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# Researchers use computer-based game to find how punishment affects behaviour of children with ADHD

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Behavioral experiment on reward and punishment highlights the cumulative effect of punishment in children with ADHD.

Growing up is a challenging task full of great achievements and missteps. Sometimes it is not clear what the best course of action might be, but people around us - parents and teachers - help by giving us feedback about our behaviour. Generally, we repeat the actions that get rewarded, and try not to engage in the ones that get reproved. However, it is hard to always make the best choice.

Children with Attention Deficit Hyperactivity Disorder (ADHD) are potentially more exposed to reproaches than typically developing children. Their difficulties with focusing, elevated activity levels and impulsive actions often get them into trouble with their parents, teachers and friends. This makes it important to find out how punishment affects the behaviour of children with ADHD. Are they more sensitive to punishment, or are they less sensitive to punishment? A team of researchers from Japan and New Zealand presented children with ADHD and typically developing children with a computer-based game that involved reward and punishment. The results of this study are published in the *Journal of Child Psychology and Psychiatry*.

"When we first began this study, there had not been a lot of experimental research done," said Prof Gail Tripp, one of the authors of the paper and director of the Human Developmental Neurobiology Unit at the Okinawa Institute of Science and Technology Graduate University (OIST). "We need to be extremely careful about using punishment, especially when working with children. Some of our first attempts to study ADHD and punishment were not very successful, because the children simply abandoned the task when they kept losing points or did not get enough rewards."

This time, the researchers were able to develop a computer-based game that was engaging but still incorporated an element of punishment. Children with ADHD and typically developing children chose between playing two simultaneously available games. Both games were presented at the same time on a computer screen, and looked the same: a two by two grid in which a mix of fun characters and sad faces appeared after pressing a button on the screen. Four matching characters equalled a 'win', while four sad faces equalled a 'loss'. Any other combination was a neutral outcome. The children could switch between playing the two games as often as they liked.

Altogether, 210 children took part in the research, with 145 diagnosed with ADHD. All children were living in Japan or New Zealand and spoke English as their first language. "The chance of winning rewards was equal for the two games, but one of the games was designed to have a four times higher likelihood of losing: playing on that game, a child would be 'punished' more often than with the other one," Tripp explained. In both games, when a child won, the computer gave him or her 10 points and played a simple animation; when a child lost, the computer took away 5 points and played a laughing sound. All children began with a positive balance of 20 points and the game continued until either they reached 400 points or completed 300 trials. Each child won a prize at the end of the game. The rewards were also arranged to discourage children from playing on one game exclusively or switching every time. A session lasted typically half an hour. The reason for such an extended game was to observe fairly stable performance over time.

"What we actually saw was that both typically developing children and children with ADHD developed a preference - what we call 'bias' - for the less 'punishing' game," Tripp said. "Both groups played the less punishing game more often. But over time, the children with ADHD found losing points and the laughter more punishing than typically developing children."

During the first 100 trials, there was no difference between the two groups of children. But later on, the preference for the less punishing alternative increased substantially in the children with ADHD, while the choices of the typically developing children were stable for the duration of the task. By the 200th trial, the children with ADHD were much less likely to play the more punishing game. The results suggest that children with ADHD avoid punishment more often over time than typically developing children. The latter seemed less distracted by punishment and kept their focus on winning.

This finding has important implications. "If a child with ADHD is reluctant in doing a task, or if the child gives up easily, it might be important for the parent or the teacher to check if the task has the appropriate balance of reward and punishment," Tripp said. "We are not saying that the task has punishment built in, rather that the effort needed to do the task might be perceived as punishing by the child. The more effortful a task is, the more incentives a child is going to need to keep persisting, and simple but frequent rewards, such as smiles or words of encouragements, can help children with ADHD to stay on the task." The same could be said for typically developing children, but this is especially important for children with ADHD, as they seem more sensitive to repeated experiences of punishment or failure, and are more likely to miss opportunities for success.

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Source:

Okinawa Institute of Science and Technology Graduate University - OIST

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