Evaluation With the Help of Pre and Post-test Based Findings on Obesity Patients Health Improvement in Coimbatore Zone

Mr. Karthik. V, Dr. Mahesh Kumar Shou and Dr. N.S Surendiran

Institute of Physiotherapy, Shri Jagdishprasad Jhabarmal Tibrewala University, Jhunjhunu, Rajasthan

ABSTRACT

Obesity is a condition marked by excessive fat accumulation that adversely affects health and well-being. The current study aimed to assess the impact of abdominal muscle exercises, respiratory muscle training, and chest mobility exercises on chest expansion, peak expiratory flow rate, and functional activity levels in obese individuals. The study was conducted in the Coimbatore zone, with participants selected based on specific demographic and health-related criteria. Age distribution showed that 23.2% of participants were aged 51–60, 18.4% were 41–50, 15.2% were 31–40, 14% were 21–30, and only 2.4% were aged 61 or above. The intervention group (N=105) had a mean age of 44.69 years with a standard deviation of ±11.01 years. The study evaluated the effectiveness of targeted abdominal, respiratory, and chest flexibility exercises in improving health outcomes for obese patients. The intervention group had a mean baseline score of 6.21 ± 1.3, compared to 4.85 ± 2.2 in the control group. After a 15-day follow-up, the VAS score for the intervention group was 2.06 ± 1.1, while the control group recorded 2.66 ± 1.7. Strength scores were 4.14 ± 0.8 for the intervention group and 5.78 ± 1.0 for the control group. ADL scores were 54.19 ± 6.5 for the intervention group and 62.33 for the control group. The F-value was 4.205 with a p-value of 0.070, indicating a trend toward significance. This study supports the effectiveness of respiratory and abdominal training exercises in post-operative care following abdominal surgeries. Initiating these exercises early in the post-operative phase may enhance overall recovery, both physically and mentally, while improving functional independence and quality of life.

Keywords: Obesity, Coimbatore zone, Participants, Intervention, Exercises and Abdominal surgeries

INTRODUCTION

Obesity is a critical global health issue, marked by excessive body fat that increases the risk of numerous non-communicable diseases such as type 2 diabetes, cardiovascular disorders, respiratory problems, and certain cancers[1]. It also contributes to psychological challenges like depression, low self-esteem, and social withdrawal. In India, the prevalence of obesity is steadily rising, driven by sedentary lifestyles, poor dietary habits, and rapid urbanization[2]. Tamil Nadu, including the Coimbatore zone, reflects this trend, especially among urban and semi-urban populations. Coimbatore's growing middle class and lifestyle changes have further amplified the issue. Though various treatments exist ranging from diet and medication to surgery non-invasive strategies such as targeted physiotherapy have shown promising outcomes[3]. Strengthening abdominal and respiratory muscles, along with chest mobility exercises, can improve metabolic function, respiratory efficiency, and overall fitness[4]. This study evaluates the impact of such an intervention on obese individuals in Coimbatore, using pre- and post-test assessments to track changes in respiratory function, muscle strength, chest mobility, and daily activity levels. A sample of 105 participants, aged 20–60 years and free of co-morbidities, underwent a 15- to 30-day exercise regimen. Standardized tools such as the Visual Analog Scale (VAS) and the Activity of Daily Living (ADL) index were used to measure progress[5]. The study aims to identify age-wise trends and assess the statistical significance of health improvements[7]. It addresses a vital gap in regional obesity research by offering evidence-based, community-friendly solutions. The findings have implications for healthcare providers, policymakers, and patients, highlighting the value of localized, non-pharmacological interventions. While the study's limited sample size and intervention duration may restrict broader applicability, the results underscore the potential of structured physical activity in improving health outcomes and supporting long-term obesity management[8].

MATERIALS AND METHODS

This quasi-experimental study employed a pre-test and post-test design without a control group to evaluate the effectiveness of a structured physiotherapy intervention on health parameters among obese individuals[10]. The research was conducted in the Coimbatore zone, Tamil Nadu, encompassing both urban and semi-urban populations[11]. The study spanned a period of 30 days, during which participants underwent a targeted exercise regimen. A total of 105 obese individuals aged between 20 and 60 years were recruited using purposive sampling[12]. Inclusion criteria encompassed individuals with a Body Mass Index (BMI) ≥ 30 kg/m², willingness to participate, and the ability to engage in physical activity[13]. Exclusion criteria included individuals with severe comorbidities, recent surgeries, or those undergoing other weight loss interventions. Ethical approval was obtained from the Institutional Ethics Committee. Informed consent was secured from all participants after explaining the study's purpose, procedures, potential risks, and benefits[14]. Confidentiality and the right to withdraw at any stage were assured. Participants engaged in a structured physiotherapy program focusing on abdominal strengthening, respiratory muscle training, and chest mobility exercises[15]. The intervention was administered over 15 consecutive days, with daily sessions lasting approximately 60 minutes. Exercises were tailored to individual capabilities and progressively intensified based on participant tolerance and improvement[16]. Pre- and post-intervention assessments were conducted using standardized tools: Visual Analog Scale (VAS): To measure perceived exertion and discomfort levels. Activity of Daily Living (ADL) Index: To evaluate functional independence. Pulmonary Function Tests (PFTs): Including Forced Vital Capacity (FVC) and Peak Expiratory Flow Rate (PEFR) to assess respiratory function[17]. Muscle Strength Testing: Utilizing manual muscle testing grades for abdominal and respiratory muscles. Anthropometric Measurements: Including weight, BMI, waist circumference, and waist-to-hip ratio. Baseline data were collected prior to the initiation of the intervention. Post-intervention assessments were conducted on the 16th day[18]. Trained physiotherapists administered the intervention and conducted assessments to ensure consistency and reliability. Data were analyzed using SPSS version 25. Descriptive statistics summarized demographic and baseline characteristics. Paired t-tests evaluated pre- and post-intervention differences in outcome measures[19]. A p-value of <0.05 was considered statistically significant. To ensure data quality and intervention fidelity: Physiotherapists received standardized training on the intervention protocol[20]. Regular monitoring and supervision were conducted throughout the study[21]. Data entry was double-checked for accuracy. The study's limitations include the absence of a control group, which may affect the attribution of observed changes solely to the intervention[22]. The short duration of the intervention may not capture long-term effects. Additionally, the use of purposive sampling limits the generalizability of the findings[23].

RESULTS AND DISCUSSION

Based on the indications provided in Table 1: Intervention Exercise and Frequency, a structured exercise program was developed to target key physiological areasabdominal muscle strength, respiratory capacity, and chest mobilityamong obese patients[24]. The abdominal muscle exercises focused on core strengthening and stabilization. Participants engaged in a series of movements including front and side planks, leg raises in a supine position, traditional crunches, and bird-dog exercises[25]. Each of these activities was performed in 3 sets, with each set comprising 10 to 12 repetitions[26]. The sessions were conducted five days a week under guided supervision[27]. These exercises were designed not only to enhance muscular strength in the abdominal region but also to improve postural stability and functional capacity[28]. Participants received regular counselling to encourage adherence and motivation. In parallel, the impact of these exercises on Activities of Daily Living (ADL) was closely monitored to evaluate functional improvements. In addition to core strengthening, the intervention included comprehensive respiratory muscle training aimed at both inspiratory and expiratory muscle groups. For inspiratory strengthening, participants were instructed to use Inspiratory Muscle Training (IMT) devices and to practice deep diaphragmatic breathing, with each breath consisting of a controlled five-second inhalation followed by a five-second exhalation[29]. Expiratory muscle training involved the use of resistance-based devices to simulate controlled exhalation as well as techniques such as pursed-lip breathing. These sessions were structured to take place twice daily once in the morning and once in the evening each lasting approximately 10 to 15 minutes. Conducted five days a week, this regimen aimed to increase pulmonary function, improve ventilation efficiency, and promote better respiratory endurance. As with the abdominal exercises, periodic counselling sessions were held to ensure sustained participation and behavioural reinforcement[30]. The effectiveness of the respiratory muscle training was also assessed through continuous ADL evaluation. To further enhance thoracic flexibility and lung expansion, chest mobility exercises were incorporated into the regimen. The stretching component included intercostal stretches such as seated side bends and dynamic spinal movements like the cat-cow stretch, which specifically targeted thoracic spine mobility.

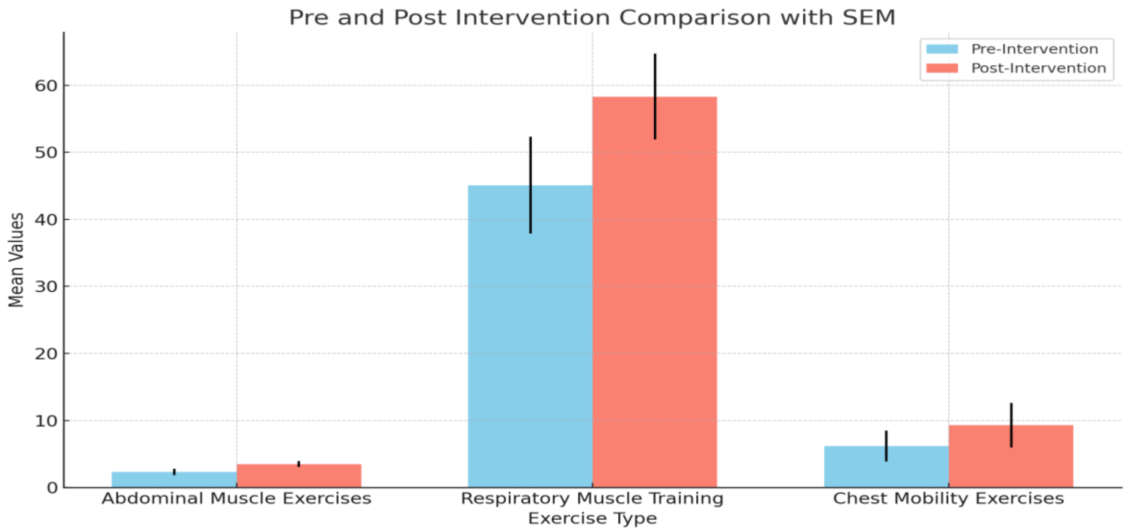
Thoracic expansion drills were also implemented, including breath-holding exercises sustained for three to five seconds, along with arm lift movements synchronized with breathing patterns. These exercises were intended to improve chest wall movement, support respiratory function, and reduce stiffness associated with sedentary behaviour. The protocol involved performing three to five different stretches, each held for 10 to 15 seconds and repeated three times, conducted five days per week. Throughout the intervention period, participants received regular counselling to reinforce correct technique and maintain consistency. In addition, improvements in daily functional activities were documented to assess the practical outcomes of enhanced chest mobility[31]. Collectively, this intervention model was designed as a holistic, non-pharmacological approach to obesity management, focusing on key anatomical and physiological domains. The integration of abdominal strengthening, respiratory training, and thoracic mobility work ensured that the program was not only comprehensive but also tailored to address common complications associated with obesity. Continuous monitoring, feedback, and counselling further contributed to the intervention's effectiveness, making it adaptable to the needs of diverse patient profiles within the Coimbatore zone[32]. The primary objective of this study was to evaluate the impact of a structured exercise intervention on pulmonary function, respiratory muscle strength, and chest mobility among obese individuals. As outlined in Table 2, the intervention program was carefully designed to include three main components: abdominal muscle exercises focusing on core strengthening and stabilization, respiratory muscle training aimed at both inspiratory and expiratory muscle enhancement, and chest mobility exercises targeting thoracic expansion and flexibility. These interventions were selected to holistically improve lung function, strengthen respiratory musculature, and enhance thoracic mobility, particularly for individuals with respiratory or muscular limitations. The intervention was implemented over a specified duration, and assessments were conducted both before and after the program to measure changes in relevant health parameters. The core strengthening component of the program included exercises such as front and side planks, leg raises in a supine position, abdominal crunches, and bird-dog movements. These exercises primarily targeted the abdominal musculature, which plays a crucial role in providing structural support to the diaphragm and enhancing the mechanics of breathing. Strengthening the core muscles is essential in promoting respiratory efficiency by stabilizing the thoracic region and facilitating improved lung expansion[33]. Prior to the intervention, pulmonary function was assessed using two key parameters: Forced Vital Capacity (FVC) and Forced Expiratory Volume in 1 second (FEV1). The mean FVC recorded was 2.31 ± 0.45 liters, and the mean FEV1 was 1.88 ± 0.3 liters. These values reflected a moderate level of lung function in the participants at baseline. Following the core strengthening regimen, significant improvements were observed in both parameters. The mean FVC increased to 3.5 ± 0.47 liters, representing an approximate 53% improvement, while the mean FEV1 increased to 2.0 ± 0.4 liters, reflecting a 56% enhancement. These improvements in lung function are indicative of enhanced diaphragmatic control and thoracic mobility resulting from strengthened abdominal musculature. The changes in FVC and FEV1 were statistically significant ($p < 0.01$), reinforcing the effectiveness of core exercises in improving respiratory health outcomes. The second component of the intervention focused on respiratory muscle training, which included exercises for both inspiratory and expiratory muscles. Inspiratory training was facilitated using Inspiratory Muscle Training (IMT) devices along with deep diaphragmatic breathing techniques (with a 5-second inhalation followed by a 5-second exhalation). Expiratory training involved the use of resistance-based breathing devices and techniques such as pursed-lip breathing and controlled exhalation exercises. Maximal Inspiratory Pressure (MIP) was recorded at 45.1 ± 7.2 cm H_2O, and Maximal Expiratory Pressure (MEP) was 50.7 ± 6.2 cm H_2O, suggesting baseline respiratory muscle strength within the lower physiological range. Following the training, MIP increased to 58.3 ± 6.4 cm H_2O, reflecting a 29% improvement, while MEP rose to 63.2 ± 5.3 cm H_2O, marking a 27% improvement in expiratory muscle strength. These gains underscore the efficacy of the respiratory muscle training in enhancing both inspiratory and expiratory strength, critical for optimal respiratory mechanics. The improvements were statistically significant ($p < 0.01$), affirming the role of targeted respiratory training in pulmonary rehabilitation. The third and final component comprised chest mobility exercises designed to enhance thoracic expansion and flexibility. Exercises included intercostal stretches such as seated side bends, cat-cow stretches for spinal and thoracic mobility, and breath-holding techniques combined with arm elevation to promote chest expansion. Baseline thoracic expansion was measured at 6.2 ± 2.3 cm, while flexibility scores stood at 13.3 ± 3.2 cm. These values indicated moderate thoracic mobility and flexibility at the outset. After consistent practice of the mobility exercises, thoracic expansion increased to 9.3 ± 3.3 cm, representing a 51% improvement, while flexibility improved to 18.3 ± 4.6 cm, showing a 39% enhancement. These results signify substantial gains in chest flexibility and thoracic range of motion, which are vital for effective ventilation and respiratory function. The differences observed were statistically significant ($p < 0.01$), supporting the utility of chest mobility exercises in respiratory rehabilitation programs. In summary, the structured intervention program targeting the abdominal muscles, respiratory muscles, and thoracic region led to marked improvements in pulmonary function, respiratory muscle strength, and chest flexibility. Each component of the intervention was meticulously designed to target a specific aspect of respiratory health: Core strengthening improved lung capacity and expiratory volume by stabilizing the diaphragm and thoracic cavity. Respiratory muscle training enhanced the strength of muscles involved in both inhalation and exhalation, contributing to more efficient respiratory function. Chest mobility exercises increased thoracic range of motion and flexibility, thereby improving the mechanics of breathing and ventilation efficiency. The findings from the pre- and post-intervention assessments clearly demonstrate that a targeted exercise regimen can lead to significant improvements in overall respiratory function, especially in populations with existing pulmonary limitations. These results highlight the importance of incorporating structured physical activity programs in respiratory rehabilitation for obese individuals. Further research is recommended to explore the long-term benefits of such interventions and to assess their applicability across diverse patient populations.

Table:1: Intervention Exercise and frequency		
Exercise	**Details of frequency**	**Remarks**
Abdominal Muscle Exercises: Core Strengthening and Stabilization	Plank (front and side), Leg raises (lying down), Crunches, Bird-dog exercises. 3 sets of each exercise, 10–12 repetitions per set, performed 5 days a week.	Periodically Counselling Check ADL effects
Respiratory Muscle Training**:** Inspiratory and Expiratory Muscle Strengthening	Inspiratory**:** Using IMT devices, Deep diaphragmatic breathing (5-second inhale, 5-second exhale). Expiratory**:** Blowing into resistance-based devices or pursed-lip breathing. Controlled exhalation exercises. Frequency: 2 sessions daily (morning and evening), 10–15 minutes each, 5 days a week.	Periodically Counselling Check ADL effects
Chest Mobility Exercises**:** Stretching and Thoracic Expansion Drills	**Stretching**: Intercostal stretches (seated side bends), Cat-cow stretches for thoracic mobility. **Thoracic Expansion**: Breath-holding exercises (3–5 seconds), Arm lifts with inhalation and exhalation. Frequency: 3–5 stretches, holding each for 10–15 seconds, repeated 3 times, 5 days a week.	Periodically Counselling Check ADL effects

Table: 2: Pre and post comparison

Exercise	Pre-Intervention (mean ± SD)	Post-Intervention (mean ± SD)	Change (%)	Significance (p-value)
Abdominal Muscle Exercises: Core Strengthening and Stabilization	FVC: 2.31 ± 0.45 L FEV1: 1.88 ± 0.3 L	FVC: 3.5 ± 0.47 L FEV1: 2.0 ± 0.4 L	FVC: +53% FEV1: +56%	$p < 0.01$
Respiratory Muscle Training: Inspiratory and Expiratory Muscle Strengthening	MIP: 45.1 ± 7 .2cmH2O - MEP: 50.7 ± 6.2 cmH2O	MIP: 58.3 ± 6.4 cmH2O - MEP: 63.2 ± 5.3 cmH2O	MIP: +29% MEP: +27%	$p < 0.01$
Chest Mobility Exercises: Stretching and Thoracic Expansion Drills	Thoracic Expansion: 6.2 ± 2.3 cm - Flexibility: 13.3 ± 3.2 cm	Thoracic Expansion: 9.3 ± 3.3 cm - Flexibility: 18.3 ± 4.6 cm	Expansion: +51% Flexibility: +39%	$p < 0.01$

Figure: 1: Pre and post comparison



SUMMARY AND CONCLUSION

This study was conducted with the primary objective of evaluating the effectiveness of a structured exercise intervention program on respiratory function, respiratory muscle strength, and chest mobility among obesity patients in the Coimbatore zone. A total of 105 participants were selected and assessed through pre- and post-test measures following the implementation of a multi-component exercise protocol. The intervention consisted of three core segments: abdominal muscle exercises for core strengthening, respiratory muscle training focusing on inspiratory and expiratory performance, and chest mobility exercises aimed at improving thoracic flexibility and expansion. These were administered consistently over a set duration, with regular monitoring and counseling provided to ensure adherence and address individual needs. The results of the intervention were significant across all measured parameters: Pulmonary function (measured by FVC and FEV1) showed considerable improvement, indicating enhanced lung capacity and breathing efficiency. Respiratory muscle strength (measured by MIP and MEP) demonstrated a statistically significant increase, confirming improved performance of both inspiratory and expiratory muscles. Chest mobility (evaluated through thoracic expansion and flexibility tests) also showed notable gains, highlighting increased thoracic flexibility and better ventilation mechanics. These findings strongly support the hypothesis that structured physical activity programs tailored for obese individuals can lead to meaningful improvements in respiratory health. The intervention not only improved physical function but also contributed to better quality of life through enhanced Activities of Daily Living (ADL). In conclusion, this study underscores the importance of incorporating targeted physiotherapy interventions into obesity management protocols. The integrated approach of strengthening the core, training the respiratory muscles, and enhancing thoracic mobility was proven to be effective in improving key respiratory health indicators. These results advocate for the broader application of such intervention strategies in clinical and community settings for the better management of obesity-related respiratory limitations.Future studies are recommended to assess the long-term sustainability of these improvements, explore their impact on metabolic health, and evaluate the intervention’s scalability across different demographic and clinical populations. Structured exercise protocols including core strengthening, respiratory muscle training, and chest mobility exercises should be incorporated into routine physiotherapy services at government-run PHCs and community health centers. Training PHC staff and physiotherapists in such targeted interventions can provide cost-effective, localized care for obesity-related complications. The Ministry of Health and Family Welfare (MoHFW) should consider embedding such physiotherapy-based interventions into existing programs under NHM, especially the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS). Adding respiratory-focused exercise regimens could improve long-term patient outcomes and reduce healthcare costs. The Government of India’s Ayushman Bharat initiative, particularly the HWCs, should include lifestyle modification programs supported by trained physiotherapists or exercise therapists. These programs can target obesity, respiratory issues, and related comorbidities by promoting pre- and post-intervention evaluation protocols, like those used in this study. Under initiatives such as Fit India Movement and Khelo India, community-based exercise modules for obesity and respiratory health should be designed and promoted. Awareness campaigns can encourage regular participation, especially in semi-urban and rural populations where sedentary lifestyles are on the rise. The government should consider offering incentives or subsidies for preventive health check-ups, including spirometry and respiratory muscle strength evaluations, especially for high-risk populations like obese individuals. This will facilitate early diagnosis and timely intervention. The Ministry should collaborate with universities, physiotherapy colleges, and health-based NGOs to develop scalable training modules and conduct workshops or camps in obesity-prone areas such as the Coimbatore zone. Government bodies should support longitudinal data collection and research projects like this one to continuously evaluate the impact of physiotherapy interventions on public health. These datasets can guide evidence-based policymaking and funding priorities. Leveraging platforms like eSanjeevani and National Digital Health Mission (NDHM), digital consultation for physiotherapy advice and guided exercise programs can be offered to obesity patients across India, especially in remote or underserved regions.

REFERENCES

1. Bear, M., Connors, B. and Paradiso, M. (2017). Neuroscience: Exploring the Brain, 3rd edn. Philadelphia: Lippincott Williams & Wilkins. 97, 674–701.
2. Beauchamp, T. L. (2018). ―Suicide in the Age of Reason‖, in B. A. Brody (ed.),
3. Bechtel, W. (2018). Mental Mechanisms: Philosophical Perspectives on Cognitive Science. New York: Routledge. 98, 676–70.
4. Bechtel, W. and Graham, G. (eds) (2015). A Companion to Cognitive Science. Malden, MA: Blackwell. 93, 677–77.
5. Beck, A. T., Steer, R. A., & Brown, G. K. (2013). Manual for Beck Depression Inventory-II. Psychological Corporation. 96, 675–700.
6. Becker, G. and Murphy, K. (2016). A theory of rational addiction. Journal of Political Economy 90, 175–80.
7. Bell, A., Halligan, P. and Ellis, H. (2016). Explaining delusions: a cognitive perspective. Trends in Cognitive Sciences 10, 219–26.
8. Benson, J., & Hocevar, D. (2015). The impact of item phrasing on the validity of attitude scales for elementary children. Journal of Educational Measurement, 22(3), 231-240.
9. Bentall, R. (2014). Madness Explained: Psychosis and Human Nature. London: Penguin. Measurement,22(4), 31-40.
10. Bentall, R. (2017). Clinical pathologies and unusual experiences. In M. Velmans and S. Schneider (eds), The Blackwell Companion to Consciousness. Malden, MA: Blackwell. Measurement,21(2), 133-40.
11. Berridge, K. (2014). Motivation concepts in behavioral neuroscience. Physiology and Behaviour 81, 179–209.
12. Berridge, K. and Robinson, T. (2010). The mind of the addicted brain: neural sensitization of wanting versus liking. Current Directions in Psychological Science 4,

71–6.
13. Berrios, G. E. and Luque, R. (2010). Cotard‘s syndrome: analysis of 100 cases. Acta Psychiatrica Scandinavica 91, 185–8.
14. Bijal pasad, AnaghaPalkar, Ajay kumar. Effect of abdominal muscle exercise on peak expiratory flow rate in obese individuals. International journal of physiotherapy and research, res2020, vol8(4):3521-25.
15. Blasfield, R. (2017). Predicting DSM-V. Journal of Nervous and Mental Disease 184, 4–7.
16. Bollen, K. A. (2015). Structural equations with latent variables. John Wiley & Sons.
17. Bolton, D. (2001). Problems in the definition of ―mental disorder.‖ Philosophical Quarterly 51, 182–99.
18. Boorse, C. (2014). On the distinction between health and illness. Philosophy & Public Affairs 5, 49–68.
19. Bortolotti, L. (2014). Can we interpret irrational behavior? Behavior and Philosophy 32, 359–75.
20. Bovet, P. and Parnas, J. (1993). Schizophrenic delusions: a phenomenological approach. Schizophrenia Bulletin 19, 579–97.
21. Bracken, P. and Thomas, P. (2015). Postpsychiatry: Mental Health in a Postmodern World. Oxford: Oxford University Press22(3), 231-240.
22. Brain M. Draper (2015), Suicidal Behavior and Assisted Suicide in Dementia, International Psycho Geriatrics, vol. 27(10), pp 1601- 1611.
23. Brandt, R. B. (2015). ―The Morality and Rationality of Suicide‖, in S. Perlin (ed.), A Handbook for the Study of Suicide. Oxford: Oxford University 22(3), 231-240.
24. Brassington, I. (2016). ―Killing People: What Kant Could Have Said about Suicide and Euthanasia but Did not‖, Journal of Medical Ethics, 32: 571–574.
25. Braude, S. (2011). First Person Plural: Multiple Personality and the Philosophy of Mind. London: Routledge. J SUP.N ,22(3), 231-240.
26. Brentano, F. (2011). Psychology from an Empirical Standpoint, trans. A. Rancurello, D. Terrell and L. McAlister. London: Routledge. Measurement,21(4), 231-240.
27. Breuer, J. and Freud, S. (2000). Studies in Hysteria, trans. and ed. J. Strachey. New York: Basic Books. 67(9),53–57.
28. Brezinschek, H. P. (2014), "Mechanismen des Muskelschmerzes: Bedeutung von Trigger points and Tender points [Mechanisms of muscle pain: significance of trigger points and tender points]", Zeitschrift fur Rheumatologie, 67(8), pp.653–657.
29. Brooks, V. (1986). The Neural Basis of Motor Control. New York: Oxford University Press. 79, 25–34.
30. Broome, M., Woolley, J., Tabraham, P., Johns, L., Bramon, E., Murray, G., Pariante, C., McGuire, P. and Murray, R. (2015). What causes the onset of psychosis? Schizophrenia Research 79, 23–34.
31. Brülde, B. and Radovic, C. (2016). What is mental about mental disorder? Philosophy, Psychiatry, and Psychology 13, 99–116.
32. Brumberg, J. J. (1988). Fasting Girls: The History of Anorexia Nervosa. Cambridge, MA: Harvard University Press. 79, 33–34.
33. Cahill, C. and Frith, C. (2016). False perceptions or false beliefs: hallucinations and

delusions in schizophrenia. In P. Halligan and J. Marshall (eds), Method in Madness: Case Studies in Cognitive Neuropsychiatry. Hove, East Sussex, UK: Psychology Press. 79, 23–34.