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Research Paper

Studying the Relationship between Chronotype, Well-Being and Anhedonia Among Young Adults

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ABSTRACT

The chronotype which refers to the sleep- wake behavior of an individual can be an integral reason for many of the physiological, mental issues an individual faces. The preferred timings of sleep- wake affects our peak cognitive and physical performance, both morningness and eveningness are associated with various issues, where subjects with higher eveningness scores are more prone to unhealthier lifestyle, diabetes, mental disorders, metabolic syndrome, etc. Therefore, sleeping patterns can play a very important role in satisfaction, well-being and pleasure in life. Therefore, beginning from the concept of chronotype, anhedonia and well-being, the present study aims at studying the relationship of the various aspects of the variables selected, and how they are correlated. A random sample of 152 male and female young adults were selected from different walks of life, and three questions were presented to them, namely the Composite Scale of Morningness (CSM), the Questionnaire for Eudaimonic Well-Being (QEWB) and the Snaith-Hamilton Pleasure Scale (SHAPS). The statistical tools used for the study were Pearson correlation, Descriptive Analysis and Sample t-test for independent t-test. The findings of the study suggest that there is a positive correlation between Chronotype and Well-Being, and Anhedonia. There is no correlation between Well-being and Anhedonia (reverse).

Keywords: *Chronotype, Anhedonia, Well-being*

CHRONOTYPE- Morningness or eveningness (or chronotype) is an individuality trait, which refers to the sleep- wake behavior (the preferable timings of sleeping and waking up), in addition to the times of peak cognitive and physical performance and to the psychological aspects, like the feeling after awakening, known as affect (Bullock, 2019).

People who achieve peak mental and physical arousal during the day, fall under the category of Morning types (also known as MT), and the opposite of this, people who achieve mental and physical arousal peaks later in the day, fall in the category of Evening types (also known as ET) (Randler et al., 2014).

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People associated with eveningness are more likely to have a flexible sleep schedule, are less physically active and end up making up on their sleep during the weekends, and sleeping less during the weekdays. They are related to a more unhealthier lifestyle that lead to increased stress response, higher cortisol levels, and higher resting heart rate, which end up increasing risks of sleep apnea, obesity, type 2 diabetes, mental disorders and metabolic syndrome.

According to conducted research, evening people are also linked with impulsivity, anxiety, depression and anger, and are host to many negative habits like risk- taking, overuse of electronic media, substance abuse (including caffeine, alcohol and tobacco), skipping breakfast and overeating during the evening.

This shows that the chronotype interacts with various other factors to produce such effects. Many problems occur due to the mismatch of chronotype and working schedule, therefore a way to reinforce a better routine, there is a need for matching the schedule with the person's chronotype. When such a thing doesn't happen it leads to a severely limited career choice.

Factors that might affect the Chronotype

The changes in chronotype can change significantly throughout a person's life. It's not fixed, still as we age, our circadian rhythm tends to shift (Hasher, 2018).

Chronotype can be an inheritable trait, which was verified by a twin study resulting in the proposition of several gene polymorphisms. In the human cognitive and physiologic function, there is a considerable amount of variation during the day. Other factors like the environment, non-genetic factors such as family, work schedules play a significant role in middle adulthood, along with developmental processes in the adolescent.

The biological Aspect of Chronotype

The sleep- wake cycle is mostly controlled by the suprachiasmatic nucleus also known as the master clock, which is a cluster of neurons located within the hypothalamus (C. May,2018). It works in relation with the stimuli from the environment, like exposure to light. Our biological rhythm is deep rooted in our genes. Most of these tendencies tend to run in families. However, these tendencies are not fixed, and as we age, our circadian rhythmicity shifts as well.

Chronotype and Well- being

A major difference between the morning type and evening type is their associated outcomes of well-being.

Subjective Well-being can be defined as the presence of frequent positive affect, and at the same time, absence of any negative affect, in addition to overall satisfaction in life. When conceptualizing and measuring aspects of well-being, it was observed that ETs (or Evening-types) fare much worse than MTs (Morning-types)

1.1.1 TYPES OF CHRONOTYPE - As people's cognitive abilities shift throughout the day in accordance to their circadian patterns, there can be five different types of chronotypes, according to the timings of most alertness and energy (May, 2018)

- Strong morning types
- Moderate morning types
- Strong evening types
- Moderate evening types

- Neutral (who peak midday)

Some surveys used to measure your type can be Morningness- Eveningness Questionnaire (MEQ), Composite Scale of Morningness (CSM) and the Munich Chronotype Questionnaire (MCTQ).

Dr. Michael Breus developed four different kinds of chronotypes on the basis of sleep- wake patterns that he had observed in animals, which are as follows-

1.1.1.1 *Lion*- The lion chronotype represents the early riser. These people are most productive in the mornings since they get up early, but they may struggle to keep a social schedule in the evenings.

1.1.1.2 *Bear*- Dr. Breus estimates that the bear chronotype accounts for around 55 percent of the population. People with this chronotype have a tendency to follow the sun. They are capable of working typical business hours while also keeping a social life in the evenings.

1.1.1.3 *Wolf*- The wolf chronotype is similar to the typical night owl and is thought to account for about 15% of the population.

1.1.1.4 *Dolphin* - The dolphin chronotype is based on genuine dolphins' propensity to stay awake even while asleep. The best way to describe human "dolphins" is insomniacs.

1.1.2 THEORIES ON CHRONOTYPE

1.1.2.1. *Biological Theories* - There are two hypothesis when it comes to the biological hypotheses regarding the chronotype, the two of them are-

- Inadequate exposure or non-optimal usage of light affects the circadian system stability, which eventually leads to chronodisruption eventually leading to an impaired circadian system. The 24-hr light/ dark system affects the SCN, (or the Suprachiasmatic model), which strongly affects the physiological arousal, along with mood and emotion regulation.
- The second is reduction in well-being due to the lack of sleep, which also happens due to the misalignment of social time and circadian clock. This misalignment is known as social jetlag, which is more persistent and leads to long-term consequences for well-being,

1.1.2.2. *Genetic Theorie*s- Genes that are shared between chronotype and well-being aspects explain the processes mechanistically. Shared genetic processes underlie chronotype, mental illness, the fear response, and behavioral defense response.

1.1.2.3. *Developmental Theories*- A lifetime trajectory for chronotype follows a consistent pattern of preference of morningness in childhood and a shift of that preference towards eveningness during their adolescence and which gets more pronounced with age.
There is still no research to prove that tendency towards a morning preference is driven by the work schedules and family or if it's biologically driven.

At this key stage of physiological growth, pubertal mechanisms appear to be substantially driving the change towards eveningness during adolescence. Significant hormonal changes are linked to neurobiological changes that affect social and emotional well-being at this period of development. Adolescents' low well-being results are exacerbated by the related

change toward eveningness at this stage of development. The interaction of developmental circadian and neurobiological processes in the transition to adulthood appears to be a key driver of the chronotype-well-being relationship.

1.1.2.4. *Psychological Theories* - Personality is a powerful predictor of happiness, and there are reliable links between personality qualities and chronotype. Morningness is most frequently connected with personality traits that are defined by facets of discipline, tenacity, and dutifulness - for example, conscientiousness, constraint, and control. These characteristics are also linked to happiness. Long-term mood outcomes and overall well-being are linked to neuroticism. Eveningness and depression may be linked to emotion dysregulation, which is a basic component of neuroticism and related features, possibly through shared brain pathways. Extraversion promotes happiness, but it interacts with eveningness in unexpected ways to influence well-being outcomes. Drezno et al. recently demonstrated that extraversion regulated the relationship between chronotype and life satisfaction, allowing the favorable effects of chronotype to be preserved.

1.1.2.5. *Psychosocial Theories* - Social variables may also play a role in the relationship between chronotype and happiness. For example, social connectivity is a very strong predictor of health and happiness. Recent research suggests that a lack of social connection has at least as much of an impact on mental and physical well-being as previously stated lifestyle factors like lack of exercise and bad food. Extraverted ETs report superior overall well-being than introverted ETs, according to Drezno et al.. From this perspective, it appears that extraversion's social advantages defend against evening solitude, whereas introverts' preferred seclusion is not conducive to social connectivity and the high well-being outcomes that emerge from it (Bullock, 2019)

1.2 WELL- BEING - It is a highly popular approach in positive psychology that majorly concentrates on building personal strengths and ideas such as happiness, well-being, hope, self-efficacy, development, resilience, optimism, self-esteem, gratitude, instead of focussing on the negative aspects of the mind, like mental illness, pessimistic thinking, negative cognition, and maladaptive behavior.

1.2.1. TYPES OF WELL-BEING - One of the key interests of positive psychology is to analyze happiness, which have been defined according to opposing philosophical views-

- Hedonism
- Eudaimonism

1.2.1.1. HEDONIC WELL-BEING - The hedonic view equates to happiness, pleasure, comfort, and enjoyment, whereas the eudaimonic view equates happiness with the ability of pursuing goals that are more complex, and meaningful to the individual and society.

Besides analyzing, correlating and checking the consequences that happiness can entail for human well- being, the recent trends call for the integration of hedonic and eudaimonic views into a global theory of human well-being, and stress the need to adopt cross-cultural perspectives on happiness.

Psychological Hedonism

Psychological hedonism constructs pleasure very broadly, by including all positive feelings and experiences like satisfaction, ecstasy, joy, contentment, bliss and so on. On the other hand, pain is understood as all the negative experiences such as aches, guilts, discomfort,

fear, anxiousness, regret, and so forth. Yet even with the division it is impossible to divide all actions into acts that either produce pleasure or pain. Eventually agents try to claim psychological hedonism as something to to be pleasure- producing or pain- reducing.
It is also the view that ultimately all actions of humans are motivated by the desires for pleasure and to avoid any kind of pain. It is also known as a form of psychological egoism.

There are six core dimensions that are important for quality of life-

1. Autonomy
2. Environmental mastery
3. Personal growth
4. Positive relations with others
5. Purpose in life
6. Self acceptance

1.2.1.2. EUDAIMONIC WELL-BEING or EWB- It refers to a life of quality which is derived from the development of a person's potentials and their application for the fulfillment of personally expressive, and self-concordant goals,

The Eudaimonic Well-being arises from the Subjective Well-Being and has emerged as its complementary and contrasting feature.

Hedonia refers to the feelings of pleasure in the form of a subjective experience irrespective of the source of the happiness. According to Kraut, the philosopher, hedonia is said to be a belief that says that one is getting the important things one wants, along with the certain pleasant effects that go with this belief.

Self-discovery
Norton (1976) had helped identify two imperatives which express the central elements in the philosophy of eudaimonism-

- Know thyself
- Choose yourself

As an ethical theory, eudaimonism seeks to call upon each person to recognize and live according to their daimon

1.2.2.1 Eudaimonic Identity Theory- This serves as the bridging framework used to develop potential items to be included in the QEWB. This theory is used to link the eudaimonism philosophy with studies of psychological functioning. The eudaimonic identity theory focuses on the concept of daimon or 'true self', which has been drawn upon by the eudaimonistic philosophical construct, along with self- realization, pursuit of excellence, and eudaimonia (subjective experience) to integrate aspects of psychosocial perspective on identity formation.

1.3. ANHEDONIA- It is defined as the inability to enjoy experiences or even activities that they would normally find more pleasurable. It is also one of the two factors that can be a defining symptom for a major depressive episode (the other factor is a persistent depressed mood), but this is not a defining symptom for just depression but also other disorders like schizophrenia.

Derived from the greek words an- and hedone, anhedonia when translated means "without pleasure", it more appropriately means decrease in the capacity to experience pleasure.

The term anhedonia defines major constructs, affective experiences and events. Anhedonia is almost always related to psychopathologies.

Depression Vs Anhedonia

Depression is a disorder marked by a sad mood and/or anhedonia, a diminished interest or pleasure in activities that once brought a lot of pleasure. Depression is used to refer to two conditions -

- A stage of profound sadness
- To describe a manifestation of clinical syndrome

This duality created a confusion regarding the concept of anhedonia.

Mental Health

A mental state marked by emotional well-being, good behavioral adjustment, relative independence from anxiety and disabling symptoms, and the ability to form positive relationships and cope with everyday demands and stresses.

1.3.1. Types of Anhedonia- Anhedonia is divided into two types:

1.3.1.1 Anticipatory Anhedonia- related closely to the "wanting" system, which refers to a decreased pleasure due to anticipation of an upcoming activity, or impaired ability to imagine stimuli which are associated with motivation and goal-directed behaviors.

1.3.1.2 Consummatory Anhedonia - Dominated by an impaired "liking" system, it emphasizes on the decrease of in-the-moment pleasure and hedonic response to reward stimulus, reflecting the abnormalities in reward satiation and desire.

Anhedonia can further also be studied as these two types:

- Social Anhedonia, where you do not wish to interact with others.
- Physical Anhedonia, where physical sensations are unpleasant to you. Instead of feeling nurtured, a hug leaves you feeling empty. Your favorite dishes are bland in flavor. Even sex might become unappealing.

Anhedonia makes connections difficult, particularly those with friends and family. It's difficult to be motivated to spend time with others now that the incentive of enjoyment is gone. You may decline invites and skip events such as concerts, parties, and even one-on-one gatherings because you no longer see the value in participating.

You could also suffer from social anxiety. You feel out of place, particularly while meeting new people.

Positive feedback is equally important in relationships; without it, they would suffer.

1.3.2. Theory of Anhedonia in depression

1.3.2.1. Vulnerability- Stress Model - Vulnerability is a stable, endogenous trait including genetic (biological), psychological factors. In case of anhedonia, it was demonstrated there is an effect of genetics on hedonic ability.

All the studies done emphasize gene polymorphism on reward processing, imaging genetics show multilocus genetic profile for dopamine signaling. Few studies link genetic

polymorphisms to reward attached neural responses during reward processing. Maladaptive attentional bias in depressed individuals (characterized by attentional biases) is more towards negative stimuli than positive stimuli, and is related to anhedonia. Evidence shows that there is a strong connection between stress and anhedonic symptoms.

REVIEW OF LITERATURE

Hasher et al (2012), conducted a research to see the effect of synchrony effects, and whether it holds true for all ages. They had presented a suite of tasks testing the executive functioning of adolescents who were identified as "morning" types or "evening types". The test was conducted in the morning or in the afternoon, as a result the larks or the owls when tested during their peak times, had scored higher in domains like decision- making, working memory and overall executive functioning than students were tested off- peak times.

Hasher, May et al (2005), had conducted a study where they tested both younger and older adults at their non-peak and peak hours. A test was done with the purpose of evaluating their implicit memory (automatic memory, with unconcious recall of well- known information) and the explicit memory (it is the conscious, deliberate effort to process and retrieve information). In both the younger and older groups, the subjects' explicit memory was better at the subject's peak times, but surprisingly the results were flipped for the implicit memory results, since the morning type had better implicit memory in the afternoon and the evening type had scored higher in the morning.

Jankowski et al., used a within-subject study to monitor the changes in the well-being in the summertime in Poland amongst the students, aged between 19 to 31. It was a naturalistic experimental manipulation, where he tried to shift all the students to a more morning orientation. With the change in routine, and a shift to earlier sleep and wake timing, there were no changes observed in the mood or even the life satisfaction of the students. Therefore, the study suggests small correlations, and a poor understanding of the relationship between chronotype and well-being.

Mao et. al, (2020), conducted a study that demonstrated that depressed adults with anhedonia are characterized by anticipatory pleasure, reward on subjective learning basis, incentive effort and motivation, behavioral and neuro physical evidence, although the existing literature on consummatory anhedonia present in depression are inconsistent. It also introduces the "vulnerability stress model" as the main model for anhedonia, and focuses on the functioning of dopamine system abnormalities and altered brain structures which restrict reward processing. There is inclusion of interventions including direct psychosocial interventions (focussing on social anhedonia), indirect working memory training, realtime neurofeedback training using fMRI.

The neural basis of Anhedonia and the positive emotion perception

Feeling a normal emotion necessitates first determining the emotional relevance of a stimulus (appraisal), followed by the generation of an affective state (production), both of which can be controlled at various degrees (regulation). These three processes can be thought of as being arranged by two separate systems that have a functional relationship.

The amygdala, insula, ventral striatum, and ventral regions of the anterior cingulate gyrus and prefrontal cortex may all play a role in determining the emotional relevance of environmental inputs and producing affective states. This system could possibly be in charge of the

automatic regulation and modulation of autonomic responses to emotive stimuli and settings that precede affective state creation.

On the other hand, the dorsal system (which includes the hippocampus and dorsal regions of the anterior cingulate gyrus and the prefrontal cortex) may be more important for effortful rather than automatic regulation of affective states, most likely through executive functions such as selective attention and planning.

Different paradigms have been used to investigate the origins of hedonic feelings. Dextroamphetamine-induced euphoria, cocaine-induced euphoria, monetary reward, and even pleasurable responses to music, pictures, and attractive faces, have all been linked to activity in the nucleus accumbens, ventral caudate, and ventral putamen, as well as dopamine release in the ventral caudate and putamen in studies devoted to the neurobiology of pleasure.

According to research in both animals and humans, the ventral striatum, particularly the nucleus accumbens, may have a key role in behavioral responses to, anticipation of, and/or monitoring of errors in reward prediction. The nucleus accumbens appears to respond to the emotional intensity and self-relatedness of various stimuli, regardless of valence, with both positive and negative valences possibly processed along a rostrocaudal gradient. The nucleus accumbens receives projections from midbrain regions (such as the ventral tegmental area), emotion-processing regions (such as the amygdala, orbitofrontal cortex, and medial prefrontal cortex), motor regions (such as the dorsal caudate and globus pallidus), and memory-processing regions (such as the amygdala, orbitofrontal cortex, and medial prefrontal cortex) (such as the hippocampus).

The accumbens also sends signals to the cingulate and medial prefrontal cortex, the ventral pallidum, the thalamus, the amygdala, and the hypothalamus via indirect pathways. Many of these areas are also involved in emotion processing, implying a network of physically and functionally linked areas.

Sensory integration, autonomic reaction modulation, and anticipation in learning, prediction, and decision-making for emotional and reward-related behaviors are all facilitated by the orbitofrontal cortex.

Neuroimaging investigations have discovered that the orbitofrontal cortex represents the reward value, the expected reward value, and even the subjective pleasantness of food and other reinforcers. The orbitofrontal cortex gets information from all five traditional sensory modalities: gustatory, olfactory, somatosensory, auditory, and visual, as well as visceral sensory information.

The orbitofrontal cortex is one of the most polymodal regions in the entire cortical mantle because of its wide range of inputs. The amygdala, cingulate cortex, insula/operculum, hypothalamus, hippocampus, striatum, periaqueductal gray, and dorsolateral prefrontal cortex all have direct reciprocal connections with the orbitofrontal cortex. As a result, the orbitofrontal cortex may play a key role in expressing incentive salience, hedonic impact, and subjective hedonic experience, ic, and therefore in forming the relationship between reward and hedonic experience.

The human amygdala, which has been demonstrated to be a critical region for extracting affective significance from external stimuli, responds preferentially to emotionally valenced faces, for both frightened and pleasant faces, and quickly becomes used to them.

According to contradictory findings the amygdala may be reacting more intensely for negative stimuli, while explaining its functioning in fear and anxiety. According to contradictory findings the amygdala may react more intensely to negative stimuli, explaining its central role in fear and anxiety.

Transient happiness caused by recalling pleasant life events and looking at cheerful human faces did not stimulate the anterior cingulate cortex. Individual disparities in the ability to accurately detect emotional signals, whether interoceptively or exteroceptive, may, on the other hand, be a result of the extent to which the anterior cingulate cortex participates in the experiential processing and reaction to emotion cues.

The ventromedial prefrontal cortex (VMPFC) has been implicated in the formation of an abstract representation of a stimulus's rewarding value through responding to its context, as well as the learning of contingencies based on those representations.

In contrast, lateral parts of the ventral prefrontal cortex, which respond to aversive rather than rewarding stimuli, may be less implicated in hedonic emotions.

The insula, for example, may have a more prominent role in negative and/or upsetting emotions than hedonic experiences.

Sadness induced by recall was linked to significantly higher activity in the anterior insular cortex, implying that this area is involved in the emotional response to potentially distressing cognitive or interoceptive sensory stimuli.

2.1 *Rationale of the Study*

The present study tries to explain the relationship between chronotype, Well-being and Anhedonia.

There have been many studies conducted that show associations between chronotype and other factors like health, personality and quality of life.

Personality traits associated with morningness are conscientiousness and agreeableness. Traits that are associated with eveningness are neuroticism and openness, there have been conflicting studies done on the trait of extraversion, and no solid proof is present on the representation of morningness or eveningness in that aspect Talking about the Creativity domain, people who agree more with morningness, tend to be better at school than the evening type, who have an aptitude for creative thinking. There is no proof as to whether these traits are innate or are present due to secondary factors. There are some influencing factors in such scenarios like the tendency of school to start early in the day and creative professions that need people to be more active in the evening.

RESEARCH METHODOLOGY

3.1 AIM- To compare and study the relationship between the Chronotype, Communication type and Personality types

3.2 OBJECTIVES-

1. To study the relationship between the Chronotype and Well- being
2. To study the relationship between the Well- being pattern and Personality types
3. To study the relationship between the Chronotype and Anhedonia

3.3. HYPOTHESES- Sleeping patterns and Chronotype have been studied previously with variables like educational performance, mental health and even the incidence of some mental disorders, like depression, but the main purpose of this research is to explore this variable with other variables like Anhedonia and Well-being to understand more about the relation of Chronotype.

The hypotheses for the study will be-
H1 : There will be a significant negative correlation between the chronotype and anhedonia
H2: There will be a significant negative correlation between anhedonia and well-being
H3: There will be a significant positive correlation between well-being and chronotype
H4: There is a presence of gender differences on the variables, Chronotype, Well-being, and Anhedonia
H5: There is a presence of locational differences on the variables, Chronotype, Well-being, and Anhedonia
H6: There is an effect of family settings on the variables, Chronotype, Well-being, and Anhedonia

3.4 TYPE OF THE STUDY- The nature of study for this particular research is a quantitative study. A quantitative study is a research method which relies on the variables measured by a numerical system, analyzing the measurements using various statistical models, and reporting relationships, in addition to associations among the variables being studied.

Goal of this type of research is to understand, describe and predict the nature of phenomena with the help of development of models and theories. Quantitative research includes techniques like experiments and surveys, experimental research, correlational study, etc.-

Surveys- Surveys are the study conducted within a group of participants, which are selected from a larger population, and data or opinions are collected from these selected participants are then analyzed, collected and measured. This data is collected through interviews, self-report questionnaires.

This quantitative study is using measurable data to conclude data, it has used a large sample of the population present. The survey method has been used to collect data for the following, such as interviews and online surveys, and questionnaires. The quantitative research is used to prove facts that have been hypothesized in this particular research.

3.5. RESEARCH SAMPLE- There were a total of 152 participants in the study, with no. of females, and males, involved in the present study of ages between 16 to 28. The data was collected through a non- probability sampling technique (this technique is used when the researcher selects a sample based on his/her subjective judgment instead of random selection) called convenience or haphazard sampling.

Convenience sampling- it is a method of sampling depending upon the ease of access, since it is easier for the researcher to get in touch with the subjects and eases out the process of

communication and carrying out the experiment. It is mostly done on the basis of proximity and not representativeness.

This is also used when the research is time- bound or has cost- limitations, for collecting data. In limited resources or initial stages of a research, such a type of research is needed.
Variables-

3.6. RESEARCH DESIGN- The research design for this study is correlation design. A correlational design is as such which instigates relationships between the existing variables without any external factors controlling the study, or any external manipulation, it also reflects the strength of study along with direction of the relationships between the selected variables. It describes the administration and measure of a relationship, The direction of correlation is either positive or negative (or zero correlation)

Positive correlation- Both variables show change in the same direction
Negative correlation- Both variables show change in opposite direction
Zero correlation- No changes are seen in between the variables

3.7. TOOLS FOR DATA COLLECTION-The participants were given three questionnaires to evaluate their chronotype, communication style and personality type, the questionnaires used for chronotype is

Composite Scale of Morningness (CSM),
Composite Morningness Questionnaire (Smith et al.)- The self-assessment questionnaire has been developed from two different forms called the Horne Ostberg Morningness-Eveningness Questionnaire and the Diurnal type scale developed by TOrsvall and Akerstedt. It is a pen-paper test that requires three to five minutes to fill,

Development of the Scale-
Factor Analysis was done, and 13 items were selected from the above- mentioned original questionnaires
The three factors that were identified through this were-

- Morning activities
- Morning affect
- Eveningness

The 13- item questionnaire has an internal consistency of .87 after combining two original scales and analyzing three factors mentioned above that represent the questionnaire.

Scoring of the Questionnaire-
There are questions on the preferred sleeping and waking times, where the respondent is supposed to select the most appropriate option in their aspect, from the options with increasing time. Other questions that were asked were from issues like alertness during the day, ease of waking up, and exercise.

Potential scores from the questionnaire fall in the range of 1 to 4 or 5, with higher scores indicating a greater degree of morning activeness or (morningness). cut -offs for the scale were chosen from the upper and lower percentiles- Score of 22 or below results in an evening type, whereas a score above 44 indicates a morning type, any score in between means that the person falls in the category of intermediate.

Reverse scoring-
Items that are reverse scored are 3, 4, 5, 11.
Examples of the questions that indicated morningness were in questions- "One hears about"morning `` and"evening `` types of people." with options like- "definitely a morning type" getting the highest score than any other option.

In this questionnaire, a 5-point scale was used for some questions like 1, 2, 7. The scoring for this was done separately, then the scoring for the rest of the items as well as the items that were reverse scored was done separately, and computed using the SPSS package.

Snaith-Hamilton Pleasure Scale (SHAPS) (Snaith, Hamilton et al, 1995)- The 14- item SHAPS scale is a measure of anhedonia, which in simple terms is the inability to feel pleasure. The domains covered through these items are-

- Social interaction
- Food and drink
- Sensory experience
- interests/ pastimes

Scoring- Scoring below 2 or less can be defined as a "normal" score, but a score above 3 is defined as an "abnormal" score.
All items has four possible responses namely-

- Strongly disagree
- Disagree
- Strongly agree
- Agree

It is a 4- point Likert scale: with normal sum- scored items, with the normal scoring trend which goes like- 0= strongly disagree, 1= disagree, 2=agree, 3= strongly disagree, with reverse items scoring for the items like= 2, 4, 5, 7, 9, with a scoring 0= definitely agree, 1=agree, 2= disagree, 3- definitely disagree

Constructs of the test-
The SHAPS scale has sufficient construct validity, and an adequate test- retest reliability (ICC= 0.70) (Franken et al, 2007) with a high internal consistency, and a Cronbach's alpha of 0.94 (Franken et al, 2007). The scoring for the scale was done by doing the sum total of all the individual items in each subscale separately, the scoring was done according to the manual and they were computed with the help of the SPSS package.

The Questionnaire for Eudaimonic Well Being (QEWB) (Ryan and Deci, 2001)-
The questionnaire was developed as a way to measure well-being consistent with the old philosophy of eudaimonism. Some aspects of the questionnaire are-

- Self-discovery
- Perceived development of potential
- Sense of purpose and a meaning of life
- Intense involvement in activities

By using the description of EWB, Ryan and Deci who developed the scale, tried associating variables which were consistent to living a "good life". The variables included were-

- Life satisfaction
- Overall happiness levels

- Self esteem
- Internal locus of control
- Adaptive coping strategies
- Conscientiousness
- Extraversion
- Authenticity
- Low neuroticism

The questionnaire was developed on a 5-point Likert- type scale, with the possible responses ranging from 0 (Strongly Disagree) to 4 (Strongly Agree). 14 of the 21 items are written in an affirmative tone which when scored high are indicative of EWB, whereas 7 items that are written in the negative direction imply an absence of EWB, these are the items that are reverse scored.
The possible range of scores in the questionnaire range from 0 to 84 (85 points in total)

The example of an item that helps tapping into the self- discovery is the item "I believe I have discovered who I really am". Sense of purpose and meaning in life, one thing to identify one talent

Pilot Research-
There was an initial pool of 25 items that were selected for the QEWB. These items were administered to a sample of undergraduates. Items were eliminated to reduce the value of Cronbach's alpha for the scale as a whole. Finally, after the feedback was received, several new items were created, and a 21- item scale was finally developed for the research.

The scoring was done in accordance with the manual and was computed with the help of the SPSS package.

3.8. PROCEDURE- Initially, the subjects were asked to give consent for this research. The students were explained and given detailed explanations clearly about the confidentiality of all the responses and that all the responses collected will be used for study purposes and for collecting data for research purposes. The importance and the purpose of the study was also explained to the subjects. The questionnaire was then distributed to the students in Amity, and nearby colleges. The students were given proper instructions on answering the questions of the form. The students were administered The Questionnaire for Eudaimonic Well Being (QEWB), Snaith-Hamilton Pleasure Scale (SHAPS) and the Composite Scale of Morningness (CSM). The students were given appropriate time to finish the test. It was distributed to students in colleges, schools and even some working young adults. Total of 153 students were used for the collection of data. Data for people with repeated responses were discarded. The scoring for all three questionnaires were done separately for each of the questionnaires. Later when the data was collected, they were computed with the help of the SPSS package.

3.9. STATISTICAL ANALYSIS - The analysis of the study was done with the help of the SPSS package. The version of the SPSS was. The statistical tools used for the study were Pearson correlation, descriptive statistics and independent t-test. Further results are explained in the next chapter that is chapter 4.

3.10. ETHICAL CONSIDERATIONS - Following ethical considerations were kept in mind while conducting the research study-
1) The use of unethical means will be avoided for the composition of the questionnaires.

2) No harm will be subjected to any participant in any way.
3) The confidentiality of the research data for each of the participants will be guaranteed.
4) The protection of the privacy of each of the participants will be confirmed.
5) Any confusion of the participant regarding the questionnaire will be cleared out.
6) The dignity of research for each of the participants will be respected and prioritized.
7) Before the study, full consent will be taken from each of the participants.
8) Any overemphasizing about the objective and aim of the study will be avoided.
9) Any type of conversation related to the research will be done with clarity and honesty.
10) Biases in the research will be avoided

RESULTS

The aim of the ongoing research was to study the relationship between chronotype, well-being and anhedonia. For the purpose of collecting data, the data was collected with the help of 152 patients (N= 152) in which there were almost equal numbers of female and male participants (males= 74, females= 77) from various colleges and societies, with different occupations, some from working lifestyle, with the inclusion of different types of young adults possible, the results were then calculated with the help of SPSS version 28.

Table 4.1 Shows the descriptive statistics of all the 152 subjects with minimum, maximum, mean and standard deviations of the subject sample with all three variables of Anhedonia, Well- being and Chronotype.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Anhedonia	152	26.00	39.00	35.4474	3.18687
Well_being	152	36.00	64.00	51.6447	6.12281
Chronotype	152	26.00	49.00	35.4145	3.97916
Valid N (listwise)	152				

Out of the sample of 152 subjects, on an average the students had the minimum score of Anhedonia was 26.0, and the maximum score was of 39, with a mean of 35.44 and a standard deviation of 3.186.

The minimum score of Well-being is 36, and the maximum score was of 64, with a mean of 51.64 and a standard deviation of 6.122.

The minimum score of Chronotype was 26.0, and the maximum score was of 49.0, with a mean of 35.41 and a standard deviation of 3.97.

Table 4.2. Shows the correlations between the chronotype, anhedonia and well-being. With the help of results obtained through SPSS, the following hypothesis were estimated-

Correlations

		Anhedonia	Well_being	Chronotype
Anhedonia	Pearson Correlation	1	.369**	.254**
	Sig. (2-tailed)		.000	.002
	N	152	152	152
Well_being	Pearson Correlation	.369**	1	.120
	Sig. (2-tailed)	.000		.140
	N	152	152	152
Chronotype	Pearson Correlation	.254**	.120	1
	Sig. (2-tailed)	.002	.140	
	N	152	152	152

**. Correlation is significant at the 0.01 level (2-tailed).

With the help of results obtained, the following hypothesis were estimated-
According to the above shown table, a positive correlation was seen when comparing the results of Anhedonia with Well-being and Chronotype both, with a significance value above .01 level ($p<0.01$ level). So as per findings of the results, the second hypothesis of this study was rejected as there was a positive correlation between Anhedonia when correlating with Well-being has a significant correlation value at .0369 ($p= 0.369$), with this value it is significant in nature.

According to the above-mentioned table, there is a positive correlation of well-being with Anhedonia only. No significant value is seen when comparing the variable with chronotype. With values like .120, it is an insignificant result, meaning that the second hypothesis is eventually rejected.

The third hypothesis stated that there is a positive correlation between Well-being and Chronotype, which was proven true.

According to the results obtained, Chronotype when correlated with Anhedonia shows a positive correlation and no significant value is seen when comparing it with Well-being. The positive correlation value for this was 0.254 with statistical significance of 0.01 level ($p<0.01$). So as per this investigation, the hypothesis was accepted as it showed a positive correlation between the two variables, and is significant in nature.

Table 4.3. Shows the group statistics of the independent variables.

Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Anhedonia	Male	74	34.9865	3.12521	.36330
	Female	77	35.8442	3.20388	.36512
Well_being	Male	74	51.6622	6.58200	.76514
	Female	77	51.4675	5.55258	.63278
Chronotype	Male	74	35.2027	3.77439	.43876
	Female	77	35.4416	3.91184	.44580

The above shown table is for group statistics of the independent variable.
The mean for males (N= 74) for the variable Anhedonia is 34.98 and for the females (N=77) is 35.844 showing no significant difference in the scores for both the gender types for the variable Anhedonia.

The mean for males (N= 74) for the variable Well-being is 51.66 and for the females (N=77) is 51.46 showing no significant difference in the scores for both the gender types for the variable Well-being.

The mean for males is 35.20 for the variable Chronotype, and for females is 35.44, which again shows no significant differences when comparing the means for the different gender types and the discussed variables. The means taken out from the group statistics that gender does not influence the variables used in the following study.

Therefore, this proves the hypothesis 4(H4) wrong, that there is a presence of gender differences affecting the results of the study, which it clearly is not.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Anhedonia	Equal variances assumed	.053	.818	-1.664	149	.098	-.85767	.51532	-1.87596	.16062
	Equal variances not assumed			-1.665	148.966	.098	-.85767	.51507	-1.87545	.16011
Well_being	Equal variances assumed	1.719	.192	.197	149	.844	.19463	.98956	-1.76075	2.15001
	Equal variances not assumed			.196	142.828	.845	.19463	.99290	-1.76804	2.15730
Chronotype	Equal variances assumed	.384	.537	-.382	149	.703	-.23886	.62594	-1.47573	.99802
	Equal variances not assumed			-.382	148.997	.703	-.23886	.62550	-1.47485	.99714

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Anhedonia	Equal variances assumed	.731	.394	-.576	150	.566	-.45113	.78333	-1.99892	1.09667
	Equal variances not assumed			-.531	22.355	.600	-.45113	.84889	-2.21001	1.30775
Well_being	Equal variances assumed	.199	.656	.750	150	.454	1.12782	1.50384	-1.84362	4.09926
	Equal variances not assumed			.727	22.985	.475	1.12782	1.55230	-2.08347	4.33911
Chronotype	Equal variances assumed	4.615	.033	-.793	150	.429	-.77444	.97712	-2.70512	1.15625
	Equal variances not assumed			-1.100	32.246	.280	-.77444	.70424	-2.20850	.65963

Table 4.4. Shows an independent-sample t-test to compare and check the relationship between the variables chronotype, anhedonia and well-being.

The scores for participants for anhedonia were as follows- the mean difference= -.85, SD (Standard error difference) = .515, the value of t= -1.66 and F=.053. And the confidence interval for anhedonia were precise (lower= -1.87 to .16)

The scores for participants for well-being were as follows- the mean difference= -.19, SD (Standard error difference) = .989, the value for t= 0.197 and F= 1.719
Finally, the confidence interval for well-being were precise (lower= -1.76 to 2.15)

The scores for participants for chronotype were as follows- Mean difference= -.238, SD (Standard error difference) = .625, the value for t= -.382 and F= .384. Finally, the confidence interval for chronotype were precise (lower= -1.47 to .99)

DISCUSSION

The aim of the present study was to study the relationship of chronotype, well-being and anhedonia. The sample consisted of 152 participants (74= males, 77= females). The sample was collected from the people of Delhi and Gurgaon of different colleges and nearby surrounding areas. The data was collected from colleges like Amity University, Mary College, Delhi University, and other colleges in Delhi with the help of convenience sampling methods. No data was discarded from the sample intended to be studied.

The obtained data was then analyzed, and the hypothesis was developed and tested with the help of statistical tools like descriptive statistics, correlational tests, and independent sample t-test to identify the relationship between the three variables, chronotype, anhedonia and well-being.

Out of the 152 of total sample, on an average it was noticed that since Chronotype was positively correlating to Well- being and Anhedonia, it shows-
The subjects scoring high on Chronotype test are more prone towards morningness than eveningness, therefore, morningness is positively correlated to a higher eudaimonic well-being, it also positively correlates to the Pleasure scale, since the subjects who score low on the test are prone to Anhedonic behavior, higher scores shows more proneness towards Pleasure-seeking activities, showing that the three correlate well with each other.

While studying all three of the variables, other variables were also considered for the result and discussion which were the demographic details taken from the participants. Gender

studies, location studies and familiar environment studies show that there is no significant relation of these particular demographic details with the variables in question,

SUMMARY

The aim of the given study was to study the relationship of Chronotype, Well-being and Anhedonia amongst young adults. Out of the six hypotheses that were stated, only one was accepted, while all other five hypotheses were rejected. As per the results of the study, the findings were that there is a positive correlation between chronotype and well-being, chronotype correlates positively with anhedonia and well-being, whereas Well-being correlated positively with anhedonia, showing that in this case, even vice versa was correct. Chronotype and Well-being individually did not correlate with each other significantly. Chronotype and Well-being didn't correlate significantly either. Anhedonia has shown correlational values in the positive side, and there were no negative correlations in the study.

CONCLUSION

As it has already been discussed the aim of the study is to analyze the relationship between Chronotype, Well-being and Anhedonia. The objective was to see the effect of sleep times in respect to daily well-being, satisfaction and even anhedonia or the inability to feel pleasure. On the basis of the previous chapters, chapter 4 and 5, according to the results, the findings were as such that there was a positive correlation between Anhedonia, Well-being and Chronotype.

When relating to previous studies, there have been past researches on the effect of chronotype on psychological well-being and social jetlag which have shown inconsistent results (Dimitri et al., 2020). Sleep quality, sleeping behavior was enquired, and according to the study, less sleep led to psychological well-being impairment. In such studies, the sample plays a very important role in the determination of factors and relationship between the variables.
So higher scores of pleasure show better well-being as has been seen in the study.

According to the study, Anhedonia and Well-being also correlated, according to a study done by Druiven et al, 2020, Chronotype was moderately table for over 7 years, and a decrease in depressive symptoms were noticed in the subjects with a more stable chronotype, which again shows a more stable chronotype leads to a higher score on pleasure scale, therefore this study is also lining in references to the older studies.

Finally, anhedonia and well-being were being correlated, where previous researches have shown that well-being, don't have very specific researches that can be backed up to support the data that has been collected and therefore, more research can be done in regard to these variables, and more research findings can be investigated for the same.

Limitations of the Study-

1. Standardization- One of the biggest limiting factors of the study is that it is difficult to generalize or standardize it to the entire population of India, since it was not possible to collect that huge sample of data.
2. The sample size of the population was very small/ when conducting a formal research, the research gives more beneficial data only when the sample is large, or at least large enough. The larger the subject population, the better the analysis of the sample.
3. Another limitation can be dishonesty while filling the form. There is no way to figure out if the forms were filled out with full honesty and if they give genuine responses of

the subjects that were filling them. This raises a question on the authenticity of the consent form of the study as well, and if that was filled with all honesty and sincerity.

Future Framework of The Study-

1. As a researcher, more research can be conducted on the variables in discussion, like chronotype, well-being and anhedonia.
2. To increase the reliability of the test, the sample population could have been increased, giving more apt data for analysis, with less scope for sources of error.
3. The demographics of the study could have been more balanced, as there is a huge gap between the different types of location, and preferably the data and the study can be re-evaluated with a proper set of data, with proper representation of all the subjects in the study. Focus should be placed on the variables and details that play a significant role in influencing each other.

Implications of the Study

The study on the relationship between the chronotype, well-being and anhedonia can be beneficial for the younger population who don't utilize their chronotypes to the best, and can experience phenomenons like social jetlag when they go against their chronotype. It will also help understand the relationship between depression, and the inability to feel pleasure with very basic habits like sleep hygiene. Therefore, this study can have a huge impact on building sleep hygiene and understanding what type you are, to help achieve academic achievement, a better well-being and even to be able to feel pleasure. It is very essential for people to understand their patterns, and the regulation mechanism behind everything that goes on in our body, and to better function in almost every aspect of their life.

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Conflict of Interest
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