to perform and complete the task, and those that did the test performed worse than better-rested birds." Reversal learning tasks measure how quickly and successfully animals adapt to the change

of reinforcement contingencies and has been widely used in testing avian cognition.

The researchers also found that tired magpies sang longer yet fewer songs, shifted twilight singing to mid-day, and during the post-recovery day, song frequency bandwidth narrowed. This is important because individuals which produce physically demanding songs, such as trills (rapidly repeating song elements with high frequency bandwidth) receive stronger responses from both rivals and mates, and increased fitness. Magpie song serves several ecologically-relevant functions, including territorial and nest defense, food calling, and pair bonding, and is performed by the adults of both sexes.

Ph.D. candidate and lead author, Robin Johnsson said that the results of the study show that bird, like other animals, sleep is important for optimizing waking performance, when new memory traces are acquired and encoded in the brain. "During subsequent sleep, newly formed memories are stabilized and enhanced via a process of memory consolidation," he said.

"Insufficient sleep negatively affects these neurological processes leading to impaired cognition, broadly defined to include attention, motivation, visual-motor coordination, emotional stability, communication, short- and long-term memory, and executive functions related to decision making."

Dr. Lesku says, "Our results on Australian magpies are in accordance with previous research on humans in that [sleep deprivation](#) impairs cognition and alters communication. We found that magpies, a bird with advanced cognitive abilities, kept awake for an entire night have impaired motivation, attention, and behavioral flexibility. Moreover, our serendipitous recordings of songs hinted that these social birds changed their [song](#) timing and output. Thus, many aspects of cognition appear to

be sleep-dependent in Australian magpies."

More information: Robin D. Johnsson et al, Sleep loss impairs cognitive performance and alters song output in Australian magpies, *Scientific Reports* (2022). [DOI: 10.1038/s41598-022-10162-7](https://doi.org/10.1038/s41598-022-10162-7)

Provided by La Trobe University

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