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Global and Local Attention Processing in Depressed Mood

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Abstract

Background: Attention impairments are the hallmark feature of subclinical depression. The present study used Navon task to compare the allocation of attention to the local and global stimuli in depressed and nondepressed participants.

Method: The primary sample included 186 female high school students from Shiraz city who were selected using cluster sampling. The final sample included 143 participants with a stable mood across two-week mood assessment (73 nondepressed and 70 depressed). A computerized version of Navon task was used to measure attention to local and global stimuli.

Results: Depressed participants showed relatively faster reaction times towards the global stimuli than to the local stimuli when compared with those in the nondepressed group, which implies a more global scope of attention.

Conclusion: Findings are discussed in line with the available conceptualizations of attention changes in depression. In addition, the results are explained in terms of the defocused attention hypothesis and functional perspective of depressed mood.

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Introduction

Depression is expected to become the second biggest health challenge in the world, after cancer by 2020 (1). About 65% of adults will experience depressed mood at some points in their lives (2). Subclinical depression and persistent sad mood are characterized by specific cognitive symptoms (3) which interfere with different aspects of cognitive processing. Among the affected areas are problem-solving and inability to make use of available information (4), working memory (5), memory biases (6), higher-order cognitive skills (7, 8) and visual attention (9).

Depressed people show difficulties in attention-based processing tasks, (10-13). Normal attention is characterized by maintaining a focus on the relevant information and inhibiting irrelevant information, an area in which people with depressed mood show differences from non-depressed people (14). The depressive pattern of performance; namely, allocating proportionately greater amounts of attention to the periphery,

may support the idea that depressives allocate attention to the visual field as if they are watching through a wide-angle lens with a decreased zoom, which addresses the zoom lens model of attention (15). Using gaze-contingent eye-tracking procedures to measure perceptual span in groups of dysphoric subjects showed broader preferred areas of visual attention in depressed than nondepressed individuals while reading (16). It has been proposed that depressed mood (14) and induced negative affect low in motivational intensity (sadness) is associated with a broadened attention (17,18). Moreover, a global processing bias is evident in the low levels of depression (19).

The changes in the attention allocation as seen in depressed people are explained under different conceptualizations. For instance, impaired control of attention in mild depression has been explained as a necessary step in the process of disengagement from unattainable goals, as claimed by the cyclic view of depression (20). From this perspective, attention impairments in depression are playing a functional role in disengaging individuals from unattainable goals after they become eventually unavailable and this goal disengagement could serve human life (14, 20-23). Accordingly, the performance of depressed people in tasks requiring greater levels of attention resources is regarded as indicating an alternative mode of attentional processing, i.e., a defocused mode (14). This mode of attention is characterized by an allocation of relatively more attention to peripheral/ non-central, irrelevant and presumably global aspects of stimuli in depressed participants, as opposed to central, relevant, and local aspects, when compared with nondepressed participants.

Part of the researches that support a defocused and more global attention in the state of depressed mood come from source monitoring task (14) and eye tracking methodology (16). It is assumed that this altered mode of attention brings some functional values for the organism in terms of a heightened capability to adapt to a recent experience of loss (24, 25). Welling (23) argued in a similar vein for a "cognitive map" explanation of depressed mood. According to him, periods of depressed mood might have an evolutionary value in terms of allowing for a time out for the individual. This time out permits for the cognitive structures to be updated for altered circumstances, and to avoid risky actions based on the use of inadequate cognitive maps.

Oatley and Johnson-Laird (1987) argued that the emotion of sadness, in a functional sense, may constitute a "juncture" in an action plan, whereby a previous major plan has failed, and a so-far activated goal is lost. The resulting tendency in an organism, associated with the emotion of sadness, would then be to "do nothing and/or search for a new plan" (25). In such circumstances, a more open, unfocused, unselective, and low-effort mode of attention is presumably not deficient as such, but on the contrary, could be beneficial (14). As Klinger argued (20) dissociating oneself from a goal that has become terminally unavailable is advantageous for an organism, likewise to be receptive and open for an alternative, a new stimulus that might help to shape future goals (26). Therefore, the present study aimed at testing the hypothesis whether or not the depressed participants to display a more global processing when compared with nondepressed participants.

Materials & Methods

Participants

The population included final year female students from the public high schools of Shiraz, Iran. Using

cluster sampling, two high schools were selected at the first stage and three entire classrooms from each of the schools formed the screening sample. Due to the possibility of having participants with the changing mood across the mood assessments, a larger sample size was tested at the initial stage using the Farsi version of Beck Depression Inventory [BDI-II] (27). All of the students (n=186) from the six classes participated in the mood assessment stages (screening). They completed the Farsi versions of the BDI-II and Beck Anxiety Inventory [BAI] (28) two times in a two-week interval. 43 cases were dropped from the final sample due to the changing BDI-II scores across measurements. Therefore, the nondepressed group included 73 (mean of depression= 6.78, ±2.38) and the depressed group included 70 individuals (mean of depression= 21.46, ± 5.43). The mean age was 17.08 ± 0.73 for nondepressed and 17.13 ± 0.78 for the depressed group. Descriptive data are depicted in Table 1.

Instrument

Navon Task**.** The Navon global letter task (28) is widely used as an objective measure of attentional breadth (29, 30). The original Navon task includes five global letter shapes, each made up of small letters arranged in vertical and horizontal directions (e.g., a big H made up of five small Ls). In the standard version, the global targets are T and H that are made up of Ls or Fs. The local targets in these cases are L and F. Participants are instructed to press keys as fast as they can after they see a T or H. Relatively, faster reaction times (RTs) to the global target letter are seen as indicative of a more global mode of attention while faster responses to the respective small, shape-constituting letter is seen as indicative of more local attention (18). In the present study, a Farsi version of the Navon task was employed. The Farsi Navon task includes capital Farsi letters constituting from five small letters in each of the horizontal and vertical aspects. For example, آ (A) constituted of د (D) and ر (R). ک (K) constituted of د (D) and ر (R). د (D) constituted of آ (A) and ک (K). ر (R) constituted of آ (A) and ک (K) (Fig. 1).

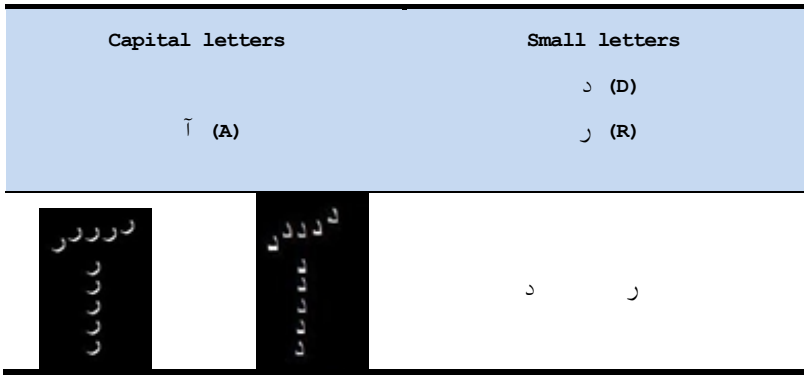

Figure 1. Sample stimulus of the Farsi Navon task

Each of the stimuli was presented 8 times, the total stimuli were 64 in the main study. Each participant was presented with a randomised order of 64 stimuli. A white fixation point was followed after 500 ms by one of the letters. Participants were instructed to respond by pressing one of the Right or Left-Ctrl keys on the keyboard when they saw either of the two Farsi letters including "ا "(A) or "ک" (K) on a 14" LCD monitor, accordingly. The response window was open for 5000 ms after which the next letter was then presented if the participant did not answer at all. A short practice time was included before the main stage.

Procedure

The initial mood assessment was followed by a second assessment in a two-week interval. Those participants with BDI-II scores of 13 and less were classified as nondepressed and those with BDI-II scores of 14 or higher in a two weeks' interval were classified as depressed (27). As the result (after exclusion of those participants whose classifications changed between assessments), 73 were included in the nondepressed group and 70 in the depressed group. In addition, the Beck Anxiety Inventory [BAI] (28) was employed in two stages of assessments to control for the possible effects of anxiety. Stimuli were presented on a 14" LCD monitor. The distance between the middle screen and the participants' eyes was 30^{cm} and their height relative to the middle screen was calibrated by a chin rest and the adjustable lab chair. The stimulus presentation was managed by Opensesame (31) in which a randomized order of the Navon stimuli was presented to each participant.

Table 1. Descriptive measures for nondepressed (n=73) and depressed (n=70) groups

Variable	Nondepressed		Depressed		t
	Mean	SD	Mean	SD	
Age (Years)	17.08	0.73	17.13	0.78	0.38
1st BDI-II	5.95	3.30	21.40	6.1	18.77**
2nd BDI-II	7.61	2.17	21.53	5.14	20.98**
Depression	6.78	2.38	21.46	5.43	20.84**
1st BAI	8.12	7.05	17.89	9.53	6.97**
2nd BAI	9.77	4.05	18.19	8.10	7.82**
Anxiety	8.95	5.30	18.04	8.70	7.52**
Local RTs	838.30	229.52	1003.02	243.87	4.19**
Global RTs	821.27	252.80	891.15	204.17	1.82

* p≤.05 ** p≤.01

Results

The participants' performance on the Navon task was recorded. In the Navon task, the averaged RTs were calculated for each of the local and global conditions. Descriptive information for the outcome variables is depicted in Table 1. The local and global RTs across two groups were subjected to a mixed ANOVA with the Factor Group (depressed vs. non-depressed) and Focus (local vs. global). Mauchly's test

showed no deviation from the assumption of sphericity. In addition, Box's M test showed no deviation of the covariance matrices homogeneity assumption. The main effect of Group × Focus was significant, $F_{(1,143)}$ =6.47, p=0.012, η^2_p=0.043. Simple effects using Bonferroni-correction showed no significant differences in the non-depressed group at the local (*M*= 838.30±229.52) and global conditions (*M*= 821.27±252.80). However, depressed people were significantly faster in responding to the global (*M*= 891.15±204.17) than to the local condition (*M*= 1003.02±243.87), $p \leq 0.0001$ (Figure 2).

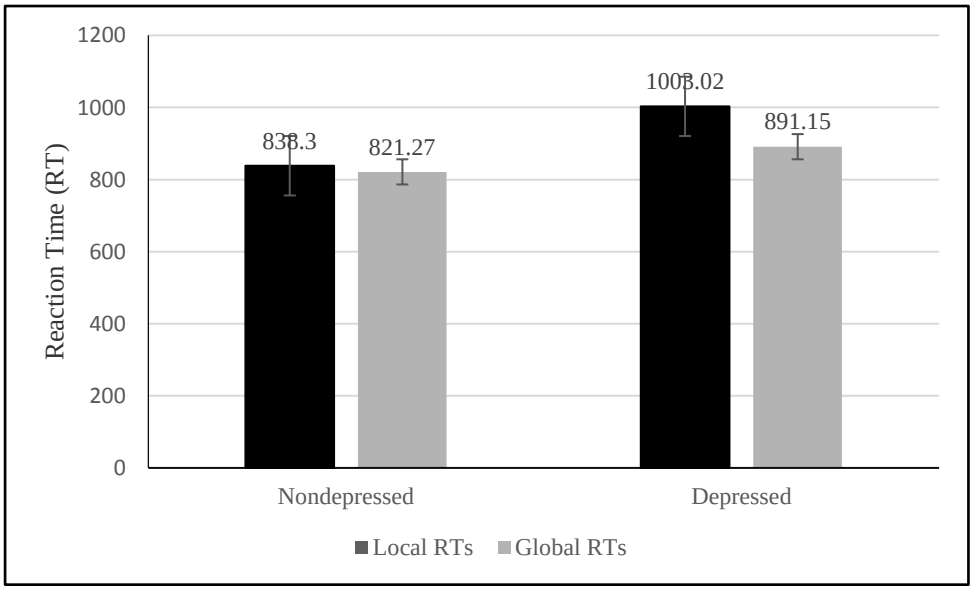

Figure 2. Average reaction times for the local and global stimuli by group

In addition, group comparisons showed significant differences between the depressed and nondepressed groups only in the local condition. People in depressed group were slower (*M*= 1003.02± 243.87) than the nondepressed people (*M*= 838.30±229.52). There was no significant difference between groups in the global condition. Further analysis of data using BAI as a covariate showed the same results. The effect of BAI was not significant on the local and global RTs. Therefore, depressed people were relatively faster in the process of the global task, but delayed at the local stimuli.

Discussion

The present study aimed to examine global and local attention processing in people with subclinical depression. The findings showed that depressed people were relatively faster at the global condition when compared with the local task. Earlier findings gave support to a global preference, i.e., being faster in identifying the stimulus features at the global level (29) and at the mild levels of depression (19). This finding may show that depressed people are allocating attention in a more global mode. It might be viewed in line with the earlier studies that depressed mood (14), and induced negative affect

low in motivational intensity (sadness) is associated with a broadened attention (17, 18).

One way to explain the finding is the conceptual views of sadness that suggest depressed mood occurs after a failure in the major plan or loss of active goal which in turn causes one to do nothing and/or search for a new action plan (25). Depressed mood is associated with declining goal engagements in which the hierarchy of goals are revised in the light of current failure (20). In such the circumstances, "a wider (9), unselective, low-effort mode of attention, namely; a defocused attention" (14, 16) would prove not deficient but, on the contrary, beneficial'' (14). This interpretation fits with the past views, suggesting that disengaging from a terminally blocked goal and remaining open to new goals and previously irrelevant action plans, as materialized in a more global attention, might be part of the function of sadness and depressed mood (20, 26).

It is worth recalling that the results are inconsistent with the earlier findings in which depressed mood found to be associated with item-specific and detailed-oriented processing, whereas positive mood was linked with more general, schematic and relational processing, (30). The findings are also inconsistent with depressive diligence conceptualization in social information processing (32). According to control motivation hypothesis, there is a possibility for the generally superior performance of depressives in some of the tasks (33-37). According to this hypothesis, it seems possible that the experience of failure and depressed mood facilitates more detailed, effortful and complex attentional processing with the aim of regaining control.

One way to reconcile the conflicting findings from defocused attention hypothesis with depressive diligence and control motivation predictions is considering the nature of the tasks employed. In depressed mood, people are expected to perform faster and more efficiently (as opposed to nondepressed individuals) when the task allows (i.e., in the target-locating task, 38, 39). Earlier findings showed that it is more likely to expect a control motivated performance; (a) when individuals experience a low amount of control deprivation or, (b) when the test task is easy (i.e., does not require considerable amounts of cognitive resources), or, (c) when a schema that may help for optimal performance is highly accessible (33). Control deprivation may, however, result in decreased performance in information processing when the level of control deprivation is too high, which may be relevant to depression, where deprivation of control can be the core factor (40). Hence the pattern of performance of depressed people as observed in the present study cannot be explained in terms of depressive diligence and control motivation frameworks due to the nature of task employed.

In conclusion, the finding showed that mood has a significant effect on global and local processing. What remains to be studied is why mood triggers differential processing styles, under what conditions global and/or local processing is favored, and whether or not the observed pattern of attentional processing might be evident for the further levels of cognitive processing.

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