The neuropeptide arginine vasopressin (AVP) mediates complex social behaviors such as pair bonding, social recognition and aggressive behavior in mammals. Here, we investigated AVP’s role in human cooperation by assessing behavior and functional magnetic resonance imaging during risky social cooperation (the stag hunt game). We measured the causal influence of AVP on behavior during high and low cooperation incentive levels. AVP increased cooperative behavior when the incentive to cooperate was high. The AVP-related increase in cooperation was mediated by two neural mechanisms: During cooperative (risky) choices (1) AVP reduces the influence of social risk by down-regulating activity in the left dorsolateral prefrontal cortex (dlPFC); and (2) AVP strengthens the functional coupling between the left dlPFC and the left pallidum, a region of the reward circuitry with many AVP receptors. In general, AVP increases group rewards by encouraging mutually beneficial choices, which are often avoided due to social risk.