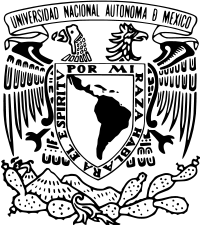
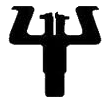
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**Title:**

**The Mirror Effect within Perception:**

**Not another Recognition Memory study.**

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**Keywords:**

Signal detection theory; Recognition memory; Perception; Mirror effect.

**Abstract (100 words):**

In Recognition Memory studies where Signal Detection Theory has been applied to describe subjects’ performance, a pattern known as the Mirror Effect has shown that when comparing subjects’ responses between classes of stimuli that are differentially recognized, this difference appears for the identification of both targets and lure stimuli (hits and false alarms). The extensiveness of this pattern to other areas has not been explored yet. We present evidence of the Mirror Effect outside recognition memory, in a detection task involving perception only, where two conditions of discriminability were built upon what is known about optical illusions.

**Summary (1000 words)**

**Introduction**

Signal detection theory has been applied to Recognition Memory to describe subjects’ ability to discriminate between stimuli that have previously been presented (old stimuli) from a new set of stimuli (Wixted, 2007). Within this field, it’s been consistently found that when comparing subjects’ performance across two classes of stimuli, one being more accurately recognized (A) than the other (B), this discrepancy is shown for the recognition of both old items as old (Hits (A) > Hits (B)) as for new items as new (False alarms (B) > False alarms (A)). This pattern of responses has been identified within Recognition Memory literature by the name of the Mirror Effect, with evidence in favor of it reported across a wide range of procedures (Yes/No tasks, Confidence Rating, and Two-alternative forced choice) and variables influencing stimuli recognition, (Glanzer, Adams, Iverson & Kim, 1993).

Surprisingly, evidence for the Mirror Effect has only been collected within Recognition Memory. Thus, most theories and models proposed to explain this pattern tend to do it in terms of high-level processes engaged in the study phase, where subjects interact for the first time with the stimuli and, presumably, attend/process them differently, leading to the different rates of response observed in the recognition phase, (DeCarlo, 2007, Glanzer et. al, 1993).

The main goal of the present study was to explore the existence of the Mirror Effect within a perceptual detection task, testing the assumption that it depends on high-level processing differences engaged during the study phase included in recognition memory tasks. Evidence of its existence outside recognition memory would suggest that it could be simply understood as a much more basic product of any SDT-like procedure.

**Research Question:**

Can we find evidence of the Mirror Effect pattern of response outside recognition memory?

***Method:***

We designed a perceptual detection task with two levels of discriminability designed from what is known about the variables influencing the magnitude of the Ebbinghaus illusion, across which subjects’ performance was compared. Levels of discriminability were built manipulating the number of external circles contained in each Ebbinghaus illusion-stimulus, which has shown to be directly related to the magnitude of the illusion (Massaro, 1971), and were defined as follows:

* High accuracy (A): Ebbinghaus illusions with 2 or 3 surrounding circles.
* Low accuracy (B): Ebbinghaus illusions with 7 or 8 surrounding circles.

We conducted two experiments where participants had to indicate, pressing one of two keys, whether two circles appearing on screen were the same size (Signal) or not (Noise). In Experiment 1 both circles were constructed as Ebbinghaus illusions, while Experiment 2 consisted of a single Ebbinghaus illusion-circle that had to be compared with a constant reference circle.

Participants graded how confident they were about their response by pressing one of three response keys, (1-Low, 2-Medium, 3-High). The computer registered these choices as part of a larger continuum going from 1 to 6, assigning values depending on their previous response as follows:

1. If participants chose ‘Noise’ and pressed 3, it would be registered as 1 (‘Very sure Noise’); 2 would remain 2 (‘Medium sure Noise’) and 1 would be 3 (‘Low sure Noise’).
2. If participants chose ‘Signal’ and pressed 3, it would be registered as 6 (‘Very sure Signal’); 2 would change into 5 (‘Medium sure Signal’) and 1 would be 4 (‘Low sure Signal).

Participants had to press the space bar to indicate that they were ready to continue to the next trial. Response time was also registered.

Stimuli were shown on each trial for only 1.5 seconds to prevent habituation to the illusion. Participants could respond (‘Yes, circles are the same size’ or ‘No, they’re not’) either before or after stimuli disappeared from screen. The confidence rating scale remained on screen until grading was registered.

Each experiment included a total of 640 trials (320 trials for each class of stimuli, A or B, with 160 signal and noise trials respectively) presented at random. We had 20 different psychology undergrad students participating in each experiment.

**Results:**

We looked for evidence of the Mirror Effect, as usually reported in the literature, in terms of the rates of ‘Yes’ responses given across accuracy conditions (Yes(AN) < Yes(BN) < Yes(BS) < Yes (BS); A and B being ‘high’ and ‘low’ accuracy’, ‘S’ and ‘N’ being ‘signal’ and ‘noise’ trials, respectively) and the mean confidence rates assigned to stimuli within each condition (Mean(AN) < Mean(BN) < Mean(BS) < Mean(AS)). Response time correlations were also tested (Glanzer & Adams, 1990).

In each of the two experiments, we had 17 participants showing the expected pattern of ‘Yes’ responses across conditions and 18 showing the expected mean confidence rate pattern. This means that at least 85% of our population presented evidence in favor of the Mirror Effect. Furthermore, no correlation between accuracy conditions and response time was found. The attached Figure presents the mean performance of participants in Experiment 2.

Data analysis was conducted in terms of the mean performance across subjects per condition to make our results more comparable with the literature on the mirror effect in recognition memory.

**Discussion**

We present evidence of the existence of the Mirror Effect outside recognition memory. The pattern was found within a perceptual task that didn’t include any pre-experimental phase where attention or processing levels could influence discriminability differences across conditions. Furthermore, accuracy conditions were designed based on what has been reported about the variables involved in the Ebbinghaus illusion, which is explained in terms of a mechanism that estimates size by contrasting any target with its surroundings. This suggests that neither attentional nor processing level differences were regulating subjects’ performance in the task presented, which is supported by the fact that no correlation between response time and accuracy conditions was found.

A review of the literature suggests this to be the first study to show evidence of the Mirror Effect on a SDT-task that does not involve recognition memory.

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