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## **The Relationship between Sleep Deprivation, Mood Disorders and Non-suicidal Self-injury Behavior among Adolescents**

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**Abstract.** Sleep deprivation is directly linked to the deficits in an individual's emotional regulations. Most of the adolescents, who experience NSSI, actually do so to regulate their emotions. To evaluate the existing relationship between sleep deprivations, adolescent's mood disorders and NSSI, this study adopted a qualitative research evaluation approach with the help of self-report online questionnaires that were administered to a representative sample of respondents in China ranging between 12 to 19 years. The research found, whether the sample respondents reported engaging in NSSI and finally, emotional or mood disorders witnessed among the adolescents. The perceived "insufficient sleep" was directly linked to the NSSI engagement and the emotional or mood disorders witnessed by adolescents. Additionally, the mediation interventions or analysis strongly revealed that the mood disorders experienced by the adolescents contributed to their NSSI engagement and perceived "insufficient" sleep. The final results of this research study go a long way in revealing that the "sleep" deprivation witnessed by the adolescents may eventually result in risks for NSSI engagement through mood or emotional deregulation. Moreover, intelligence gained from this paper may contribute towards the development of treatment and prevention strategies for engaging in NSSI in adolescents.

**Keywords.** NSSI engagement, insufficient sleep, sleep deprivation, emotional disorders

### **Introduction**

According to (Carskadon, 2011), the sleep experienced by adolescents has loosely been described as a "Perfect Storm." This is mainly attributed to the fact that night time is the period in which they experience numerous psychological and biological changes in their bodies. This biological transformation is the main reason why adolescents experience less sleep as they are expected. A poll found that most of the young individuals in their adolescence progressively get less sleep during the night during the biological transformation from the childhood stage to the adolescence period (Carskadon, 1990). Ideally, the opinion poll also revealed that the

adolescents reported an average of 8.4 sleep hours while at 6<sup>th</sup> grade to 6.9 sleep hours when they reached the 12<sup>th</sup> grade (National Sleep Foundation, 2006).

Despite the opinion polls indicating that most of the adolescents experienced less sleep during their adolescence stage when compared to their childhood stage, the mean sleep duration is estimated to range between 9 hours to 10 hours for every child during the transitions into the adolescence period (National Sleep Foundation, 2006). The author (Carskadon, 2002), reported that the biological sleep period for the adolescence may also significantly increase during this period in time. Therefore, the (National Sleep Foundation, 2006) reported that the recommended sleep duration or period for about 80% of the adolescents in America and across the globe is a total of nine hours and fifteen minutes (9hrs and 15 min) every night (National Sleep Foundation, 2006).

Moreover, chronic deprivation of sleep among the adolescence may eventually result in severe mental health challenges. The main mechanism in which the loss of sleep among the adolescence contributes to impaired mental health challenges in emotional or mood dysregulation. However, (Talbot, McGlinchey, Kaplan, Dahl & Harvey, 2010) informed that there are various ways in which the adolescents may regulate their emotions or mood, the rate of sleep deprivation may predispose them to various vulnerabilities to the emotional maladaptive regulation initiatives and strategies like the NSSI also (Non-suicidal Self-Injury). According to (Talbot, McGlinchey, Kaplan, Dahl & Harvey, 2010), NSSI is directly linked to the deficits in emotional regulation witnessed by adolescents and that most of the individuals usually engage in NSSI to deliberately regulate their emotions. Moreover, (Talbot, McGlinchey, Kaplan, Dahl & Harvey, 2010) reported that one of the major ways in which adolescents may effectively regulate their emotions is to engage in NSSI traits or behaviors. Therefore, the authors (Talbot, McGlinchey, Kaplan, Dahl & Harvey, 2010) informed that engaging NSSI is part of the human body reflex system for compensating the loss of sleep. Therefore, engaging in non-suicidal self-injury (NSSI) may be viewed as the cost paid for the insufficient sleep debt exacerbated by young individuals while transitioning or in their adolescence.

### **Methods**

The first goal and objective of this report are to focus on replicating the previous research findings on the relationship between NSSI and emotion or mood dysregulation and they are both related to the concept of deprivation of sleep (that is evaluated or analyzed) in the adolescents: a) Deprivation of sleep in adolescents is directly related to emotion or mood regulation; b) Deprivation in the adolescents is directly related to NSSI engagement. The second objective of this study is to focus on investigating whether the imminent relationship or association between NSSI and deprivation of sleep in adolescents may be explained by the difficulties during emotional regulation. The difficulties or challenges in emotion or mood regulation partially intervene or mediate on the relationship between NSSI engagement and deprivation of sleep in adolescents.

### **Participants**

This research was mainly conducted on a sample of representative respondents in China. The main study protocols that were adhered to during the study mainly included a self-administered online questionnaire. To collect reliable feedback from the sample respondents, this study aimed at identifying 40 respondents who were adolescents aging between 12 years to 19 years. The sample selected was representative enough and the feedback obtained would be critical in informing on the patterns and trends depicted by the general population. This study

mainly focused on evaluating the adolescent's stage because this is the main developmental phase of the human growth that is increasingly marked by numerous disruptions in the sleeping patterns and duration that may eventually contribute to chronic deprivation of sleep. Additionally, this paper opted to evaluate the adolescents because engaging at NSSI usually commences during this phase in the life of the adolescents (Carskadon, 2011). The study sample participants were recruited from China. Moreover, the respondents were required to provide intelligence or information about their: employment status, education level, sexual orientation, gender, ethnicity or race, and age.

### Procedure

For this research study, all of the individual measures were effectively administered by the members of the entire study team in China. This research paper opted to utilize questionnaires that were administered to the sample respondents via the internet. The representative sample population was required to participate in the questionnaires and provide their honest feedback. This research paper adopted a cross-sectional and correlation analysis that will mainly focus on evaluating the psychological factors that are directly linked to the deprivation of sleep in adolescents. The correlation evaluation aimed at analyzing whether sufficient sleep mediates the relationship between NSSI and emotion regulation among adolescents.

### Results

#### Description of basic situation

The below tabular representation is significant in presenting the descriptive statistics of the data collected from the sample population. According to the information presented, the data was classified into: (1) race, (2) the sexual orientation of the respondents and finally (3), respondent's gender. The mean of the sample population (n=40) is 2.48, 1.78 and 1.18 respectively. The above descriptive statistics is essential in informing or providing further explanations of the variables utilized in this research study.

*Table 1: Showing Descriptive Statistics*

		Race Ethnicity	Respondents Sexual Orientation	Respondent Gender
N	Valid	40	40	40
	Missing	0	0	0
Mean		2.48	1.78	1.18
Std. Error of Mean		.193	.170	.061
Median		2.50	1.00	1.00
Std. Deviation		1.219	1.074	.385
Range		4	3	1
Minimum		1	1	1
Maximum		5	4	2
Sum		99	71	47

The below frequency distribution analysis is key in informing on the sleeping duration or period spent by the sample population. More details informs that 17 of the sample respondents (42.5%) of the sample population, informed that they slept from 7 to 9 hours on normal school days.

*Table2: Adolescents Sleep duration during school Nights*

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 2-3 Hours	7	17.5	17.5	17.5
3-5 Hours	7	17.5	17.5	35.0
5-7 Hours	8	20.0	20.0	55.0
7-9 Hours	17	42.5	42.5	97.5
More than 10 Hours	1	2.5	2.5	100.0
Total	40	100.0	100.0	

The below bar-graph informs of the total number of adolescents' sleep duration during the weekends. 5% of the sample respondents indicated that they only sleep from 2 to 3 hours, 12.5% of the respondents stated that they only slept for 3 to 5 hours during weekends, 17.5% of the sample population indicated that they slept from 5 to 9 hours. Finally, 47.5% of the sample population indicated that they slept for more than 10 hours during the weekends.

*Table3: Adolescents Sleep duration during weekends*

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 2-3 Hours	2	5.0	5.0	5.0
3-5 Hours	5	12.5	12.5	17.5
5-7 Hours	7	17.5	17.5	35.0
7-9 Hours	7	17.5	17.5	52.5
More than 10 Hours	19	47.5	47.5	100.0
Total	40	100.0	100.0	

In conducting the correlation evaluation, the SPSS One-Way Anova will be utilized to analyze the following research assumption: *the adolescents engage in non-suicidal behaviors if they do not get enough sleep*. To provide an effective analysis or evaluation of this research assumption or claim, this report will conduct the SPSS One-Way ANOVA analysis. To evaluate this study, the following dependent and independent variables include: a. Dependent Variable: Sleep during Weekdays; b) Independent Variables: Self-injury.

This research also performed a test of Homogeneity of the variances using SPSS statistical software. The test of Homogeneity mainly focuses on analyzing whether the assumption of the variances is in line with the dependent variables that are evaluated on a continuous scale. In this paper, the key assumption is the variance of S.D. also standard deviation and evaluating whether they are equivalent to the sampling variations. Form the above analysis the significance is 0.14 which is below 0.05 which indicates that the test variables are significant.

Table4: Descriptive statics on the sleep Duration during School nights

	N	Mean	Std. Deviation		95% Confidence Interval for Mean		Minimum	Maximum
			Lower Bound	Upper Bound	Lower	Upper		
Yes	30	2.57	1.135	.207	2.14	2.99	1	4
No	10	4.10	.316	.100	3.87	4.33	4	5
Total	40	2.95	1.197	.189	2.57	3.33	1	5

The SPSS ANOVA test evaluation or analysis of the variances is critical in evaluating the variability of the individual means and in comparing the final output with the variance's variability within the variance of every mean study group. The F analysis from the ANOVA study is 17.510 which may be viewed or considered as statically significant at point 0.14. However, the test homogeneity informs that the variables used in this analysis are statistically significant which indicates that the variables one comparison between the variances may be considered to be statistically significant. Moreover, since the significance is 0.14 which is more than 0.05, it is prudent to reject the "Alternative" hypothesis and accept the "NULL" hypothesis. Therefore, this report concludes that adolescents engage in non-suicidal self-injury if they do not get enough sleep.

Table5: ANOVA Correlation Analysis

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	17.633	1	17.633	17.510	.14
Within Groups	38.267	38	1.007		
Total	55.900	39			

**Variable Means Plot:**

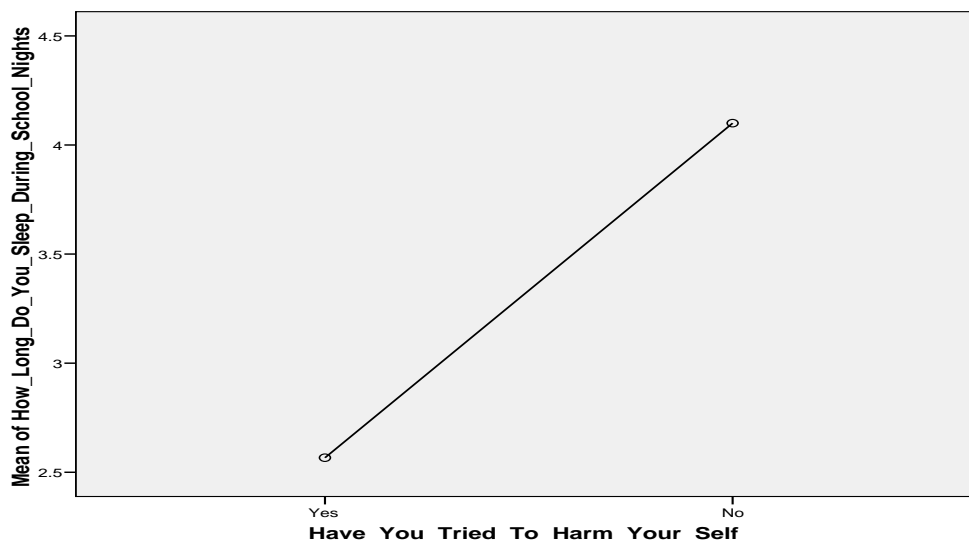


Figure 1: Variables Correlation Analysis Means Plot

### **Discussion**

This research report is effective in building upon the previous studies that have been done by other authors that aimed at evaluating the existing relationships between NSSI, emotion or mood dysregulation and deprivation of sleep in adolescents. Ideally, this study mainly focused on replicating the previous findings that inform how the deprivation of sleep is directly linked to NSSI and mood dysregulation. Moreover, this paper also focused on extending the previous findings by analyzing whether the relationship between NSSI and sleep deprivation could be analyzed through mood disorders.

The above findings reveal that the “perceived” level of inadequate sleep was directly linked to mood disorders and engagement in NSSI. Moreover, this findings presented in this study also reveal how emotion or mood dysregulation was effective in mediating the existing relationship or correlation between NSSI and the perceived "insufficient sleep" by the adolescents who did not get adequate sleep reported increased difficulties in regulating their emotions and they were increasingly likely to exhibit non-suicidal self-injury or engaging in NSSI.

### **The Biological Transformations contributing to the changes in the Sleeping Patterns in the Adolescents**

The Biological or Neurodevelopmental transgressions or changes among the adolescents may be viewed from the extensive transformations that occur in the CNS also central nervous system during transitions into the adolescence stage (Buchmann et al., 2011). According to (Buchmann et al., 2011), the transformations witnessed by the adolescent are reflected in some of the major changes to the sleeping patterns among the adolescence. The biological changes witnessed by most adolescents are constantly reflected in some of the key alterations in the sleeping patterns with the help of the longitudinal studies that utilize EEG to analyze the sleeping duration in the children transitioning through adolescence.

Additionally, (Tarokh & Carskadon, 2010), reveals that the changes in the sleeping duration exhibited by the adolescence is a product of the “neuro-developmental” transformations that transpire during this growth period in their life. According to (Campbell, Grimm, De Bie, & Feinberg, 2012), the individual transformations and changes that occur in the central nervous system (CNS) of the adolescent may not necessarily have a direct impact on the sleep patterns but they are more likely to alter or influence the emotional or mood regulatory activities in the that are critical in interacting with the sleep patterns among the adolescent. The hormonal transformations and individual changes witnessed by the young adults may be linked to the timing of the decline of the delta that is witnessed by the decline of delta in the NREM sleep slow-wave that is directly associated with the puberty maturity stage witnessed by young adults. The study done by Baker and Driver (2007) reveals that there is insufficient information to reveal if the relationship between the hormonal variations and sleep deprivation is casual. This is mainly attributed to the fact that the sleep regulatory system in the human body is often sensitive to the levels of "gonadal" hormonal changes that significantly increase in adolescence. An independent review done by (Karatsoreos & Silver, 2007) is also effective in informing the fact that the women or female gender across various age brackets increasingly reported sleep deprivation before their menstruation week and a few days before the menstruation. The findings revealed by (Karatsoreos & Silver, 2007), go a long way in revealing that sleep patterns and duration are a product of the hormonal variations and changes that occur in the human body system.

### **The Psychological Factors Affecting the Sleep Patterns in the Adolescent**

The adolescent stage is directly linked to the numerous biological transformations that occur in young adults that can interfere with their sleep patterns. As the children transition from childhood to adult-hood stage through the adolescence period, they often acquire a lot of responsibilities and independence in various aspects of their lives, which can impede their sleep. Most of the young individuals usually begin to acquire their autonomy during the adolescence stage: therefore, setting their sleep duration is one of the steps in exemplifying their autonomy. Due to the delays and changes in their sleeping period and patterns witnessed during this period, most of the adolescents may fall into the temptation of going to sleep later.

Additionally, young adults also experience numerous challenges during the busy weekday activities that affect their sleep patterns. The sleep delays are mostly witnessed when the adolescent reach their high school as opposed to when they were in elementary or primary school. Moreover, the increase in the extra-curricular activities witnessed during this stage of their lives often acts as the major impediment or constraint affecting their sleep duration. The initiative to reduce the total available sleep duration or time of the adolescence usually becomes one of the major strategies implemented by the adolescence in finding time to read to improve their grades at school. The adolescent stage is also marked with a significant increase in the time to complete the assigned homework and in forming relationships with their peers because socializing is one is more significant among the adolescent.

According to (Dahl & Lewin, 2002), adolescents often tend to access more technological devices and gaming equipment for instance smartphones, video games, and computers which usually make them stay up late engaging in the digital content that is accessible using their technological gadgets or devices. The authors inform that these technological devices and activities increasingly contribute to the psychosocial transformation and changes in the sleep duration and patterns as the children transition from childhood to adulthood. Ideally, most of the adolescents usually go to bed later and they are required to wake up earlier which eventually results in chronic deprivation of the sleep patterns and duration that is often associated with NSSI mood or emotional regulation.

### **Sleep Deprivation: Self-Injury and Emotion or Mood Regulation**

The human being's sleep has a significant and profound impact on emotion or mood regulation (Xianchen, 2004). According to the authors (Talbot et al., 2010), the resultant effect of sleep deprivation may have a significant and potent effect on the PFC also prefrontal cortex of the adolescent which is the main control center for the human's emotions. According to (Schmidt & Van der Linden, 2015), chronic deprivation of sleep may eventually result in the emotional or mood variations witnessed by the adolescents which limit their ability to confront some of their affective weaknesses. Additionally, (Gau et al., 2007) inform that adolescents often experience severe consequences as a result of sleep-deprivation which ranges from psychological and emotional instability.

The existing relationship between emotion or mood dysregulation and sleep deprivation among the adolescence may be considered as a complex and dynamic process. Several research studies provide further insights or information in explaining the relationship between mood dysregulation and sleep deprivation. The authors Fulingi and Hardway (2006) focused on evaluating the existing dynamics associated between the psychological wellbeing, daily-activities and sleep duration across various ethnic representative samples of (n=750) participants who ranged from 14 years to 15 years. All of the 750 participants completed a daily

activity list of items by evaluating the sleep duration, the stress demands of the activities and the individual daily functions for two weeks.

The findings of the resulting study revealed that most of the adolescents usually spent a mean sleep duration of 7.480 hours of sleep with a standard deviation of 0.98 for every sleep time at night. Moreover, the study identified that sleep duration among the adolescents also varied by 1 hour across various days in the two weeks. Finally, the authors Fulingi and Hardway (2006) also indicated that several interrelated input factors result in sleep deprivation among adolescents which has numerous health implications on the psychological, mood or emotions of the adolescent.

### **Mood Dysregulation as a mediating factor in the relationship between NSSI and sleep deprivation**

The psychological concept of “deprived sleep” was found to be directly associated with the suicidal behaviors and attributes (Goodwin, Marusic, 2008; Bernert & Nadorff, 2015; Bernert & Joiner, 2007; Iwata & Perlis, 2015; Bernert, Kim, Iwata & Perlis, 2015). The research study that was conducted by Bernert and Nadorff (2015) that focused on evaluating the suicidality and insomnia attributes revealed that the disturbance or changes in the sleeping patterns or were directly associated with suicidal attempts, thoughts, and eventually suicidal actions. Moreover, Bernert and Joiner (2007) reported that most of the suicidal behaviors and intentions were closely associated with the quality and level of sleep and that for some individuals; the association is more prevalent after controlling all symptoms of depression.

The concept of insufficient sleep or deprivation of sleep is analyzed or evaluated by the total sleeping time or duration by the adolescents and there was no direct relationship between sleep deprivation and emotion or mood dysregulation. However, it is critical to identify that about 97.50% of the respondents reported that they experienced less sleep or insufficient sleep during the school period. Most of the respondents informed that they did not get the recommended 9 hours of sleep during normal school nights. Consequently, the "perceived" insufficient sleep and emotion or mood disorder were directly linked to engagement in NSSI. Moreover, it is more likely that the duration of sleep may be considered as a study variable that is mainly limited to the sleep needs across various participants in the study. However, the findings in this report go a long way in revealing how the deprivation of sleep or insufficient levels of sleep in adolescents is a major risk trigger or factor contributing to engagement in NSSI among adolescents.

Mood dysregulation may be viewed as a mediating factor in the relationship between NSSI engagement and the "perceived" level of insufficient sleep among adolescents. The findings revealed in this report, go a long way in suggesting how insufficient sleep lacks a direct correlation with the engagement of NSSI in adolescents but it is a major factor contributing to mood dysregulation. Moreover, there is a need for more longitudinal studies to effectively confirm the relationship between the engagement of NSSI and insufficient sleep witnessed by adolescents. Consequently, this study strongly believes that if insufficient sleep presents challenges in the relationship between NSSI and mood regulations, then it is prudent to confirm that most adolescents usually engage in NSSI to compensate for the insufficient sleep in the event where the strategies for regulating the moods and emotions in the adolescents are not available or they are inaccessible to them.

Moreover, NSSI may also be viewed as a complex and severe challenge that may not be tackled by a mere good night's sleep. However, it is essential to conduct a comprehensive research study aimed at investigating whether the deprivation of sleep is directly linked to

increased vulnerabilities. The deprivation of sleep among adolescents impairs emotion or mood regulation which is a key role of NSSI. However, there are increased study queries on how sleep deprivation contributes to mood or emotion regulation and whether the deprivation of sleep is directly linked to the engagement in NSSI as a key mood or emotion dysregulation. Therefore, the deprivation of sleep is a factor that aims at directly contributing to emotion or mood dysregulation or by limiting the increased availability of the adaptive emotion or mood regulation initiatives. Therefore, NSSI may be viewed as an emotional regulatory strategy that is triggered by adolescents receiving too little sleep periods.

### **Limitations of this Study**

The findings presented in this report are susceptible to the following limitations. Firstly, this analysis adopted a cross-sectional research model or design. However, the cross-sectional research design presented weaknesses in its ability to evaluate whether the changes in the duration of sleep or mood regulation would effectively predict the future engagement of NSSI. Due to this fact, it was not possible to evaluate whether there was a direct correlation between these variables. Therefore, there is a need to investigate directionality in future evaluations. The second main weakness or limitation of this research is that the findings relied on a smaller sample size. Due to the small samples, it was not possible to identify a large sample population to act as control variables in evaluating other issues emanating from the study. Mood disorders like depression are directly related to mood regulation and insufficient sleep issues. Moreover, prior research studies reveal a direct relationship between NSSI and mood disorders like depression.

### **Future Research Directions**

This paper reveals that deprivation or insufficient sleep in adolescents is a major risk component or a factor contributing to NSSI. The findings presented in this report lay out the foundations for further longitudinal studies aimed at confirming the directionality for investigating or analyzing whether insufficient sleep is the main risk factor. Therefore, evaluating the adolescents who are resilient despite being deprived of sleep, may significantly assist in identifying the factors contributing to their resilience. This intelligence will go a long way in helping researchers to develop appropriate mediating interventions aimed at developing other adolescents. Moreover, the findings in this report could also be utilized in developing appropriate interventions aimed at bolstering appropriate mechanisms aimed at compensating the adolescents for protecting them against engaging in NSSI and compensating them for the insufficient sleep in scenarios where increased sleep duration may not be considered as an appropriate option.

### **Conclusion**

This paper mainly focused on examining the existing relationship between NSSI, mood dysregulation and insufficient sleep in a sample of 40 adolescents. The data presented in this report are important in supporting the study assumptions or hypothesis that insufficient sleep is directly related to NSSI through mood dysregulation. Moreover, the findings presented in this research emphasize that "insufficient sleep period" is an important factor contributing to the vulnerabilities of engaging in NSSI among adolescents.

The association between NSSI and the perceived sleep deprivation is a mediating factor in mood dysregulation. Therefore, further studies should effectively investigate whether the individual components of mood regulations affect the existing relationships. These will go

a long way in helping the individuals working with the adolescents to focus on improving the treatment interventions, the screening vulnerabilities and educating on the appropriate sleep patterns among the adolescents to effectively reduce the adolescents from engaging in NSSI.

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