

## Effects of Burnout on the Cognitive Function and Neuroendocrine System of Employees

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### ABSTRACT

At times Working environment be harder to be adjusted into due to that employees face the sudden burnouts that if not prevented in the long run might have a long-term physical impact on the body. The research papers are meant to aware the working industry that burnout is not something that can be neglected for a long time as it just not impairs the workers overall performance yet it will go even further impacting the neurological system that can result in high risk of health issues in future. According to the study of van Dam et al (2012) the effects of burnout on the three major areas of cognition these are execution of task, memory weakness and attention deficiency. On the other hand, there are very less studies that can be used as evidence for any significant change on the effects of burnout in neuroendocrine system as the study transforms itself into an arduous experiment of neuropsychological field.

**Keywords:** *Burnout, Cognitive Functioning, Neuroendocrine System*

**B**urnout is a worldwide culture issue that has a direct effect on a person quality of life as well as work efficiency. For a long time, burnout is seen negated cause of few researches have been done on it that employees have been considered as lazy or unmotivated cause of their own action.

Bhalla chief experience officer from parkland hospital has said that due to the increase in technology and resources the distance between work and personal life is decreasing day by day. There are many areas where an employee my feel burnout, they might be bullying or getting discriminated by other people and employee also put fairer share of their work. A survey was done by Li L et.al (2020) with the help of the questionnaire method to collect data that projected the relationship of job burnout, depression, and work performance among nurses in China. It presented that the direct effect of age, years working and the job title were the greatest cause of burnout. The world health organization (WHO) classified as an occupational situation rather than a medical condition it later on included in the international classification of diseases 11<sup>th</sup> revision (ICD-11) on 28<sup>th</sup> of may2019. It is been said that this phenomena triggers in a work place environment and should not be appeared in any part of day-to-day lives. Burnout was also been discussed in the previous revision of ICD however

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later the definition is now elaborated even further than before. As, it has been said that job burnout influence cognitive functioning of a person but there are only handful of research to prove this statement. A study executed by Pavlos Deligkaris et.al (2012) that suggest, job burnout affect only specific area of cognition those are memory, attention given to the task and execution of the task. a protein named Brain derived neurotropic factor (BDNF) is encoded in humans as their birth parent's gene. It is in basal forebrain, cortex and hippocampus that are the important areas of learning, memory and high level of thinking. Evidence by S.C. He et.al (2017) have shown that BDNF has relation with the cognitive functioning of person.

Research by W De Vente and his associates (2003) studied to observe the difference between the persona that has experienced burnout and a healthy person. The research was recorded by measuring hypothalamic pituitary adrenal (HPA) and sympathetic adrenergic medullary (SAM). SAM levels was recorded by recording the heart rate (HR) and blood pressure (BP) and HPA levels recorded through salivary cortisol ratio also its morning ratio was also been recorded in a standardized laboratory by using speech and math challenges. The result revealed an increase in heart rate recovery in burnout effected patients compared to patients who are healthy other than that all the other areas were recorded as normal between both the groups. But at the start of the research, it was been seen that there was high cortisol level in patents who are affected by burnout rather the people who are healthy.

### ***Burnout***

According to Cambridge dictionary “burnout is a state of extreme tiredness or a feeling of not being able to work anymore, caused by working too hard”.

Burnout also have its physical limits effects

### ***Dimensions of Burnout***

There are three dimension of burnout these are-

- Feeling of negativism and increased mental distance from once own work.
- Professional results from work are starting to decrease
- Feeling of exhaustion.

### ***Classes of Burnouts***

According to a research done by Jesus Montero-Marin et al (2014) there are three types of burnout, these are as follows-

1. **Overload burnout**-This is a type of burnout where the person pushes him/her for the sake of success that there is willing to give up their health and personal life. They're coping technique is to complain. According to the research overload burnout is mainly explained by expression of strong emotion due to not sharing it with others about their issues time to time it led to bottled up emotions that burst out as a result. The strategy can develop depression and psychological problem's if it is being used often.
2. **Under Challenge burnout**- its accrued cause of not being appreciated for their efforts, boredom cause no motivation to push themselves and lack of opportunities in their profession. The reason which triggers this type of burnout is because the employee is not proportionate or enjoying their work their source of coping strategies is by distancing themselves from their jobs which leads to irresponsibility for their work, thinking that people work for their self-interest and overall

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disengagement from work. This strategy might lead to substance abuse if it went further ahead.

- 3. Neglect burnout-** people who comes into this category are mostly passive and unmotivated to work in their job. They feel helpless at work most of the time they feel that they cannot complete the task at hand and can't keep up the demands of the job. This also leads to cynicism and a distorted vision of job achievement and success.

### *Sings of Burnout*

According to an article by Elizabeth Scott (2020) "Even if burnout is not a psychological disorder that can be diagnosed it should not be taken lightly". Here are few common burnouts physical evidence-

- **Alienating themselves from work**  
Employees with burnout see their jobs stressful and annoying they may act negative about others motivation of work and other types of decision in the working environment. Emotionally distancing them self from others might also happen and having no feelings towards their work might also be an issue.
- **Physical condition during burnout**  
Chronic stress will affect once physical condition like headaches, dizziness, chest tightness, respiratory problems, back pain, tinnitus, sexual problems, tiredness and stomachaches.
- **Emotional symptoms**  
Employees may feel tired and drained unable to deal with job that often leads to their low responds on their work.
- **Unable to perform well**  
Employees are unable to perform at their optimum level like unable to do assignments on time and lack creativity.it also affects one personal life and employees who have a family of their own are more stress because of it.

### *What is cognitive function*

If we look at the physical structure of cognition, we can see that it is the combination of hundred billion of nerve cells. Each cell has ten thousand connections that are connected with other cells, these are known as neurons. cognition is a mental process that gathers knowledge and interpret the situation through past experiences and thoughts. It derived from the Latin word 'cognoscere' which means 'get to know'. The ability to take information from outside world and react, understand the environment or situation and finds a reasonable reaction towards it that's why cognitive functioning is important for us to govern our daily lives through past teachings and use it in an environment which is appropriate for that moment. Our mind grasps all the outgoing information through sensory memory which is complicated to understand so our cognition helps us to decipher the outside information to its core for us to understand.

Evolution of cognition changes over time, our experiences which characterized our behavior its decline and increase depends on the environment and genetics. But after when a person hits old age the neurons inside the brain starts to drop which leads to dementia and other cognitive disorders. Thomas Chao et.al (2019) Investigate the cognitive function of those

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who have done cocaine during their adult life style. The result shows the marginal difference in distortion in verbal function between the once who controlled and the cocaine users.

### ***What is neuroendocrine system***

Neuroendocrine system is the study of neurons and endocrine system. When we talk about nerves system, we are exploring brain, spinal, cord, ganglia, and nerves. The nerve cells send signals to other cells, these are known as neurotransmitters. The function of the endocrine system is to send signals to the organs through hormones which helps it to communicate. The hormones go to the bloodstreams like an airways and work with other part of the body at a distance. The endocrine that goes inside the blood stream and work in a distance and paracrine hormones which work on small part of the body the regional area the work of the paracrine do get to blood stream but they are too close to the synthesis and for autocrine, there is a huge concentration of the receiving end next to the cell and to the next. In endocrine system the hormones are controlled through the negative feedback mechanisms that function to control the quantity of hormones the organ required this is known as the homeostasis. Let's take an example of incline's, hormones that are produced by the pancreas and glucagon regulate the blood glucose level to get high. when this process happens the pancreas releases insulin, that controls the level of glucose from getting high. When the amount of glucose starts to decrease, the pancreas starts releasing glucagon that stimulate the breakdown of glycogen and releases glucose into the blood which results in the blood glucose level to revert to normal.

### ***Relation of Burnout and Stress***

If we look at the definition of stress which says it is a state of physical or emotion tension so we can say that burnout is the extreme condition of the stress. Cause even if a person is in a state of stressful situation, they can still there be a chance that they might be able to control the stress at any moment but in burnout it is a state of exhaustion from caring for someone, mentally demotivated and having a sense of hopelessness. Now if we compare the difference, we can see that stress is characterized by over engagement but in burnout its characterized by disengagement. People under stress have overreaction due to stress but for burnout it's more like a blunted emotion (no reaction from the situation). loss of energy is also common but for a burnout person it is more in the area of loss of motivation and hope. Stress cause physical damage to the body on the other hand theirs an emotional damage which is caused due to burnout. Burnout patient have a tendency of detaching themselves from the people who are around them and stay clinically depressed but a stressful person has only anxiety towards to issues there are no detachment or depression episodes.

### ***Burnout and Cognitive Function***

As we know functions of cognition and burnout, we can say that both goes hand in hand the main cognitive function that gets highly affected by keeping oneself from updating from the information (memory), our response from the outside information (processing) and finally switching between the mental task (decision making) which was evaluated by Bart G Oosterholt. Et.al (2011). Even a minor impact of switching between the task might impact the performance at the work or lead to social relationship issues if the decision making is not up to its optimum function. Let's take an example you are conducting a presentation at your office now if you are already burnout putting an optimum function will be difficult like recalling the long information which is written in a key format in the presentation or during the part when others ask something in regards of the presentation or the switching between answering or presenting your topic that's why it has been said that practice is necessary before conducting a presentation.

### *Burnout and Neuroendocrine system*

As according to the ICD 11 it has been understood that the burnout is chronic work place stress that a person is unable to manage. If we compare the stress complains the clinical issue for stress, issue in sleeping, concentration issue, feeling of low energy.

A research study showed the overlap symptoms of major depression disorder and burnout. The imbalance of hypothalamus, pituitary gland and adrenal axis is the main area behind both disorder. It explains the long-term exposure of long-term stress that leads to no time for the body to recover. Researches who supports this statement for example the study of Ingibjörg H. Jonsdottir, and Anna Sjörs Dahlman(2018) have stated that the HPA axis is the centre which is the case of the stress but only few researches have little evidences which explain the relation of burnout and HPA axis.

### **REVIEW OF LITERATURE**

Research study was done by Ning Tao et.al(2015)to check the soldiers job burnout and neuroendocrine system and its relation in a harsh location.600 soldiers were posted in urban area and 300 were posted in harsh desert environment. The sample was collected with the help of Maslach Burnout Inventory questionnaire. A sample of 100 was taken from both the group. The result showed that the burnout was little higher on the soldiers who were located in desert area then those in urban area. HSP-70, serum cortisol, and adrenocorticotrophic hormone level were found higher in them.

Chow et al (2018) conducted a research review to see all the past researches on limbic system and how they are connected with burnout. Total 13 studies were selected 6 were based on hypothalamus-pituitary-adrenal (HPA) axis and their relation with burnout.4 were based on the size of the limbic system of burnout clients with the help of neuroimaging tech. The result concluded that chronic stress from work disrupt the balance of the hpa axis and that leads to decrease in brain-derived neurotrophic factor and leads to impairment in neuron atrophy and neurogenesis.

Huffman and Michelle C (2016) study the effects of neuroendocrine system and psychological play the role in mental health professionals' compassion in fatigue and satisfaction. Saliva was collected from the sample during the trier social test (TSST). the result showed that depression and compassion fatigue and burnout is related to HPA axis but not related to sympathetic nervous system.

Bianch et al (2017) study the previous researches to remove the overlapping of the limitation of burnout and depression with the help of biological findings of the past research. They studied the depression on a subtype level and made research to understand the overlap process between them. It concluded that it's not evidence that the burnout has a specific biological finding to look upon.

Holberg et al (2019) studied the burnout relation with stress and an individual's fact of being likely to get affected by the data was collected from the past evidences and data sources that showed the 3 major component of burnout. The results shows that resources that can help in coping, understanding and mastery over work can protect from being burnout.

Moen et al (2019) studied the cognitive areas of psychological and perceived stress in positive and negative form and how athletes perceived it during burnout. Sample size(N=670) was taken and data was collected from structural equation modeling (SEM).

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The result concluded that the sample resilience plays the important part in understanding their burnout and perceived performance.

Deligkaris et al (2014) did a in depth review on job burnout and cognitive functioning. 15 articles from 2005-13 were taken. The result showed that profession which require higher demands disrupts the attention, memory, functioning and understanding.

He et al (2017) studied the brain-derived neurotrophic factor (BDNF) which might linked with impairment in cognitive functioning which results in burnout. The sample size(N=712) was collected with the help of cross-sectional method. The test was used repeatable battery for the assessment of neuropsychological status (RBANS) and Maslach Burnout Inventory (MBI) and study the levels of BDNF. The results shows that BDNF acted as a referee between burnout and cognitive impairment.

Van Dam et al (2012) study the level of response towards reward of burnout patients and impaired cognitive function. The data was collected from 40 burnout samples and 40 healthy samples who participated, 2 years back on experimented activity where motivation effects intervened in cognitive performance. The result showed that symptom's will be there for a long time but it's possible to overcome burnout.

Oosterholt et al (2014). studied the burnout samples cognitive performance in clinical and non-clinical area. Questionnaire was used and a battery test for executive and general cognitive function And Sample was collected from healthy sample of 30, non-clinical sample of 29 and clinical sample of 33. the result showed that non clinical sample had less cognitive issues then clinical sample.

Van Dam et al (2011) study if reducing the requirement for cognitive performance of burnout patients can be used as a motivational support. Sample was collected through examining the motivational intervention effects on cognitive functioning Data was collected from 40 burnout samples and 40 healthy samples who have complex attention task. The result shows there will be a reduction of cognitive functioning of burnout samples.

Beck et al (2013) study the burnout executive function goes down compare to a healthy person but might become normal soon. Data was collected from 12 job burnout sample by following the questionnaire on levels of burnout and executive functions after a follow up in 12<sup>th</sup> week of the experiment. The result shows a reduction in executive function in low burnout level patients compare to healthy once but no changes were there between the two.

Kotb et al (2020) studied the cognitive performance and if it has any relation with neuroendocrine system. The data was collected from collecting blood samples between 8am to 9am and tools were used are Montreal Cognitive Assessment Arabic version, Beck's Depression Inventory and McGill Pain Questionnaire. The result revealed that people with chronic tension type headache and depressive people had malfunction in cognitive functioning and were sink with hormonal level.

Gomez et al (2018) study the university music students low and high anxiety level due to prolonged performance has any affect to neuroendocrine system and perspective cognition. Data was collected from 72 students by studying their saliva and perseverative cognition till 7 days. The result says that solo performance has long term neuroendocrine effects and musical performance anxiety is the main factor.

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Rozek, D. C., Smith, N. B., & Simons, A. D. (2018) investigated the lab's physiological response of stress and how sample thoughts keep the recordings of it. The data was collected by using Trier Social Stress Test and randomized technique on 50 control condition and 50 thought condition. The result shows the increase in cortisol levels were found in thought condition samples.

Qu et al (2018) studied the change in hormone level on neuroendocrine and cognitive performance due to chronic tension type headache (CTTH). data was collected from sample of healthy and CTTH and Montreal Cognitive Assessment and the Nine Box Maze Test tools were used. The result showed the relation of CTTH with change in neuroendocrine hormones.

Karaismailoglu et al (2017) studied the levels of caffeine consumption has any effect of maternal woman's fetal sex steroids and neonatal brain tissues. the data was collected by giving high and low dosage of caffeine to pregnant woman. Results shows the effect in ex steroids and neonatal brain tissues which leads to behavioural changes.

Adler AB et.al, (2015) made a research study on the staff and military personals who were posted in Afghanistan. A sample size of 344 were taken with the help of cross-sectional technique. The result concluded that stress in jobs and amount of burnout has a relation to one another and other areas had a negative correlation result which concluded less but not any significant results in the area.

A research study was made by Michael P. Wilmot and Deniz S. Ones (2019) to study the effect of conscientiousness(C) at work environment. A sample size of 98 were taken with the help of multiple scientific studies. The result shows the importance of (C) was  $M = 20$ . they concluded that the effect not high enough in higher level compare to low and moderate level.

Dutra, Herica Silva PhD, Guirardello Edinêis de Brito PhD, Li Yin PhD and Cimiotti, Jeannie P. PhD (2019) did research on the nurses working in Brazil and analysing the best computational method for burnout. A sample of 452 nurses were taken with the help of Maslach Burnout Inventory-Human Services Survey (MBI-HSS). using the subscale, they analysed that job satisfaction (Cox-Snell  $R^2 = 0.312$ ; Nagelkerke  $R^2 = 0.450$ ) and intent to leave (Cox-Snell  $R^2 = 0.156$ ; Nagelkerke  $R^2 = 0.300$ ), as was high emotional exhaustion (Cox-Snell  $R^2 = 0.219$ ; Nagelkerke  $R^2 = 0.316$ ).

Arif H.K Amal MD, MHS(2020) conducted research on cause and chances of having burnout in places like hospital and palliative care clinic in the U.S. the sample size was analysed from a discipline wide electronic survey with a sample size of 1357. the difference in two health centres didn't difference in burnout however it was concluded that discipline and wide variety of strategies are required in an individual level.

Peter Hassmén et.al (2019) conducted a research study on the 8 elite score coaches burnout level in the 10-year duration with the help of using Maslach's Burnout Inventory Educators Survey (MBI-ES). the survey was filled three times in 3,7 and 10 years of working year and were also interviewed. They said that it was tough to balance job and personal life and it was concluded that it got decreased over time with the right strategy.

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Meredith, Chloé, et al. (2019) conducted a study of previously contingents of burnout and how to expand those findings with the help of social networking approach. 931 samples were collected from 14 different schools by using the cross-sectional method. Burnout contagion were analysed in 12 schools with a sample size of 578 teachers with long lasting burnout effects. The result shows the importance of interpersonal relation that helps from burnout.

Boscolo et al (2012) conducted the research study on 38-year-old(N=137) male employees' anxiety, job strain and blood natural killers (NK) activity of different profession. It was concluded that NK have difference in level in regards of professions.

Gu, W., Tang, D., Zheng, K., & Wang, L. (2011) study the neuroendocrine system and the way it gives way for the manufacturing system. The studies got inspired by the neuroendocrine functions throw which they created a system that can adapt to the environment need and manufacture of the good. In the end they created a prototype system and set up the simulation.

de Souza Santos et al (2020) study the how job stress is related with Glycemic alteration. The data was collected from the longitudinal study between 2008-14 on 7503 workers. The result showed that glycemic level relation towards job stress was more in female workers.

Larkin, K. T., Brown, L. A., & Tiani, A. G. (2020). studied the environmental stress increase the chances of having cardiovascular diseases (CD) by studying the autonomic nervous system and neuroendocrine system changes towards the time of stress. The data was collected from stress responses like lack of response, start of the response and delay response. The resulted concluded that only start of response towards stress had an effect on CD.

Ménard, C., Pfau, M. L., Hodes, G. E., & Russo, S. J. (2017) made a review on stress and its relation towards immune system and neuroendocrine system that defines its resilience and variability. The data was collected from past researches and focusing on areas like pro-inflammatory cytokine signaling, peripheral monocyte infiltration, microglial activation, and hypothalamic-pituitary-adrenal axis hyperactivity in stress vulnerability. The results helped in reveling immune modulators with treatments and adaptive immune response might help in reducing the depressive symptoms.

Coffman, J. A. (2020) study the neuroendocrine stresses physiological adaption, developmental system and chronic stress levels. The study was focused on the level of chronic to collect the findings. The result reveals that continue disturbance leads to changing the threshold of sensitivity.

Hans Henrik Sievertsen, Francesca Gino, and Marco Piovesan (2016) made a research study to assess the student's cognitive level of fatigue in performance level on a standardized test. The data was analysed from the children who were attending Danish school in 2009 to 2010 in addition 2012 to 2013.the result show a decrease of 0.9% level of educational task in every hour of the day. However, findings concluded that 30 or 20 minutes of break, improved the performance level.

Shisei Tei et.al (2020) study how one gets affected by empathetic embarrassment which change its brain and behaviour in social anxiety.23 sample were taken and a sub-type of



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social anxiety disorder known as taijin-kyofusho and MRI scan was used. The result concluded that how alerted teachings can affect once cognitive processing that results in having fear that do not exist.

Kristine Olson MD, MSc, et al (2019) organized strategies for professional fulfillment and reduce physical pain. The reviews were taken by people who are in a different area of higher institutional level with their consent by using the Stanford's tripartite model as the tool and it was concluded with evidences that are usable to initiate strategies to improve professional life and reduce physical pain of any kind.

Ito, Hirotake, Makiko Nakamuro, and Shintaro Yamaguchi (2020) studied the effects of reducing the size of the class by using the Maimonides rule. The study was gathered from 1064 different schools of Japan in a three years duration of the study. The result showed that statistically speaking there was no significance in the economic and students marks in academics.

De Vito, Alyssa N., Marwa Ahmed, and Jan Mohlman (2020) study the effects of cognitive behavior therapy (CBT) and how it can be enhanced for anxiety and disorders for adults who are older and healthy. Recent evidences showed the minimum benefits of CBT on older adults than younger adults. Enhancement of CBT is been suggested for better effects on older adults.

Dodich, Alessandra, et al. (2018) study how cognitive reserve variant in social and cognitive occupational level. A sample size of 37 behavioral variant of frontotemporal dementia (BVFTD) were taken with the help of O\*Net network database and Principal Component Analysis. The result reveal that the higher occupation levels were associated with a more severe hypometabolism in the dorsolateral prefrontal cortex.

## DISCUSSION AND CONCLUSION

As the study leads to the effects of burnout impairment on cognitive skills and neuroendocrine system many evidence showed the effects of cognitive skill impairment because of burnout have a huge role in weakening of employee's cognitive skills due to burnout. According to Deligkaris et al (2014) research data from 2005 to 2013 have proved these discoveries. Moreover, study done by He et al (2017) verified the involvement of brain-derived neurotrophic factor (BDNF) as the key component for impairment of cognitive skills to take play due to burnout. As observed from prior studies it clears that burnout effects the 3 major areas of cognitive functioning, these are executive functioning, memory and attention. Dam et al (2012) founded that Burnout has a potential to stay for a very long time nonetheless there is always a chance of recovery relatively than becoming a disorder itself.

*There are few ways to recuperate from burnout for example-*

- A) Talk to your family and friends, whom you are closed to and if you have no one in your life like this then you can always build new friendships with new people.
- B) limit your contact with negative people who only complain and drag you down in their problems.
- C) Community groups are there who help in issues like these, it is a good way to recover by reaching out to them.
- D) Find balance in your life and find value towards your work.
- E) Take time off, go on vacation to refresh yourself.

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- F) Set boundaries towards those who puts you lot of work or your coworkers. You need to manage your priorities.
- G) Take daily breaks from technology to refresh yourself and give time to yourself.
- H) Bring out the creative side of your personality and your work.

These are few examples to recover from burnout. If we look at the relation of burnout and neuroendocrine system. A study showed that depression and compassion fatigue and burnout is related to HPA axis but not related to sympathetic nervous system. The findings concluded that there are no relation of stress and burnout which are related to biological findings that causes stress. The person still has faith that if he makes everything under control it will be normal. But in regards of burnout, it is a sense of helplessness that nothing is possible to overcome to tackle the problem.

The researchers concluded that burnout does have an effect on cognitive skills impairment but there are not many research evidences that could prove the relationship of burnout with neuroendocrine system as the task is arduous to follow with my limitations such as understanding the employees work task and achievement and narrowing down the average of the total performance of the group. Not to mention the long-term study that can be disturbed if any group members leave the research entirely due to unexpected reasons. Also, the employee's medical results as some of them can be difficult to get as participants may not share it with the researchers and to use the subjects with no medical history of present illnesses that may create bias variable for the research. Finally, there are no tools that can assess the entire neuroendocrine system of the participants.

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