

Managing threat-reward conflict: strategies of conflict-based decision making

The pursuit of reward and avoidance are two major behavioral motivators. Failure to balance these motivators results in maladaptive behaviors and may underlie many pathological conditions. Many studies focused on the neural substrate of avoidance, as well as reward seeking. However, little is known about the interaction between avoidance and reward-seeking circuits that result in adaptive behaviors. Previous work from our group has shown that rats learn to avoid foot-shocks by stepping onto a nearby platform when they hear a 30s tone that co-terminates with a 2s shock (Bravo-Rivera et al., 2014). In the platform-mediated avoidance task, rats continually press a lever to receive a reward pellet delivered on a variable interval schedule. Avoidance comes at a cost because the food lever cannot be reached from the platform. This cost is minimal, because food is also available during the inter-tone intervals. We modified the task to increase conflict by limiting food availability to the tone period. A light indicating food availability turned on at the same time as the tone-predicting shock. We observed three different behavioral responses to this conflicting situation. 10% (8/77) rats spent all the time on the platform and never pressed for food (avoidance-preferring subgroup). This lack of food seeking can be interpreted as the cost of excessive avoidance, and is not optimal. Finally, the remaining 18% (14/77) rats engaged in excessive food seeking showing little to no avoidance (food preferring subgroup). The increased number of footshocks received by the food-preferring group is the cost of excessive food seeking and is not optimal. In contrast, 72% (55/77) rats were able to accommodate both food seeking and avoidance behaviors, by timing the occurrence of the shock (timer subgroup). Because the shock occurs 28s into the tone-light stimulus, these rats increased their food seeking during the early portion of the tone and avoided more as the tone progressed. The timer subgroup avoided as many shocks as the avoidance-preferring group, while at the same time consuming as much as the food-preferring group. This suggests that timing is an adaptive strategy that allows for both avoidance and feeding in the conflict task. We will be presenting cFos expression data on these three subgroups. Together, these findings revealed different naturally-occurring subgroups, characterized by their contrasting behavioral response to threat-reward conflict. The approach of focusing on naturally occurring behavioral differences may provide insight into the circuits that drive decision making and their potential dysfunction in anxiety or addiction related disorders.