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Research Paper

Can Everyday Visual Stimuli Help Parents Identify Depression Risks in Adolescents?

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ABSTRACT

Studies have shown that participants' mood affect the style of processing of visual stimuli (Global processing bias and Local processing bias). While negative mood is associated with increase in local processing, positive mood was observed to increase in global processing bias. Building upon these findings, the current study investigates the relationship between depression and visual processing using a local and global processing task. However, unlike previous studies on the subject, the current research doesn't use Navon's task (Navon, 1977) or Kimchi's figures (Kimchi, 1988); instead, this research uses a power point presentation of slides with pictures of everyday visual stimuli (for example- a slide containing pictures of two cars of same make and model but different colors). This enables the researchers to investigate whether parents can use non-standardized, everyday visual stimuli to asses depression risks in adolescents. In the task, a set of 12 slides containing pictures of everyday visual stimuli (prepared by a professional illustrator) were presented to the participants. Eight pre-created slides were used to enable global processing (identical and negative match stimuli), while four pre-created slides were used to enable local processing. The participants (adolescents) were instructed to identify and report the pair of stimuli as 'same' or 'different' in each slide. As a control measure, the age, education level, city and socio-economic background of the participants (N=20) is kept same. It was observed that the participants who showed evidence of the global processing bias (identifying images as 'same') scored low on Beck Depression Inventory (BDI). By contrast, participants who prioritized local processing (identifying the images in slides as 'different'), self-reported significantly higher level of depression on BDI. This observation indicates that depression maybe associated with a reduction in the tendency to prioritise global-level processing in adolescents. Thus, enabling parents of adolescents to use daily activities to identify risk of depression in the children and being proactive with respect of mental health of depression. To best of the author's knowledge this is first study in this area. Therefore, it requires further investigation and cross-cultural studies.

Keywords: *Visual processing, Depression, Adolescents*

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According to World Health Organization more than 264 million individuals are suffering from depression. Depression at its worst can lead to suicide. Annually, 800 000 people (approximately) die due to suicide, majority of them are 15-29 years old (World Health Organization, 2020). However, early intervention is not only positively correlated with improved mental well-being but also reduced economic burden on global health (Charles, 2012).

Therefore, this paper proposes adopting a proactive approach to depression by empowering parents to identify depression risks in adolescents using everyday visual stimuli. To the best of the author's knowledge, this study is first of its kind; investigating whether global and local processing bias in visual processing can be used as a tool by the parents to identify and address depression risks in adolescents. Therefore, this paper is significant because it not only investigates how parents can be equipped with a tool to understand the perspective of the adolescents and how understanding that perspective can be related to understanding depression risk. This idea not only comes from previous psychological researches on depression and visual processing (Li-Jun Ji, 2019) (Basso, 1996), but also has spiritual backing (Cutler, 1999). In the book, Dalai Lama (Cutler, 1999) discusses, "If you broaden your perspective, and look at the situation from a global perspective, then you might see some basis for hope… you can see that the wider one's perspective, the greater the possibility for hope"

Dalai Lama attributes the achievement of happiness to adopting a global perspective in outlook (Cutler, 2009).

Similarly, in scientific community, Navon's classic study has established the individuals process information from two different perspectives, namely, global processing bias and local processing bias (Navon, 1977). According to Navon (1977) global processing bias refers to the style of visual processing in which the individual attends to the Gestalt of a stimulus, whereas in local processing bias, the individual attends to specific details of the stimulus. While there are studies associating happiness with global processing (Li-Jun Ji, 2019) and negative mood with local processing (Basso, 1996), the present work empirically examines how global vs. local visual processing can help in identifying depression risks in adolescents using everyday visual stimuli.

Studies have shown that dysphoric moods result in an information processing advantage of the left hemisphere over the right (Tucker, 1981) and depression leads to better recall for verbal (left hemisphere) than visual (right hemisphere) information (Deptula, 1991). Moreover, patterns of cortical activity further substantiate the above-mentioned cognitive conclusions. For instance, using EEG measures have demonstrated that individuals with histories of clinical depression tend to have greater left than right posterior arousal during resting baselines (Henriques, 1991). Researches have revealed that depressed individuals have greater left than right parietal arousal (Davidson, 1985) and it is well established that global processing bias is primarily a function of the right temporo-parietal region (Robertson, 1992).

This phenomenon is explained in the 'Affect-as-information' hypothesis (Schwarz, 1983). The hypothesis states that the individual's use mood as in information to make meaning of the presented situation. Under this model, positive mood results in global processing while negative mood signals the individual that the situation is problematic and that detailed and systematic processing is necessary.

Another explanation comes from mood maintenance motivation (Isen, 1987) suggesting relationship between mood and level of processing is mediated by motivation. Additionally, local processing draws attention to details, which is effortful and hence results in reduction of mood (Clore, 2001). This led researchers to conclude that when in a positive mood individuals may be less motivated to use detail oriented and effortful local processing as it may lead to mood reduction and are more motivated to employ global processing bias as a heuristic for visual processing of the stimulus present (Bless, 1995).

Based on these considerations following predictions are tested in this research. Firstly, there's difference in processing different visually presented stimuli (global and local processing bias). And, secondly, global processing is negatively associated with depression, while local is positively associated with high level of self-reported symptoms of depression.

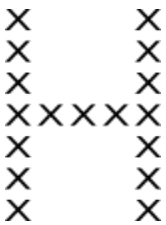
For this participant (N=20) were first presented a set of 12 slides of visual stimuli to asses to determine the local v/s global processing bias and then Beck's Depression Inventory II (BDI-II) was administered to assess their self-reported symptoms of depression. The slides used in this study differ from Navon's classic figures (Navon, 1977), as unlike Navon's figures the slides show picture of everyday visual stimuli (Appendix C). This makes the correlation between levels of depression and styles of processing observed in this field-work significant; as a further systematic study of this may equip parents of adolescents with the tool to use daily activities as a predictor of risk factors of depression in their children.

REVIEW OF LITERATURE

David Navon was first to present the concept of global and local processing bias in visual processing (Navon, 1977). Navon's classic paradigm discussed that when objects are arranged in groups, there are global features and local features. Navon used the following example to illustrate his point; a group of trees has local features (the individual trees) and the feature of a forest (the trees together).

Therefore, the key finding of Navon's work is that people are faster in identifying features at the global than at the local level. This effect is also known as global precedence.

An example of a Navon figure is shown below. The figure has a global feature, it looks like an H. Its local feature are the many small letters X the figure is made of. People are typically quicker detecting an H than an X.



The global precedence effect is not just observed in this specific setup. For example, generally words are recognized quicker than its individual letters.

Basso and colleagues (Basso, 1996) found that global processing was positively correlated with individuals' trait happiness and negatively correlated with individuals' trait depression. The tendency to focus on details and individual parts of a situation, instead of focusing on the big picture, has also been associated with depressive symptomatology.

Srinivas and Hanif's recent study found that global processing facilitated the identification of happy faces, whereas local processing facilitated the identification of sad faces. This implies that global level of processing may have potentially directed one's attention to positive mood stimuli (e.g., happy faces), which can be helpful in maintaining or promoting one's happy mood. Likewise, broadened associative thinking or divergent thinking led to a more positive mood, whereas narrow associative thinking or convergent thinking led to a more negative mood (Srinivasan, 2010).

Furthermore, positive affect is also associated with the release of dopamine in the brain, which is associated with the increased release of acetylcholine that plays an important role in the normal functioning of the hippocampus in the MTL (Ashby, 1999). Given that both cognitive and affective processes share a common brain network, and are associated with dopamine release in the brain, it is possible that broadened global cognitive process can promote positive mood via their overlapping neuropsychological pathways.

METHODOLOGY

Problem

Is there a relationship between the self-reported symptoms of depression and the visual processing styles (global processing bias and local processing bias) in adolescents in India?

Objective

To demonstrate a link between global processing and low level of self -reported symptoms of depression, and between local processing and high level of self-reported symptoms of depression adolescents.

Hypothesis

There's a significant difference in the levels of self-reported symptoms of depression between adolescents with global processing visual bias and local processing visual bias.

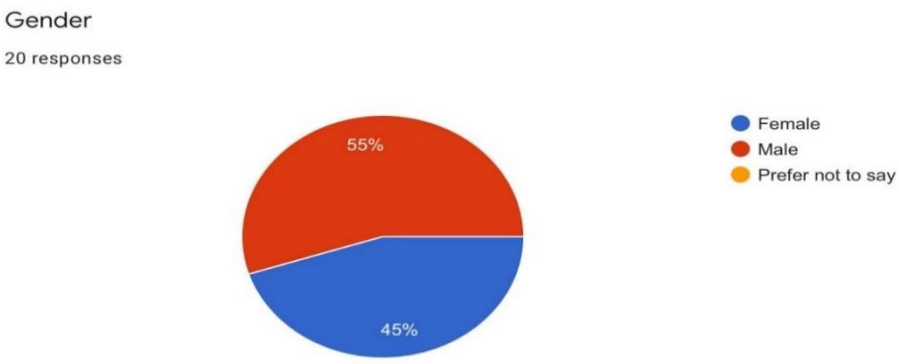
Variables

- *Independent Variable:* Style of visual processing (global or local processing)
- *Dependent Variable:* Self-reported symptoms of depression

Participants

To control the impact of age, education, socio-economic status, all participants (11 males and 9 females) were randomly selected from standard XII of J.B. Memorial Manas Academy, Pithoragarh, Uttarakhand with mode age 17 years as illustrated in graph 3.1

Graph 3.1 Illustrating the gender of the participants



Material Required

a. Set of 12 slides in the form of PowerPoint presentation (created by Amit Kaikini, professional illustrator & design consultant).
b. Stop watch
c. Beck's Depression Inventory

Description of material

Set of 12 cards: Card no's 1, 4,7, and 10 are prepared using Identical Match. These are used to enable global processing. While, card no's 2,5,8, and 11 are prepared using Negative Match. These are also used to enable global processing. In contrast, card no's 3,6,9, and 12 are prepared using Name Match. These are used to enable local processing.

Beck's Depression Inventory-II (BDI-II): The field study used the Beck Depression Inventory-II (BDI-II)- a 21-item questionnaire that can be self-scored. In this study, participants were administered BDI-II online via google meet app for self-reporting and self-scoring of symptoms. BDI-II was used to assess the presence and degree of depressive symptoms (Dermott, 2019). The author selected this instrument on the basis of the significant empirical support for its use in non-clinical population (Dermott, 2019).

Scoring:

The BDI-II is scored by adding the ratings for the 21 items in the questionnaire. Each item is rated on a 4-point Likert scale ranging from 0 to 3. The interpretation of score is in following table 3.1.

Table 3.1: Interpretation of BDI scores

Total Score	**Level of Depression**
1-10	These ups and downs are considered normal
11-16	Mood disturbance
17-20	Borderline Clinical Depression
21-30	Moderate depression
31-40	Severe depression
Over 40	Extreme depression

Procedure

Phase I: On July 17, 2021, the experiment was conducted through google meet app. The participants were made to sit comfortably. The following instructions were given to the participants, "You will be shown some slides with some information. You will see each card for a very brief period of time. Observe the card carefully and report whether the two items presented are "same" or "different". Start when the ready signal is given to you". The experimenter gives a ready signal before presenting each slide and notes down the time taken for the subject to respond using the stop watch. After presenting the 12 slides the experimenter calculates the results. (To take response time, start the stop watch as soon as the slide disappears and stop after the participant gives the response (same/different).)

Table 3.2 Correct response table for the slide

Slide No's	Identical match (Response)	Slide No's	Negative match (Response)	Slide No's	Name match (Response)
1	S	2	D	3	S
4	S	5	D	6	S
7	S	8	D	9	S
10	S	11	D	12	S

Phase II: On July 19, 2021, The Beck's Depression Inventory-II (BDI_II) was administered on each participant individually in an interview format through google meet app. The respondents were asked to rate each item based on four response choices according to the severity of the symptoms, ranging from the absence of a symptom to an intense level, during the past two weeks. Their scores were recorded by the experimenter.

Precautions

a. Care should be taken to show the slides for a brief period.
b. Participants should not be exposed to slides before experiment.
c. Care should be taken to present the slides in an order i.e., identical match, negative match and then the name match.
d. Care should be taken to note time immediately while the subject is responding.
e. Experimenter must be familiar and trained in administration of BDI.
f. The experimenter must ensure that the participant has understood the instructions (phase I) and the questions (Phase II) well.
g. The experiment must be conducted in a distraction free environment.

RESULTS:

The data for the group statistics for visual processing is illustrated in Table 4.1(Appendix A);

Table 4.1: Group Statistics for visual processing

Visual Processing	Total Score (N=20)	Mean	Standard Deviation	Standard Error Mean
Global	3	2.6667	2.08167	1.20185
Local	17	21.5294	12.17640	2.95321

The result of the administration of BDI-II on the participants is discussed in Table 4.2;

Table 4.2 Number of participants with self-reporting symptoms of depression

Category	No. of Participants
Participants with normal levels	06
Participants self-reporting symptoms of mood disturbances	04
Participants with self-reporting symptoms of borderline depression	01
Participants with self-reporting symptoms of moderate depression	04
Participants with self-reporting symptoms of severe depression	03
Participants with self-reporting symptoms of extreme depression	02

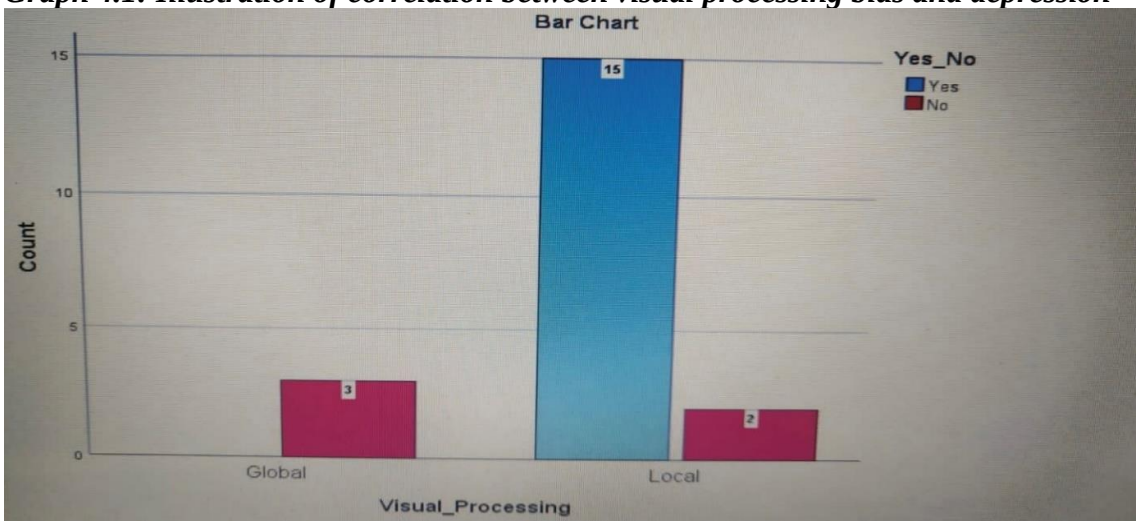
The relationship between depression and visual processing bias can be observed in Table 4.3;

Table 4.3: Relationship between Depression and Visual Processing:

Levels of Processing (N=No. of participants showing the visual processing bias)	**No. of Participants with Normal scores of depressions**	**No. of participants showing mild to extreme scores of depressions**
Global (N=3)	03	00
Local (N=17)	02	15

The relationship between visual processing (global and local bias) and depression is illustrated in Graph 4.1, where 'Yes' indicates the number of participants reporting symptoms of depression on BDI-II, and 'No' indicates participants whose BDI-II scores where in the normal range.

Graph 4.1: Illustration of correlation between visual processing bias and depression



To assess the significance of the difference in the level of self-reported symptoms of depression in global and local processing bias Chi Square (Fisher's Exact Test) was administered (appendix B) and results can be observed in Table 4.4. SPSS software was used for the statistical analysis.

Table 4.4 Statistical Analysis

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	10.588a	1	0.001		
Continuity Correctionb	6.405	1	0.011		
Likelihood Ratio	10.178	1	0.001		
Fisher's Exact Test				0.009	0.009
Linear-by-Linear Association	10.059	1	0.002		
N of Valid Cases	20				

a. 3 cells (75.0%) have expected count less than 5. The minimum expected count is .75.

b. Computed only for a 2x2 table

DISCUSSION

The Fisher's Exact Test score (Table 4.4) indicates that there's a significant difference between the two proportions: Level of self-reported symptoms of depression in participants with global processing bias and the level of self-reported symptoms in participants with local processing bias. Fisher's Exact Test is administered because the variable (depression) is qualitative and on nominal-binary scale of Yes or No (Graph 4.1). Moreover, since the sample was small (Global processing bias, N=3), Fisher's Exact Test is more accurate, as the test is specifically designed for small samples. The Chi- Square was giving only an approximation (Table 4.4) while Fisher's Exact Test provided the exact value (Table 4.4).

From Table 4.3 one may find the observed frequency of depression in participants with Global bias in visual processing is 0 (n=3), while the observed frequency of depression with participants with Local bias is 15 (n=17). The data, however, reflects relationship between the two variables (depression and processing bias) and not causality. The experimenter recommends further investigations on the matter of causality between the two variables.

Therefore, to summarize, the level of self-reported symptoms of depression is significantly lower in adolescents with global processing bias (Table 4.1) as compared to adolescents with local processing bias (Table 4.2). Thus, implying that the self-reported symptoms of depression are negatively related to global processing bias and positively related to local processing bias in adolescents in India.

CONCLUSION

Therefore, the hypothesis that there's a significant difference in the levels of self-reported symptoms of depression between adolescents with global processing visual bias and local processing visual bias has been proven.

Implications

This study, creates an opportunity to educate parents of adolescents regarding how to use every day visual stimuli to assess the risk factor for depression in their children. Therefore, this study empowers us to adopt a more proactive approach to addressing depression in adolescents rather than reactive.

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Conflict of Interest

The author declared no conflict of interest.

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