Reactivation of recall-induced neurons contributes to remote fear memory attenuation

Whether fear attenuation is mediated by inhibition of the original memory trace of fear with a new memory trace of safety or by updating of the original fear trace toward safety has been a long-standing question in neuroscience and psychology alike. In particular, which of the two scenarios underlies the attenuation of remote (month-old) fear memories is completely unknown, despite the impetus to better understand this process against the backdrop of enduring traumata. We found—chemogenetically and in an engram-specific manner—that effective remote fear attenuation is accompanied by the reactivation of memory recall–induced neurons in the dentate gyrus and that the continued activity of these neurons is critical for fear reduction. This suggests that the original memory trace of fear actively contributes to remote fear attenuation.