

Moderating Role Of Emotional Processing In Relation To Cognitive Impairment Among Individuals Exhibiting Pseudobulbar Affect

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Abstract

The current research focused on the association between emotional processing, cognitive impairment and pseudobulbar affect. The study also investigated the moderating role of emotional processing with cognitive impairment and pseudobulbar affect. The purposive sample of individuals exhibiting pseudobulbar affect (N = 150) were selected, 52 males (M = 25.72, SD = 4.91) and 98 females (M= 24.61, SD = 5.17), with the age range of 18 and above (M= 27.4, SD= 9.62) from hospitals of Azad Jammu and Kashmir and Khyber Pakhtunkhwa. Emotional Processing Scale, Center for Neurologic Study Lability Scale for pseudobulbar affect and Montreal Cognitive Assessment for measurement of Cognitive Impairment were used. Findings indicated that emotional processing was significantly positively associated with cognitive impairment and pseudobulbar affect. Results also showed that both cognitive impairment and pseudobulbar affect were significantly positively correlated. Moreover, it is also revealed that emotional processing acted as a positive moderator in the relationship of cognitive impairment and pseudobulbar affect.

Keywords: emotional processing, cognitive impairment, pseudobulbar affect.

Introduction

Pseudobulbar affect (PBA) is a condition that caused millions of people to find difficulty in controlling their emotions. It is an uncontrolled, abrupt, and uninhibited occurrence of laughter or crying, due to the lasting neural system disorders effects. The social, emotional, and physical

effects of PBA are common in people (McGill & McGill, 2018). Pathways of emotional control in brain areas are affected by the PBA. It has a strong association with neural conditions, e.g., traumatic brain injury, multiple sclerosis, amyotrophic lateral sclerosis, Parkinson's disease, and Alzheimer's disease (Brooks et al., 2013). PBA episodes can occur in absence of a stimulus, not always coincidental with the social situation, stimuli, and mood (Ahmed & Simmons, 2013).

PBA patients have more extreme and recurring responses. Display of correct emotions in an individual regarding the situation is limited by PBA, for example, patient who is crying, not always remain sad, or patient with extreme laughter is not always happy (Parvizi et al., 2009). PBA is usually misdiagnosed with some psychiatric disorders such as bipolar disorder and depression (Sauve, 2016).

PBA is primarily a disorder of laughter and crying, rather than all kind of emotional display. Change in mental abilities is experienced by patients of PBA; these patients have vision into their inappropriate emotional display and usually face social embarrassment (Parvizi et al., 2006). The disorder of laughter and crying was first described in the 19th century, so it is in fact the oldest disease not a new one but, still today it is considered as a new one (Sauve, 2016). Brain lesions cause inconsistency of emotions and explosive outbursts of sadness and weeping (Brooks et al., 2013).

PBA restricts an individual ability to show correct emotions because emotional controls are absent in these patients (McGill & McGill, 2018). Neurotransmitters (like glutamate etc.) are found in neural networks of the brain and pseudobulbar affect arises from these neural networks (Nguyen, 2015). In neurological conditions, receptors and excessive glutamate secretions reached an exceeding activation level, and these results in the abnormal working of neurotransmitters (Altevogt et al., 2011). Symptoms of PBA occur in circumstances that are not sad or funny for others. Crying is more prevalent rather than laughter in PBA (Strowd et al., 2010).

The time duration for the persistence of PBA is from few minutes to seconds. Some patients exhibit laughter, some exhibit crying only while some of the other patients exhibit both at the same time. They do not show this behavior all the time but when they show it becomes difficult for them to control their behavior. So, their behavior becomes a cause of social embarrassment for them (Cummings et al., 2006). After the diagnosis of PBA disorder, it can be managed through medication. Some of the disorders are misdiagnosed with PBA like, bipolar disorder and depression. The most prominent difference between both is the difference of duration as, PBA symptoms persist from seconds to minutes while symptoms of depression persist from weeks to months (Cummings et al., 2013).

Differentiation of Pseudobulbar Affect from other Disorders

PBA may be differentiated from bipolar disorder as, in PBA laughter and crying symptoms persist many times in a day without any reason while bipolar disorder includes other symptoms of hopelessness, energy loss, and insomnia, etc. (Arciniegas, 2005). PBA is considered as a

challenging situation, because of PBA person has loss of majors of life, including job, productivity loss, and caregiver embarrassment. Compare to non-PBA individuals, those with PBA symptoms develop more chances of having many psychiatric disorders (Colamónico et al., 2012). Clinicians fail to recognize or may ignore the symptoms of PBA, it can be detected by using an assessment scale or through the screening practice of the disorder. Worldwide the symptoms of PBA are continuously increasing because of the higher frequency of neurological disorders (Cummings et al., 2013).

Rationale of the study

The present study focused on the moderating role of emotional processing (EP) in relation to cognitive impairment among individuals exhibiting pseudobulbar affect from the areas of Khyber Pakhtunkhwa and Azad Jammu and Kashmir. Previous researches did not describe emotional processing as moderating variable in association with the pseudobulbar affect. Limited previous studies described the relationship among these variables and there are not much researches available on this topic in Pakistan. So, findings of the current study would be in a greater contribution for understanding of pseudobulbar affect and role of emotional processing with cognitive impairment among adults. The findings of the research will provide in-depth knowledge about the pseudobulbar effect as well as the role of emotional processing along with cognitive impairment. These variables were selected because the pseudobulbar affect is associated with emotional disturbance and neurological conditions (disturbance of neurotransmitters).

During pseudobulbar affect there is disconnection between frontal lobe (which control emotions), cerebellum and brain stem. Pseudobulbar affect development is closely associated with attention, executive function and visuospatial disorder. Pseudobulbar affect is not situational based (without feelings of sadness, happiness and joy), unique to study in population of Pakistan. Pseudobulbar affect patients display behavior which seems inappropriate according to situation. Their laughing and crying behaviors are not in accordance with situation. This is very embarrassing for them because people cannot understand reasons of such an inappropriate behavior.

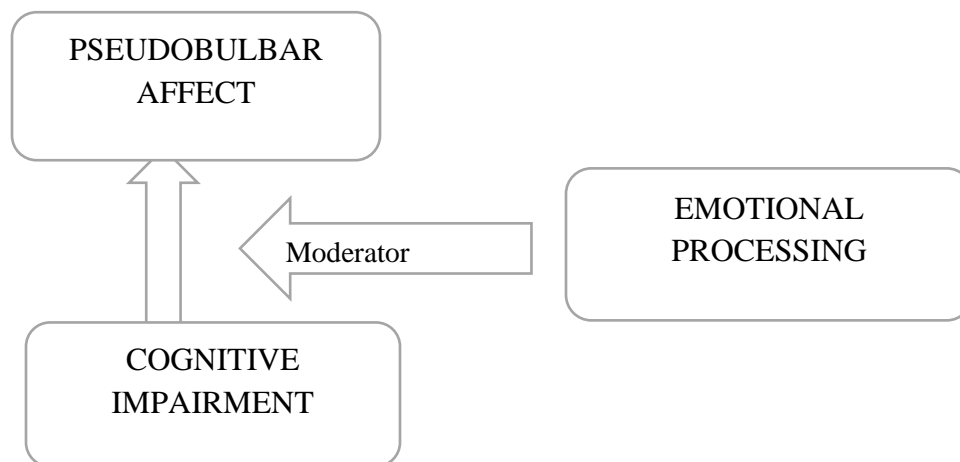
Objectives of the study

To examine the relationship between emotional processing, cognitive impairment, and pseudobulbar affect. To formulate the moderating role of emotional processing in relationship between cognitive impairment and Pseudobulbar affect among adults.

Hypotheses of the study

1. Emotional processing would be in a positive relationship with cognitive impairment and pseudobulbar affect whereas cognitive impairment would be in positive association with pseudobulbar affect.
2. Emotional processing would act as a positive moderator in the relationship between cognitive impairment and pseudobulbar affect.

Conceptual model of study



Note: EP is a moderating variable and the above figure indicated that it plays a moderating role in the relationship of independent variable (cognitive impairment) and dependent variable (pseudobulbar affect).

Method

Research design

The present study used a quantitative correlation survey research design. EPS (25 items for a measure of emotional complexes), MOCA (assessment of cognitive domains), and CNS-LS (7 items for laughter and crying measure) were used with an informed consent sheet.

Sample of the study

Sample of individuals (males = 52, $M = 25.72$, $SD = 4.91$ and females = 98, $M = 24.61$; $SD = 5.17$) exhibiting pseudobulbar affect with age range of 18 and above ($M = 27.4$, $SD = 9.62$) was selected from different hospitals of Azad Jammu and Kashmir (AJK) and Khyber Pakhtunkhwa (KP) by using purposive sampling technique. For the selection of neurological patients, proper ethical criteria were used by taking permission from the neurosurgical wards of hospitals. Data was collected from indoor patients; 300 questionnaires were distributed from which 150 matched the cutoff point of the pseudobulbar affect. Total population size at that time was 280 and selected 30% population proportion, so online Google calculator was used to calculate the sample size at 95% confidence interval and 5% marginal error, the sample size was 150. Neurologic patients having 18 and above years of age and educated were part of the study, while those who do not have neurologic conditions, less than eighteen years, and un-educated individuals were not included in the current study.

Measures

Center for Neurologic Study Lability Scale (CNS-LS)

Developed by Moore et al. (1997); a 7 items measures the PBA severity and frequency on a five-point Likert Scale (3 items measure the frequency and intensity of crying; and 4 items measure laughing). Each item is rated on a Likert scale of 1-5, i.e., 1 (applied never), 2 (applied rarely), 3 (applied occasionally), 4 (applied frequently) and 5 (applied most of the time), with a possible overall potential score ranging from 7 to 35 and a cutoff of >13 is recommended for diagnosis of PBA with its good reliability of 0.87. The result of the current study indicated that this scale has a reliability of 0.60.

Emotional Processing Scale (EPS)

A 25 items scale given by Baker et al. (2010) to measure emotional processing difficulties. Internal consistency of EPS -25 factors was .87. This scale measured emotional processing through response categories of 0 to 1 (completely disagree), 2 to 3 (disagree), 4 to 6 (in between), 7 to 8 (agree) and 9 (completely agree). It has a maximum score range of 225 and a minimum score range of 0. The total emotional processing score was computed by taking the sum of all the scores which was divided by the number of items. It had a potential score range of 1.1-8.9. Scores range of >4.7 had been recommended as the cutoff score for problematic emotional processing. The current reliability of the emotional processing scale is .84.

Montreal Cognitive Assessment Scale (MCAS)

Nasreddine et al. (2005) developed it to measure cognitive impairment. The potential range of this scale was from 0-30 with an internal consistency of 0.83. A score range of 0-25 indicated cognitive impairment. While a score range of 26-30 was considered as a normal score. In the current study reliability of this scale is 0.65.

Procedure

The purposive sampling technique was used for sample selection from hospitals of Azad Jammu and Kashmir (AJK) and Khyber Pakhtunkhwa (KP). The first step of the research consisted of obtaining official approval from authors of scales. The ethical committee ASRB of Hazara University Mansehra, Pakistan, approved this research project. An official permission letter for data collection was obtained from the heads of Sheikh Khalifa bin Zayed Hospital (CMH) Rawalakot Azad Jammu Kashmir, Ayub Teaching Hospital Abbottabad, Govt. Mental and General Hospital Dadar Mansehra, Neuro Psychiatrist Irfan Hospital Mansehra and King Abdullah Teaching Hospital Mansehra. EPS, MOCA and CNS-LS scales along with written informed consent form and demographic information sheet were given to the subjects (N = 150) to being enrolled in the study. All participants were informed about the purpose of the study, by assuring them about their anonymity. Data were analyzed by using SPSS-26 Version.

Results

Table 1 Psychometric Properties of Scales (N= 150)

Scales	α	No of Items	M	SD	Range		Skewness
					Actual	Potential	
EP	.84	25	6.9	.97	1.1-8.9	4.7-8.0	-.83
MOCA	.65	7	15.2	.65	0-30	1-25	.02
CNSLS	.60	7	25.3	.60	7-35	13-34	-.54

Note. EP = Emotional Processing; MOCA = Montreal Cognitive Assessment; CNSLS = Center for Neurologic Study Liability Scale; M = mean; SD = standard deviation.

The results in Table 1 shows that alpha reliability coefficients for emotional processing, cognitive impairment and pseudobulbar affect scale are .84, .65 and .60, which demonstrated that these scales had good reliability and internal consistency.

Table 2 Correlation Coefficients among Variables (N= 150)

S. No	Scales	I	II	III	M	SD
I	EP	-	.69**	.53**	6.9	.97
II	MOCA	-	-	.57**	14.9	5.9
III	CNSLS	-	-	-	25.4	5.2

**p < .01.

Results in Table 2 depicts that emotional processing has significant positive association with cognitive impairment and pseudobulbar affect. It also represents that both cognitive impairment and pseudobulbar affect are significantly positively correlated with each other.

Table 3 Multiple hierarchical regression analysis for prediction of dependent variable (pseudobulbar affect- CNS-LS) from independent variable (cognitive impairment - MOCA) and moderator (Emotional processing; N = 150)

Predictor	ΔR^2	β
1 st step	.33***	
MOCA		.57***
2 nd step	.04**	
MOCA		.42***
EP		.24**
3 rd step	.05***	
MOCA		.47***
EP		.07**
MOCA * EP		.26***
Total R ²	0.42***	

***p < .001, **p < .01.

Table 2 found a significant positive relationship of MOCA with CNS-LS [$\beta = .57$, $t = 8.7$, $p = .000$] and brought 33% change, [$\Delta R^2 = .33$, $\Delta F (148) = 74.7$, $p = .000$]. Second step showed significant positive relationship of EP with CNS-LS, [$\beta = .24$, $t = 2.7$, $p = .01$], which showed that EP is a significant positive predictor of CNS-LS, with 4% of change, [$\Delta R^2 = .04$, $\Delta F (147) = 7.6$, $p = .01$]. Finally in the third step MOCA and EP interact with each other and their interaction significantly positively predicted CNS-LS [$\beta = .26$, $t = 3.4$, $p = .001$] and create an additional 5% of variation, [$\Delta R^2 = .05$, $\Delta F (146) = 11.8$, $p = .001$]. 42% change occurred as a whole in CNS-LS, as indicated below in figure.

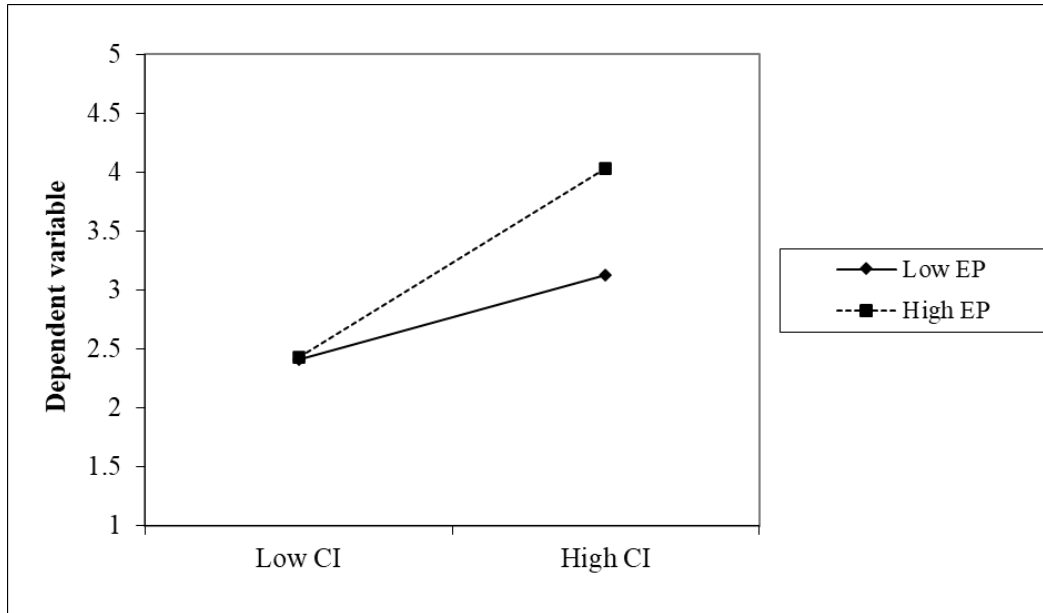


Figure1. Moderating role of EP in relationship of MOCA and CNS-LS.

Figure 1 illustrates that there is a strong association between cognitive impairment and pseudobulbar affect in adults who score higher on the emotional processing measure. Overall cognitive impairment, emotional processing, and their association accounted for 42% of the variation in pseudobulbar affect.

Discussion

The findings may aid in understanding the relationship between emotional processing, cognitive impairment, and pseudobulbar affect, as well as how emotional processing functions as a moderating variable. The research will be useful in learning about the socially humiliating symptoms of pseudobulbar affect as well as other relevant elements (neurologic factors). It will be possible to distinguish pseudobulbar from other diseases such as depression and bipolar disorder.

According to the results, a significant positive correlation of EP with MOCA was found (Table 2). These findings are supported by studies for example, when emotional processing is problematic; it has a positive correlation with cognitive impairment. Cognitively impaired individuals, as compared to normal individuals, reduce their capacity to identify facial expressions of others. Because cognitive impairment affects the neurological substrates that have a major role in emotional processing (Sarabia-Cobo et al., 2015). Similar results were revealed in another study, as greater functional disability is reported by patients of cognitive impairment, because of dysfunctional recognition of emotions (McCade et al., 2013). Impaired cognition had greater effects on emotional processing abilities and cognitively impaired patients had inaccuracy of emotional processing, their pattern of emotions changes due to the decline of major cognitive abilities (Waring et al., 2017).

Findings of current study indicated a significant positive relation of EP with CNS-LS (Table 2). For example previous studies identified that symptoms of traumatic experiences are strongly predicted by emotional processing and emotions have a greater contribution in cognitive processes, as emotions are necessary in our lives to make decisions (Phelps, 2006). According to Pessoa (2008) concentration, memory, insight, and cognitive abilities are cohesive with emotional processing so, cognitions and emotions are in positive correlation. Pseudobulbar affect is associated with emotional disturbance or abnormal emotional processing due to brain injuries, neurologic disease, and cognitive impairment (Olney et al., 2011). Wang et al. (2018) described that pseudobulbar affect disorder results because of brain area abnormalities, while normal processing of emotions depends on normal working of the brain region.

Results indicated (in Table 2) a significant positive correlation of MOCA with CNSLS. Literature in this regard depict that Montreal cognitive assessment independently predicts long-term effects of pseudobulbar affect and its development was in close association with attention, memory, and visuospatial disorder (Hanna et al., 2016). In a study of the United States (Brooks et al., 2013) it was found that because of the neurological disorders and cognitive impairment, pseudobulbar affect is a more common condition among patients. Around worldwide pseudobulbar affect is increasing continuously, as cognitive impairment and neurologic conditions are increasing at the same rate (Crumpacker & Engelman, 2014). Association between PBA and CI was found that these two variables have a strong positive association in neural conditions and the perceptive decline was associated significantly with pseudobulbar affect (Floeter et al., 2014).

The research study was in core purpose to explore the moderating role of EP in relationship of CI among PBA exhibiting individuals. Findings indicated that emotional processing acted as a moderator in relationship of cognitive impairment and pseudobulbar affect. High scores on the EP scale will have a strong relation with MOCA and PBA (Table 3). Previous studies did not deal with the moderating role of EP with CI and PBA; some of the researches from literature are here to find their relationship. PBA results from neurologic disorders (e.g. traumatic brain injury, brain tumor, Alzheimer disease, multiple sclerosis, amyotrophic lateral sclerosis, stroke, Parkinson's disease), an unexpected outburst of PBA causes inconsistency of emotions due to the impaired cognitions and is directly associated with dementia (Parvizi et al., 2009). PBA is the outcome of inconsistency in processing of emotions (Megias et al., 2017). Impairment of emotional expression is the result of the damage of cognitive processes and emotional loss. PBA is associated with damage in inputs of the cerebellum and demodulation of emotional processing abilities (Floeter et al., 2014).

Conclusion

PBA is a neurologic condition that affects quality of life and cause social embarrassment. It is concluded from the present study that emotional processing had significant positive relationship with high score on PBA scale and low score on Montreal Cognitive Assessment for measure of

Cognitive Impairment. It was also found that emotional processing moderate the relationship of MOCA and CNSLS for pseudobulbar affect.

Limitations and suggestions

The current study only included educated people and had a limited sample size. People with PBA were contacted from several hospitals in Azad Jammu & Kashmir (AJK) and Khyber Pakhtunkhwa (KPK). Clinicians and professionals did not comprehend the link between neurological illnesses and PBA, and the non-cooperative attitude of hospital authority members toward students was also a big limitation, thus a study to educate them about PBA was planned. Despite these limitations, it is proposed that future researchers use a larger sample size and include uneducated people with PBA in the study; and a sample from other parts of Pakistan could be collected. Individuals should be made aware of pseudobulbar affect in order to recognise it as a distinct condition, and in-depth knowledge and a better understanding of new psychological conditions should be established.

Implications

The findings of this study will aid psychologists in their understanding of pathological laughter and crying situations that physicians and professionals are currently ignorant of. The findings may aid in understanding the relationship between emotional processing, cognitive impairment, and pseudobulbar affect, as well as how emotional processing functions as a moderating variable. The research will be useful in learning about the socially humiliating symptoms of pseudobulbar affect as well as other relevant elements (neurologic factors). It will be possible to distinguish pseudobulbar from other diseases such as depression and bipolar disorder.

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