Title: Preference consistency relies on hippocampal function: Evidence from mediotemporal lobe epilepy

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Abstract:
If preferences are often constructed (Lichtenstein & Slovic, 2006) memory processes may play a major role in this construction. Both memory encoding and retrieval influence judgment and choice in multiple ways (Weber & Johnson, 2009).The role of memory representations of past experience in choice can be demonstrated by showing that choice is impaired in individuals known to have memory encoding or retrieval deficiencies. Thus we ask whether patients with hippocampal sclerosis are impaired in their preference construction.

We test this hypothesis with a series of binary choices among familiar food products. Our measure of choice quality is preference transitivity: If a person chooses A over B, and B over C, transitivity requires that they pick A over C (Samuelson, 1938). One reason for focusing on transitivity is that it is central to the General Axiom of Revealed Preference and is a necessary and sufficient condition for value maximization (Houthakker, 1950).

Our task examines intransitivites revealed by binary choices among 20 common candy bars. A control task, which did not involve preferences asked respondents which number was larger in a pair. Thirty one participants with MTL lesions a control group (n=30) with extratemporal lesions and a healthy control group (n=30) completed the task.

Patients with hippocampal sclerosis showed, in the preference task, a significant increase in intransitive choices compared to the two control groups (means for preference task: MTL: 6.07%; ETL: 3.37%; CON: 2.75) but not for the control task: (means MTL: 0.50 %; ETL: 1.00%; CON: 0.14%). This interaction was significant (t(91) = –2.98, p = 0.004). The difference between degree of intransitivity between the preference and control task did not differ significantly between the two control groups (b = – 0.04, t(91) = 0.97, p = 0.333).

Support for the role of compromised hippocampal functioning is provided by a significant rank order correlcation between the volume of hippcample lesions to total and the percentage of intransitive choices (spearman-rho = 0.761; p<0.001; n=16). Further analyses ruled out alternative hypotheses on explicit declarative memory deficits, speed-accuracy tradeoff and preference for specific items.

Our results suggest a critical role for the hippocampus as the input carrier into the construction of the value of choice options. Most decisions require the construction of value based on past experience. A better understanding of both internal and external inputs to preference construction processes and their aggregation and comparison will allow us to better comprehend and model how the brain calculates value and makes wise choices.