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Reward-Based Improvements in Sequential Reaching

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Reward has been shown to enhance performance across a range of simple motor tasks, highlighting that it is a powerful tool for improving human behaviour. However, much less is known regarding its impact on more complex sequential actions. To address this, a novel sequential reaching task was designed in which reaches could be performed as a sequence of discrete or coarticulated movements; a naturally slow process in which neighbouring movements are fused together leading to both improved performance and efficiency. Across three experiments, rewarded participants showed enhanced sequential reaching performance (speed) and improved movement efficiency (smoothness). These performance gains were maintained across multiple days even in the absence of reward and were dependent on the presence of explicit reward rather than simply knowledge of performance. Critically, enhanced coarticulation drove these changes in behaviour and reflected the predictions of a model which minimised jerk. Finally, a dopaminergic pharmacological study revealed that haloperidol (D2-antagonist) impaired movement speed and coarticulation but, surprisingly, reward appeared to compensate for this deficit. Therefore, coarticulation provides a mechanism by which reward can enhance the movement speed and efficiency of sequential actions. The importance of coarticulation (movement fusion) in the broader context of skill learning will be discussed.