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Is Cognitive Dissonance an Intrinsic Property of the Human Mind? An Experimental Solution to a Half-Century Debate

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***Abstract*—**Cognitive Dissonance can be conceived both as a concept related to the tendency to avoid internal contradictions in certain situations, and as a higher order theory about information processing in the human mind. In the last decades, this last sense has been strongly surpassed by the former, as nearly all experiment on the matter discuss cognitive dissonance as an output of motivational contradictions. In that sense, the question remains: is cognitive dissonance a process intrinsically associated with the way that the mind processes information, or is it caused by such specific contradictions? Objective: To evaluate the effects of cognitive dissonance in the absence of rewards or any mechanisms to manipulate motivation. Method: To solve this question, we introduce a new task, the hypothetical social arrays paradigm, which was applied to 50 undergraduate students. Results: Our findings support the perspective that the human mind shows a tendency to avoid internal dissonance even when there are no rewards or punishment involved. Moreover, our findings also suggest that this principle works outside the conscious level.

***Keywords*—**Cognitive Dissonance, Cognitive Psychology, Information Processing.

I. Introduction

THE concept of cognitive dissonance was developed by Leon Festinger [1] to describe internal contradictions which most people tend to avoid. According to the author, the beholding of two dissonant mental representations either lead to the reevaluation of one of them or to the emergence of a third cognition to amend the internal conflict.

The most famous experiment supporting this hypothesis was conducted half a century ago by the author and Carlsmith [2]. A cohort of volunteers (psychology students) participated in a boring task and then was divided in three groups and a control group: group one was offered one dollar to report to an unknown person (in fact, an experimenter) that the task was in fact exciting; group two received twenty dollars to do the same; and the third group was not asked to do that. Afterwards, the participants were asked to evaluate how boring they thought that the task was. The main finding was that the participants receiving only one dollar rated the task as less boring then did the participants that received twenty dollars.

According to the authors, doing something unpleasant for a modest payment leads to an internal conflict, which is amended by the reevaluation of the task (attributional bias). The Festinger-Carlsmith experiment became a prototypical framework in the study of cognitive dissonance and was reproduced many times up to the current days.

As this task reveals, cognitive dissonance has a ‘dialectic structure’: it relies on the assumption that mental objects associated with conflicting attributional values converge to a economical cognitive output.

Extending the philosophical perspectives that can be associated with this idea, one may note that in the behavioral level, the participants that rated the task as ‘not so boring’ may be considered irrational; while in the cognitive level, these participants present a tendency towards consistency, simplicity and cognitive parsimony, all of which can be assumed as rational principles. In conclusion, cognitive dissonance assumes that the mind is internally consistent and, for that reason, generates biased behaviors.

In that sense, cognitive dissonance represents more than just a hypothesis about a specific type of cognitive phenomenon; it is a ‘higher order theory’ regarding information and behavioral output, based on two axioms: 1. We treat information according to the tendency to diminish contradiction and increase organization, and this can lead to irrational behaviors; 2. This phenomenon takes place outside the conscious sight.

Within the field of psychology, cognitive dissonance disavowal the behaviorist assumption that rewards are always associated with the tendency to increase a target-behavior. As revealed in the aforementioned experiment, rewards are inversely correlated with positive evaluations of the rewarded behaviors, thus suggesting that, in the long run, the former could in fact diminish the occurrence of the latter.

From that standpoint, rewards should be conceived in terms of their relations with mental representations –and that is precisely what behaviorism tries to avoid. For that reason, it did not take long before the emergence of several behaviorist alternatives to explain Festinger and collaborators’ findings. Among these, the most influent is Bem’s ‘self-perception theory’ [4, 5] which states that the attributional bias is not related to the tendency to amend internal contradiction, but

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rather reflects the analysis that the participant do regarding his own behavior: “The individual’s own behavior will be used by him as a source of evidence for his beliefs and attitudes to the extent the contingencies of reinforcement for engaging in the behavior are made more subtle or less discriminable” ([4], p.8).

As much as it happened in relation to many other topics under discussion by cognitivism and behaviorism, this dispute is settled on a disagreement about the importance of the subjective experience in shaping behavior; and due to the fact that it is too hard to extract evidences about such solipsistic features of the mind, this conundrum has never been solved.

Fifty years after the presentation of the original theory, there is not a single experimental proof that the mind organizes information according to the principles of cognitive dissonance. Accordingly, while the number of studies and fields of applications of cognitive dissonance increased dramatically, the theoretical range of the principle did not follow with the same enthusiasm.

In the end, cognitive dissonance did not flourish as much as a higher order theory addressing general information processing as it did in experimental settings wherein motivation is manipulated by rewards and punishment.

Considering that picture, this paper aims to introduce the first test ever suited to solve this conundrum. Moreover, we also defined a framework to objectively quantify the degree of cognitive dissonance that the mind of different participants incorporates and a method to evaluate if cognitive dissonance relies on conscious experience or not.

II. METHOD

A. Participants

50 undergraduate students from diverse courses of University of São Paulo (Brazil) were included [there was no payment or reward to participate].

B. Procedures

The study involved: 1. Assorting cards representing human figures (faces) in order of preference; 2. Using the other cards (as many as desired) to freely create intermediary arrays to tie the original pair through a social network. This ‘double task condition’ was conducted sequentially, one participant at a time.

Task 1

In the first task twelve cards were presented to the participants, which were asked to organize them linearly and in order of preference, from ‘the one that they liked less’, to ‘the one that they liked best’. Half of the cards had pictures of women and half of men; the ages covered adulthood (from early 20th to late 60th), the races included where Caucasian, Asiatic and Afro-descendent. The pictures were selected on the internet (public domain images). We avoided picking famous, or glamour persons. Our criterion was to try to select twelve average individuals of the western urban society. Every task was recorded with a hidden camera.

Task 2

Immediately after the first task was conducted, each participant was asked to construct several hypothetical social networks to link predefined pairs of pictures. The selected pairs of cards were: (1,12), (2,7), (6,11), (4,5) and (8,9) -the numbers under the parenthesis represent the position of the cards in the order generated by the participant in the first procedure.

We quantified the number of arrays within each hypothetical social network in regard to each participant and used that to evaluate if there was a relation between the amounts of intermediary arrays in the second condition and the distance of that specific pair in the first condition.

Finally, we considered whether the avoidance of dissonance effect was due to the fact that the participants selectively attended to the parameters of their previous classification (a phenomenon named cognitive priming), or if the effect was in fact deeply settled in the unconscious/non attended level. To evaluate that, we analyzed the ‘avoidance of association’ tendency among the internal arrays of each of the social chains.

C. Objective

Our main goal was to analyze whether the distance between the figures of the pair would correlate with the amount of interpolated figures, thus expressing a tendency to avoid proximity among figures previously assorted apart.

Considering that no rewards were offered, we assumed that this could represent the perfect paradigm to investigate the role of cognitive dissonance in general information processing.

Our secondary goal was to evaluate if the phenomenon relies on conscious recalls or if it is unconscious. To achieve that, we tested if the selection an internal array increased the chance of selecting a close related card to generate the next array (‘small steps principle’) or if the selection of the internal arrays followed a random tendency in relation to the position of the cards in first sequence.

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D. Example of the procedure

Fig. 1 Figures as assorted by one of the participants.

Fig. 2 Hypothetical social array between figures ‘1’ and ‘12’.

Fig. 3 Hypothetical social array between figures ‘2’ and ‘7’.

III. Results and Discussion

E. How is the distance between cards of the pair related to the length of the arrays?

Our main parameter to consider the effect of cognitive dissonance in this experiment is directly related to the number of arrays placed between the figures of each defined pair. In this sense, distances are 11 (pair 12,1), 5 (pairs 2,7 and 6,11), and 1 (pairs 4,5 and 8,9).

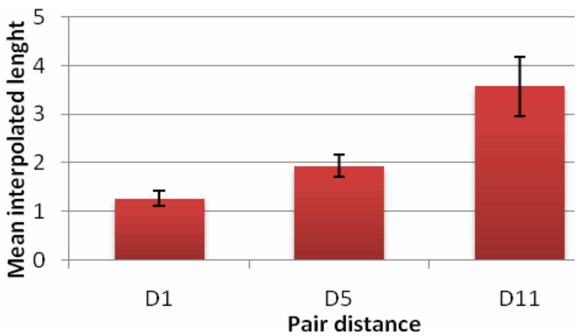

Fig. 4: Mean length of the constructed arrays (excluding the pair of terminal cards) for each position pair – D5 stands for ‘Mean Value for Distance 5’, and D1, for ‘Mean Value for Distance 1’. Standard errors are shown.

It is notable that the number of steps increases dramatically with the distance between the target cards, suggesting that the participants tend to avoid the cognitive contradiction in this associative process.

It seems obvious that if we give a pair with distance 0, this pair will consist of a double presentation of the same figure, which means that in this case the participant should not add any other step to the network. This leads to the assumption that D0=0.

From that start point, we used the Method of Least Square to fit the points (0,0), (1,D1), (5,D5) and (11,D11) with a function from the family $6-\exp(ax^3 + bx^2 + cx + d)$, obtaining the graph in Fig. 5.

We choose this family of functions because it pass through (0,0) and tends to 6 when the distance goes to infinity.

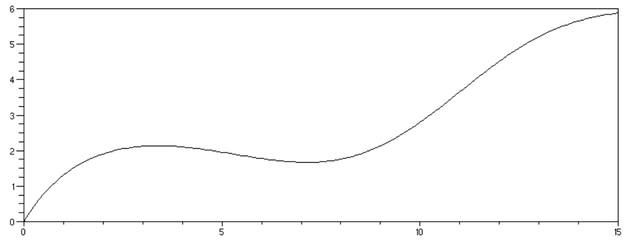

Fig. 5 Curve for Cognitive Dissonance

Moreover, we looked for an even broader organizational process. Using the Kendal-tau correlation index, we could find a measure of how close to the most ordered sequence were each of the sequences produced by the participants. That is, we ordered each sequence of our experiment and then extracted the Kendal-tau index of it.

Based on the distance from the curve in Fig. 5 and Kendal-tau correlation index we defined the general lines of the ‘cognitive dissonance index’, which was confronted with the results produced by a random simulation of 35000 samples, as to analyze the significance of the experimental findings.

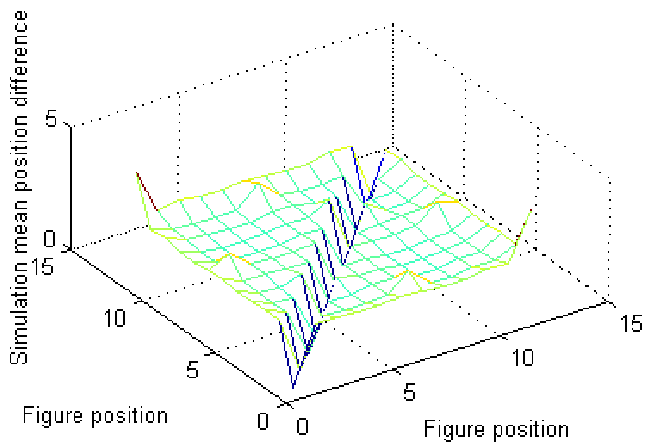

Fig. 6a

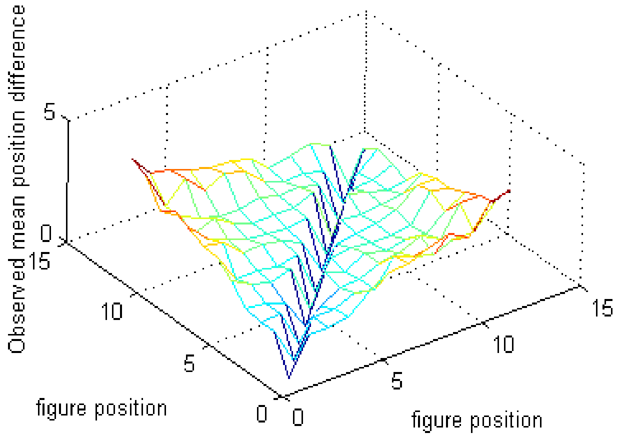

Fig. 6b

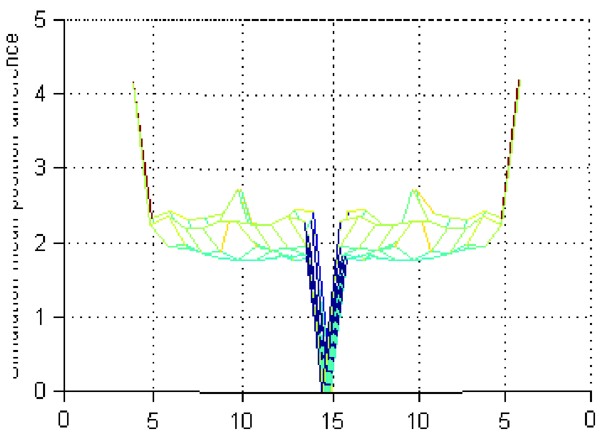

Fig. 6c

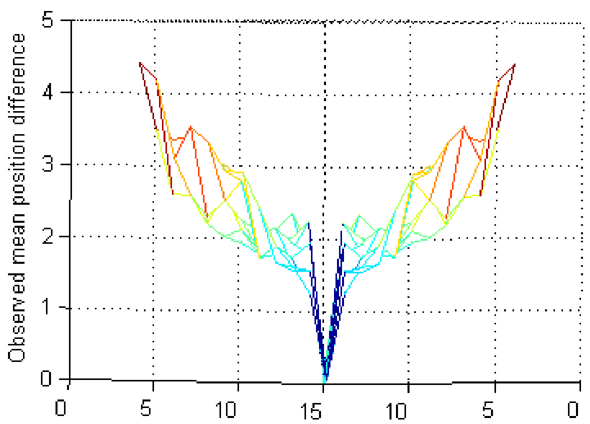

Fig. 6d

Fig. 6 a-d: Mean position difference between each pair of figures (identified by their position in the first array) for all pairs in the sequences (note that the graphics are symmetric since the distance is the same for pairs a,b and b,a). Compare with the random sequences (bottom), lateral views are provided for better visualization.

As the data shows, there is a clear monotonically-increasing relation between the mean position difference within a pair of figures in the initial array and in the constructed sequences.

F. Is cognitive dissonance a consequence of the intention to avoid contradiction, or does it works in an unconscious level?

To answer whether the observed cognitive dissonance effect is unintentional or an expression of the intention not to associate cards previously assorted apart, we took for granted that it is not feasible to track all the interpolated arrays as to avoid associating figures previously distant in the original line. In other words, we assumed that the answer to this question should be searched within the relations between the arrays. Thus, we tested whether the uniform step between the cards of the pair is smaller, bigger or equal a random step, experimentally defined as the uniform step of 35000 computer-generated random samples. The uniform step is defined as Uniform step = Pair position difference / Number of steps, and we evaluated the mean absolute deviation of the uniform step for each sequence.

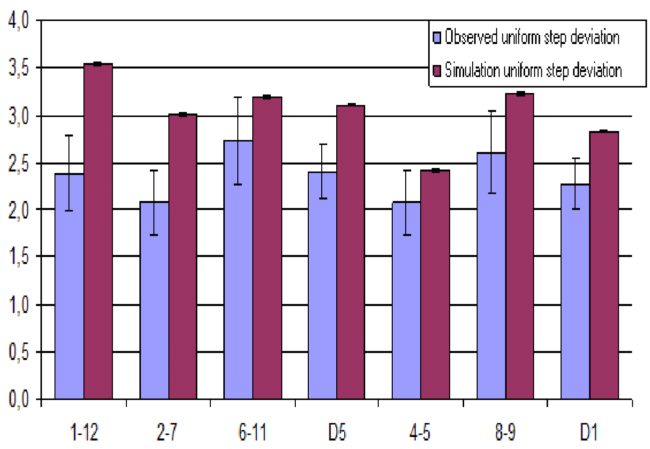

Fig. 7: Mean difference

Statistical analysis revealed that this ‘small step principle’ permeate the task’s execution, except for sequences 6-11 and 4-5. To confirm the effect, we also investigated whether there is a tendency to increase the valence of the array-cards in accordance to the closeness to the highest valence target card; in other words, we investigated whether the sequences reveal a crescent order. This secondary effect is also important because it could be the case that the observed small steps are not related to a consonant ordering, but relative to a ‘back and forth’ disposition of the figures.

For that purpose we measured how distant the sequences are from being completely increasing-order (its 'permutation index') and compared its average with the same measures from random simulations (again N=35000). The 'permutation index' measure we used is the so-called normalized Kendall-tau distance between the original sequence and itself sorted in increasing order, and it is equal to the minimal number of consecutive card swaps required to turn the first sequence into the second, divided by n(n-1)/2 where n is the number of cards. It spans between 0 and 1, being zero for a completely ordered sequence and 1 for a sequence in completely decreasing order (which requires n(n-1)/2 steps for ordering).

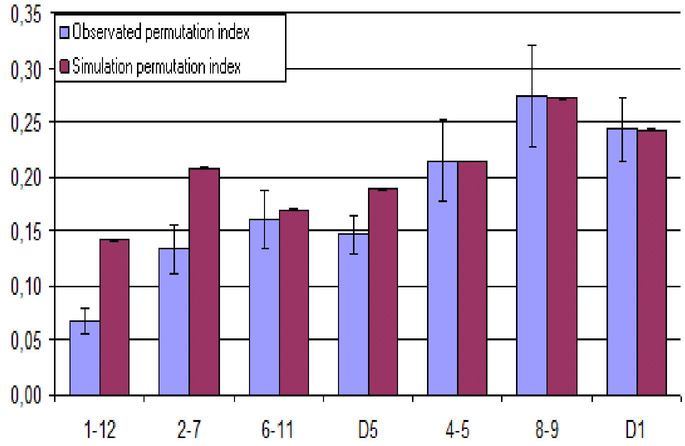

Fig. 8: Permutation index

The results were statistically significative for sequences (1-12; 2-7; and D5). This means that only the sequence (6-11) did not follow a low ‘permutation index’. Our results indicate that the constructed arrays tend to preserve the same distance order between cards, thus supporting the hypothesis of a consonance between closely preferred cards.

VI. Conclusion

In this experiment we reveal the existence of an almost linear relation between the distance within each target pair and the mean number of arrays that tend to be inserted by the participants. Moreover, we also reveal the existence of a general tendency toward small steps and interpolation of crescent-valence figures within the internal arrays (the ‘low permutation index principle’).

The associating of these findings leads to the conclusion that the principle of cognitive dissonance influences performance is this task (and possibly in many other similar tasks), regardless of rewards, punishments and any method to produce motivational contradictions. Moreover, we found that the principle of cognitive dissonance operates out of the conscious level with almost the same strength as it operates under conscious sight.

V. Limitations of the Study

This study presents a potential solution to an old problem, but it was tested in a small population. It is important to replicate this investigation with a higher N, as much as to investigate the effect among other populations, like anti-social offenders and dementia patients. We are currently working on both issues. Recent results suggest that major depression and cognitive decline associated with aging (mild dementia, subclinical Alzheimer, etc.) affect performance, diminishing the average number of social arrays, as much as the average tendency to avoid dissonant associations.

References

[1] Festinger, L., A theory of cognitive dissonance. 1957, Stanford: Stanford University Press
[2] Festinger, L. and J.M. Carlsmith, Cognitive Consequences of Forced Compliance. Journal of Abnormal and Social Psychology, 1959. 58: p. 203-210.
[3] von Neumann, J. and O. Morgenstern, Theory of games and economic behavior. 1944, Princeton: Princeton University Press.
[4] Bem, J.D., Self-perception: An alternative interpretation of cognitive dissonance phenomena. Psychological Review, 1967(74): p. 183-200.
[5] Bem, J.D., Self Perception Theory. Advances in Experimental Social Psychology 1972. 6: p. 1-62.