Examination of the Relationship between Depressive Mood Level and Attentional Bias

Abstract

Summary: Attention is defined as the cognitive process to detect a particular internal or external stimulus, and maintaining focus are closely related to mood. The orientation of the attention resource (Attention allocation) is shaped by the mood of the person. Focusing more on negative and threatening stimuli than neutral and/or positive stimuli in the outside world is called "Attentional Bias". This article emphasizes that attentional bias is linked with the level of depressive mood state, between a low level of depressive mood and a high level of depression. **Aim:** This research aimed to examine if there is an attentional bias toward negative stimuli among individuals with depressive symptoms. **Materials and Methods:** The Hamilton Depression Rating Scale and the Point Locating Task were administered to the participants. The research consists of a sample of 90 undergraduate and graduate students selected by random sampling method. **Results:** Based on the research findings, there is a positive and significant relationship between the level of depression and attentional orientation. The result of the study indicated that there is a significant negative relationship between depression scores and attentional orientation. When the attentional bias of the participants was examined according to their depression levels, it was found that the attentional bias of the participants with moderate depression symptoms was significantly higher than those without depression symptoms. **Conclusion:** These results indicated that relationship between attentional bias and depression level. Further studies are needed to examine depression levels and attentional bias levels in a larger sample size.

Keywords: *Attention, attentional bias, cognitive processing, depression, dysthymia, mood disorders*

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Introduction

Attention includes expressions, including the individual's perception and interpretation of an existing item or event, the organism's methods of obtaining information, and the development of problem-solving skills.[1] As a widely known expression, attention is defined as certain conscious reactions created for the stimuli perceived by the sensory system and the orientation of the mental process.[2]

The concept of attention is a subject emphasized in many fields, including psychology, education, and sociology. Since not all stimuli in the outside world can be processed by the human brain, certain stimuli are passed through a filter.[3] While the important and necessary stimuli are selected and included in the information processing, some of the stimuli that are not important, negative, or currently useless are generally ignored.[4]

Attention is automatic or controlled reaction with certain levels of effort, selective based on the individual-target relationship, divided and focused based on the number of stimuli present in the environment. In addition, attention is divided as sustained attention according to the duration of focus.[5] It is known that the organism selects the stimuli that are important for it due to its limited capacity, and the elimination of the stimuli that are not important could be maintained through selective attention. The fact that the speed of perceiving important stimuli takes a shorter time compared to other stimuli is defined as attentional bias, which is a concept related to selective attention. Attentional bias is the tendency to prioritize the perception and interpretation of stimuli that are important to the organism.[6]

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For instance, important names, numbers, messages with emotional content, stimuli associated with pathologies including anxiety disorder and depression, and stimuli that may pose a threat to the individual may lead to the development of attentional bias.[7-10]

Mood disorders are characterized by intense unhappiness. Mood disorders are among the most common mental illnesses worldwide. In general, depression manifests itself with a decrease in self-confidence that can last for years, the lack of pleasure and interest in work and life, hopelessness, and social isolation. Certain factors, including daily life stressors, traumas, and the environment, increase the likelihood of a person having depression symptoms. However, despite the presence of the triggering environmental factors, the severity of depression symptoms can differ. The diagnostic and statistical manual of mental disorders (DSM 5) has a wide variety of subdimensions specific to the diagnosis of depressive disorders. These include disruptive mood dysregulation disorder, major depressive disorder, dysthymia, premenstrual dysphoric disorder, substance-related depressive disorder, depressive disorder resulting from medical disorders, and undifferentiated depressive disorder. However, the most prevalent type is a major depressive disorder. According to DSM 5, the symptoms of major depression are depressed mood, decreased interest and desire, appetite disorders, sleep disorders, slowed psychomotor activity or restless mood, fatigue, guilt, feeling of worthlessness, attention disorders, and suicidality.[11] While some of the symptoms may be the result of sadness in the face of any situation, some of them may be a symptom of depression in a more complicated way. At this point, symptoms can be categorized according to the severity of the condition. For instance, psychomotor agitation, suicidal thoughts, psychotic thoughts, the feeling of worthlessness, and significant functional impairment are determinant findings for depression. On the other hand, sadness, loss of appetite, insomnia, difficulty with concentrating, and fatigue can be included as a symptom of depression if they are observed with more severe symptoms mentioned above.[12]

When the relationship between attention and depression is examined, people with depression usually pay attention to information that is related or consistent with their negative cognitive schemas and then easily remember them. Among depressive individuals, the attention source is directed more toward negative stimuli and positive stimuli are ignored, which is called "Attentional Bias."[13,14] According to a review study examining the relationship between attentional bias and depression, it was found that depressed individuals had more biased attention to negative stimuli toward themselves and their environment.[15]

The speed of perception for an emotional situation can provide information regarding attentional bias. In a study Suslow, Junghanns, and Arolt. in 2001, it was revealed that patients diagnosed with depression react more slowly to positive emotions. When the reactions shown to negative facial expressions are examined in the same study, there is no significant difference between patients with depression and individuals without a diagnosis of depression. It was also found that patients with depression showed a relatively slower response to positive facial expressions. Emotional expressions were more intense in negative situations due to attentional bias among individuals with depressive symptoms. Therefore, for depressive individuals, attentional bias slows down the process of focusing on positive situations and events.[16]

Cognitive symptoms in depressed individuals are usually reduced cognitive flexibility and inadequacy of thought content. People with depressive symptoms often have slower information processing speeds. Patients with depression may have difficulty with maintaining their daily routines. Furthermore, they may be very busy with their work, family, money, and health, but their preoccupations are mostly pessimistic and hopeless.[17]

The study by Taşpınar and Pakyürek in 2020, it was found that the more emotional encoding of personal memories of individuals may affect their attention to stimuli. It was also noted in the study that diagnosis duration, depression subtype, drug or substance use, and which subitems they have in DSM-V diagnostic criteria should be determined when considering their level of attention. In the same study, it was also thought that there might be differences between those who meet the criteria for difficulty in concentration and those who do not when elaborating on the dysfunctions in attention. Researchers also indicated that the presence of people with different psychiatric diagnoses along with depression might prevent a meaningful conclusion from being drawn between the severe depression group and the moderate depression group. Therefore, it can be understood that there is a need for studies examining the relationship between attention and depressive symptoms.[11]

Individuals with depressive symptoms tend to pay more attention to negative information than to positive information. Selective attentional bias in information processing is very important in terms of its continuance and repetition. In a study by Baert, Raedt, Schact, and Koster (2010), the effects of bias modification on depressed patients were examined. According to the results of the research, it was observed that as the severity of depression increased, attentional bias increased among the patients. According to the results obtained in terms of attentional bias modification, it was concluded that moderate and severe depressive symptoms increased after training.[18] In another study conducted with images for examining attentional biases of depressed individuals toward interpersonal aggression, it was found that depressive individuals show biased attention toward aggressive pictures.[19] conducted a study with participants with high levels of trait anxiety and state anxiety. The results showed that female participants had attentional biases toward

angry faces, whereas it was observed that male participants showed an attentional bias toward cheerful faces.[20]

In another study, in which emotions were expressed with facial expressions, it was hypothesized that depressed individuals pay more attention to angry faces. Based on the findings, when depressed individuals are compared with individuals without a history of depression, there is a stronger attention for angry faces among individuals with depressive symptoms compared to the healthy control group.[21]

In another study by Bodenschatz, Scopinceva, Rub, Suslow (2019), it was hypothesized that individuals with the major depressive disorder had an attentional bias towards negative emotions, and it was pointed out that the reasons could be related to early maladaptive life events, namely childhood traumas. Study findings indicated that negative attentional bias of depressed individuals is related to childhood traumas and that negative attentional bias increases according to the severity of childhood traumas. In addition, as depression increases, attentional bias also increases in this study.[22]

In another study by Boyacıoğlu and Aktaş, it was found that as the symptoms of depression progress, people put their negative memories and life events at the center of their lives. As the level of depression increases, the individual tends to have more negative feelings and thoughts.[23] Another study was conducted to turn attentional bias among adolescents with depressive symptoms. Based on the findings, depression level increases while attentional bias increases among adolescents.[24]

In another study examining whether attention can be controlled with attentional bias modification in major depression or not, it was found that the level of depression and attentional bias toward negative emotions and thoughts significantly correlated.[25] However, Krings, Heeren, Fontain, Blairty has an experiment with face expressing different emotions with individualc with a diagnosis of major depressive disorder, indivivualrs with depressive symptoms even without a major depressive disorder diagnosis, and individuals without any symptoms of depression. The results of the study indicate that there is no positive or negative attentional bias among depressed individuals.[26]

Elgersma, Koster, Vugteveen, Hoekzema, Pennix, Bckting (2019), conducted retrospective scans of depressed patients over a 4-year periond and noticed that the same negative attentional bias was not present in each depressive episode. According to this study, there is no continuation of attentional bias, which includes the same positive or negative emotions, in severe depression. Based on the findings, as the severity of depression increases, attentional bias may increase, may not change, or may decrease. This situation can be explained by individual differences.

In light of the literature related to the relationship between depressive symptoms and attentional bias, it can be considered that there is a positive and significant relationship between attentional bias and depression. In line with this study, when the literature is examined, it is aimed to examine the relationship between depression and attentional bias to examine the relationship between these two concepts in detail. In this direction, research questions will be listed as follows:

Is there a significant relationship between depression and attentional bias?

Do depressed individuals have increased attentional bias toward negative emotions?

Materials and Methods

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Sample

The age range of the research sample was 20–45 years. Participants are university students at Yeditepe University, Sabancı University, and Gedik University. In order to eliminate the confounding effect that may occur due to the psychiatric comorbidity of people with mild depressive symptoms, a clinical interview was conducted, and the brief symptom inventory (BSI) was applied. Participants with the possibility of psychiatric comorbidity based on clinical evaluation and BSI results were excluded from the study. The sample was chosen by random sampling method, and quantitative data collection methods were used in the study.

Point locating task was applied to measure attentional orientation, which includes the calculation of the reaction rate to the positive stimulus.

The Hamilton Depression Rating Scale was used to measure the symptoms of depression. The sample consisted of people with a score between 3 and 17.

Participants who used psychiatric drugs and received psychotherapy in the last 2 months, had comorbid psychopathology, had organic brain disease, were in grief, wore glasses and had visual impairments, and did not have computer skills were excluded from the study.

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Measurement and materials

Demographic information form

Demographic information form was created as a form, in which the characteristics of the participants, including age, gender, marital status, occupation, education level, and eye health were recorded.

Brief symptom inventory

BSI was developed by Derogatis in 1992 and adapted into Turkish by Hisli Şahin and Durak in 1994. The BSI,

consisting of one additional scale and nine subscales, is a 53-item self-report inventory. BSI evaluates the psychological symptoms of a total of 10 symptom groups and the level of strain related to these symptoms. Three global indexes are obtained from the inventory. These indices are: "Symptom Total Index," "Symptom Severity Index," and "Global Severity Index."[28]

Cronbach reliability values were determined by alpha analysis; item total coefficient was in the range of 0.21–0.78, and the reliability coefficient was found as 0.97. BSI has five subscales, including negative self, hostility, somatization, anxiety, and depression. Higher scores indicate an increase in the relevant subscale and the highest total score that can be obtained is 212.[27]

Hamilton depression rating scale

Hamilton Depression Rating Scale was developed in 1960 and was adapted by Akdemir *et al.* in 1996. The 17-item scale aims to measure the symptom pattern and severity of depression. The level of sexual desire, difficulty in falling asleep, waking up in the middle of the night, waking up early in the morning, weight loss, somatic symptoms, and poor insight are scored between 0 and 2, while the remaining items are scored individually. A range of 0–7 points indicates the absence of depression. A score of 8–15 indicates mild depression, a score of 16–28 indicates moderate depression, and a score of 29 and above indicates severe depression.

Point locating task

MacLeod, Mathews, and Tata formulated this task in 1986 to assess attentional bias. This task has been widely used in attentional bias studies since then. The Point Locator Task begins with an "X." After this sign disappears from the screen after 1000 ms, a word pair appears on the left and right of the screen at equal intervals (13 cm). This pair of words that appear will disappear after 500 ms and a dot appears on the left or right side. The dot remains on the screen until the participant presses the keyboard key in the direction it is associated with. Thus, it is determined that the participant reacts more quickly to the point after which word content and this reaction speed is recorded. In this configuration, both the region where the dot appears, and the distribution of word contents are equalized to control the confounding effect that may occur depending on the direction.

In this study, the Point Locating Task, which was developed for the measurement of attentional bias, was developed with the "OpenSesame 3.3.9" program. OpenSesame is a software and an algorithm used in psychology, neuroscience, and experimental economics. During the application with the software, words with negative and positive content were added to this interface one by one.

Procedure

The research was conducted in an online environment, preliminary information was given to the participants to meet the technical conditions. A list of 120 applicants was evaluated prior to the application. Participants who could not meet the technical requirements were not included in the study. A clinical interview and BSI were conducted with people who met the inclusion criteria. The Point Locating Task and the Hamilton Depression Scale were applied to the participants who met the inclusion criteria. The sample consists of 90 participants. The application was conducted with the shared screen with Teamviewer. For the results not to be affected by the screen size of the computers, it is provided to use laptops in the 15–16-inch range. Besides, it has been confirmed that the internet speed is in the ideal range of 16–35 Mbps. In case of Internet disconnection, the internet provider of the mobile phone was used during the application. The participant's distance with the screen was fixed at 60 cm, and it was ensured that the participant did not change his direction or distance during the application. The researcher was present online throughout the process.

Results

The frequency distributions of the participants' socio-demographic variables are given [Table 1]. In the study, which included 90 participants, 57.8% (52 people) were female and 42.2% (38 people) were men. According to education level, undergraduate graduates are 68.9% (62 people) and postgraduate graduates are 31.1% (28 people). According to the marital status variable, the rate of single people is 53.3% (48 people) and married people are 46.7% (42 people).

Kolmogorov–Smirnov and Shapiro–Wilk values given in Table 2 are $P < 0.05$, it is seen that the data do not show

Table 1: Frequency distributions of sociodemographic variables

Sociodemographic variables	Groups	Frequency (%)
Gender	Female	52 (57.8)
	Male	38 (42.2)
Level of education	Undergraduate	62 (68.9)
	Graduate	28 (31.1)
Marital status	Single	48 (53.3)
	Married	42 (46.7)
	Total	90 (100.0)

Table 2: Normality test findings

	Kolmogorov–Smirnov			Shapiro–Wilk		
	Statistics	df	P	Statistics	df	P
Hamilton Depression Scale	0.167	90	<0.001	0.903	90	<0.001
Attentional orientation	0.217	90	<0.001	0.891	90	<0.001

a normal distribution. In this case, nonparametric measures were preferred, and depression and attentional orientation scores were examined.

Spearman correlation findings of the relationship between Depression and Attention Direction Scores of the participants in Table 3, a strong, negative and significant relationship was found between depression ($r_s = -0.911$; $P < 0.001$) and attentional orientation.

Results of the Whitney U test comparison of depression and attention orientation scores by gender are given in Table 4.

Mann–Whitney U test findings in Table 4, the mean rank of Hamilton Depression Scale scores was found to be significantly higher in female participants ($\bar{x}$ $Rank = 50.56$) than male participants ($\bar{x}$ $Rank = 38.58$) ($u = 725,000$; $P = 0.031$; $P < 0.05$). Attention Orientation Scores do not differ significantly by gender.

Kruskal–Wallis test findings regarding the differentiation of the participants' attentional orientation scores according to their depression levels in Table 5, it was determined that attentional orientation differed significantly according to the depression level ($\chi^2 = 67,749$; $P < 0.001$). According to the results of the dual group Mann–Whitney U test, which was used to determine the source of the difference, the participants without depression symptoms had the highest mean scores on attention orientation. In addition, the mean scores of the participants with moderate depression symptoms were found to be the lowest.

Table 3: Spearman correlation findings

Hamilton Depression Scale	Attentional orientation
r_s	−0.911**
P	<0.001
n	90

**$P<0.01$

Table 4: Mann–Whitney U-test findings for comparison of depression and attention orientation scores by gender

Dependent variables	Gender	n	$\bar{x}$ order	Rank sum	U	P
Hamilton Depression Scale	Woman	52	50.56	2629.00	725,000	0.031*
	Male	38	38.58	1466.00		
Attention orientation	Woman	52	41.37	2151.00	773.000	0.078
	Male	38	51.16	1944.00		

*$P<0.05$

Conclusion and Discussion

The main purpose of this study, which assumes that there is a significant correlation between the depression levels of individuals and their attentional bias toward negative events and situations, is to examine the relationship between depression and attentional bias. According to the results obtained from the study for this objective, as the level of depression increases, the attentional bias also increases. There is a strong and significant negative relationship between depression and attentional orientation. The results indicated that functional attentional functions were lower among individuals who reported higher scores in depression. The analysis of the obtained data was provided, and the findings were evaluated within the scope of the literature. It was seen that the findings obtained because of the evaluations were especially supported by the literature. Depression causes the individual's information processing to shift to the negative aspects of situations and events in the outside world. The high number of female participants in the sample, in line with the scientific literature, indicates that women have a higher risk of developing depression than men.[29] However, there was no difference between genders in terms of attentional bias in the research findings.

When the diagnostic criteria of major depressive disorder in the DSM-V and the related literature are reviewed, it can be seen that there are findings that individuals develop negative attentional bias as their depression levels increase.[30]

It was previously observed that impairments occur in different information processing associated with depression. One of these deteriorations occurs in memory processes. It is observed that individuals with a diagnosis of depression allocate more attention to negative memories and stimuli, and they have difficulties with bringing back positive memories. When the autobiographical memory processes of individuals with depressive symptoms were examined, it was found that they developed sensitivity to memories with negative content. In studies with individuals having depression diagnosis, the findings indicated that they do not have difficulties with remembering negative memories and do not spend too much time to recall these memories. Ingram also asserted that depression could be an inability to process positive information rather than sensitivity to negative events.[31]

Table 5: Kruskal–Wallis test findings regarding the differentiation of attentional orientation scores according to depression level

The dependent variable	Depression level	n	$\bar{x}$ order	χ^2	P	MW
Attentional orientation	No depression	34	73.50	67,749	<0.001**	1>3
	Mild depression	48	31.49			
	Moderate depression	8	10.56			
	Total	90				

MW: Mann-Whitney U test

In a retrospective study conducted by Elgersma *et al.*, it was observed that contrary to the literature, and results were obtained in terms of negative attentional bias in wide ranges where depression levels vary. In their study, it was found that patients with different depressive levels did not always cause negative attentional bias in the long term. When considering the result and the findings in similar studies, it can be considered that it is important to conduct in-depth attentional bias studies among individuals having different levels of depressive symptoms to obtain more reliable results.[26]

The findings of this study provide significant results and maybe a guide for further other studies on attentional bias and depression. Despite significant results in terms of understanding the relationship between depression and attentional bias, this study has certain limitations. However, this study is capable of guiding the studies carried out in a large sample, supported by attention performance and attention training techniques. Since the study was carried out with 90 undergraduate and graduate students in three different universities, these findings can be considered limited in terms of generalization of the results for university students. However, it can be considered that this study will contribute to the national literature, which includes limited previous research about the relationship between attentional bias and depression. In addition, measuring attentional bias by using various methods and including participants with different levels of depressive symptoms with a larger sample will be contributive for other studies.

Patient informed consent

Patient informed consent was obtained.

Ethics committee approval

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Conflicts of interest

There are no conflicts of interest to declare.

Author contribution subject and rate

• Nazende Ceren Öksüz Özdemir (100%): Design the research, data collection and analyses and wrote the whole manuscript.

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