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How is Sleep Problems Associated with Depression in Adolescent?

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Abstract: Depression is a common mental health problem worldwide and the incidence rate of depression may increase by 15% in adolescence. One of the factors that may contribute to the increasing incidence rate of depression in adolescence is sleep problems. However, the mechanism of the influence of sleep problems on depression in adolescence was still unclear. In this study, existed literature that focused on the relationship between depression and sleep problems was reviewed. Evidence indicated that academic performance, social media abuse and emotion process were three possible factors that played roles in the relationship of depression and sleep problems in adolescents. By review the research on each individual factor, academic performance is not verified to be a key factor in the relationship between sleep problems and depression. The social media abuse is believed to be an important external factor rather than an internal mechanism. In fact, emotional process is convinced to be the core internal factor that mediates between sleep problems and depression in adolescence.

1. Introduction

Depression is one of the most common psychological concepts of mood disorders [1]. The clinical syndrome of depression is the low mood in patients' daily life, with a long duration, such as painful feelings, demotivation, isolation, apathy, hopelessness, and negative thoughts [1]. Notably, one of the features of the epidemiology of depressive disorders is the significant increase in the incidence rate that occurs during adolescence. The cumulative rate of major depression may rise from 5% in early adolescence to as high as 20% around the end of adolescence [2]. Furthermore, 18% to 40% of adolescents reported that their depressive symptoms were below subclinical levels, and the rate and severity of these symptoms increased across adolescence [3].

Currently, the most common issue reported by depressive patients of adolescents is sleeping problems. Over two-thirds of depression children and adolescents have reported sleeping problems like sleep-onset or sleep-maintenance problems [4]. Especially in adolescence, symptoms of sleeping problems included sleep insufficiency, agrypnia, somnolence and nightmare. Previous research suggested that the relationship between sleep problems and depression was bidirectional. For example, solid evidence revealed that depressive symptoms were related with short duration [5]. In addition, researches showed that age could be a mediate factor between depressive symptoms and sleep duration in adolescence [6].

However, the mechanism of the relationship between sleep problems and depression is still unclear. In order to better understand the mechanism of depression, the model of depression is necessary to

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be refined. Through investigation of the sleep problems and the depression theoretical model, the reason why sleeping problems are so common among adolescent depression patients can be explained. Once the model of sleep problems and depression mechanism was clarified, more effective treatments could be employed by regulation patients' sleep. It helps design therapy programs targeting depression adolescents with sleep problems. Therefore, this article aims to elaborate on the relationship between sleep problems and depression in adolescence, for the three important aspects: academic performance, social contact, and emotional processing.

2. The Role of Academic Performance on the Relationship between Sleep Problems and Depression

Adolescents are mostly students. This identity will sometimes bring adolescents with heavy workload and stress. Being a perfectionist and focused on their academic performance could be stressful for students. It is clear that academic performance was correlated with depression. Researches have shown that students who have overmuch burden for study tend to have depression symptoms [7]. According to the research conducted by Tehmina Zainab and Anam Zafar, there is a clear positive relationship between poor GPA and depression among students [7]. Also, previous researches suggested that poor academic performance could be an indication of depression in adolescents [8]. Adolescents with sleep problems might have difficulty in focusing their attention or memorizing things or even lose interest in the study [9]. All these obstacles would make students hard to achieve good academic performance. According to Alketa Hysenbegasi, Steven L. Hass and Clayton R. Rowland, students who have been diagnosed with depression are correlated with 0.49 points decrease in their GPA grade and it is consistent with students' self-reported data [10].

Besides the strong relationship between academic performance and depression, there is also evidence that reveals the relationship between sleep and academic performance. Since sleep is an essential activity for humans, it has a direct influence on our wellbeing and mood. experiments proved that poor sleep could result in difficulty of study. Poor sleep quality could significantly reduce the attendance, which is positively correlated to academic performance [11]. According to Sumi Rose and Ramanan, 70.6% of students had memory problems because of lacking sleep [12]. These memory problems could be one of the causes of poor grades. In another study, results showed that the grade point average (GPA) of college students is directly related to their bedtime habits difference between weekdays and weekends. Students that sleep late will experience more sleepiness during the daytime, which could be another factor of poor academic performance[13].

Although there was clear evidence showing the academic performance had a relationship with sleep problems and depression individually, no research could support the claim that academic performance played a role between sleep problems and depression. In other words, academic performance was neither a moderator nor a mediator between sleep problems and depression. This meant that depression was not caused by sleep problems' effect on academic problems. Thus, the effect of academic performance was not verified to be a key factor in the relationship of sleep problems and depression.

3. The Role of Social Media Abuse on the Relationship between Sleep Problems and Depression

Nowadays social media has become common in adolescences' life, the use of social media in adolescence is already over 90%. Clear evidence was linking to the relationship between social media use and poor sleep. For example, according to research conducted by Twenge, there was a positive correlation between social media use (e.g., smartphone or Facebook) and depressive symptoms in U.S. adolescents from 2010 to 2015 [14]. One hypothesis formulated was that social media use could

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be a potential mediating factor between poor sleep and depressive symptoms [15]. According to their research, the use of social media could cause a decrease in both sleep duration and sleep quality.

One of the unique features of social media is that it provides users incoming alerts at any moment in one day, which may cause social media to be especially relevant to sleep problems. According to research conducted by Lenhart, Ling, Campbell, &Purcell, eighteen percent of the adolescence went to sleep with their phone placed in the bedroom [16]. This could potentially disrupt adolescence' sleep. Some evidence showed that 25 percent of the adolescence reported that the sleep processing of them had been interrupted by the incoming text message. Moreover, the incoming message alert of social media could cause tremendous stress on adolescences and the constant incoming message alert could lead to a fear of missing messages among adolescences. Also, young people would feel anxiety and guilty when they were not able to reply to the message on time. Therefore, the feeling of anxiety and guilt could make adolescence difficult to relax and sleep at bedtime.

By the mediator of social media abuse, sleep problems may play a role in the development of depression. In other words, adolescences with more serious sleep problems might have more social media abuse and incoming message alert which could lead to higher mental stress, increasing the risk of depression finally. However, it is important to notice that not all adolescents have social media abuse. Therefore, social media abuse is just as important external factor that affects the relationship between sleep problems and depression, rather than being an internal mechanism.

4. The Role of Emotional Processing on the Relationship between Sleep Problems and Depression

Although the reason behind the strong link between sleep problems and depression was not fully understood, there were several explanations. One of the theories was that the strong association could be explained by the abnormal emotional processing. Emotional processing is a concept that requires a wide range of involvement of interactive neural networks in the processing of cognition and emotion [17]. Some evidence suggested that emotional processing had a close relationship with sleep problems [18]. In recent year, the impact of sleep problems on emotion and mood are being revealed. Researches showed that sleep could help people consolidate their emotional memories instead of neutral memories [19]. Consistent with this finding, Wagner and colleagues also had similar results: sleep could enhance the speed of recognizing the emotional facial expression instead of neutral expression. Besides, other results could be caused by sleep problems. Some researches suggested that acute sleep deprivation could have a negative impact on people's correctness of categorizing the emotion, which means they could be less accurate in recognizing the emotional expression instead of slower reaction in emotional recognition [20].

With these deficiencies in emotional processing caused by sleep problems, the risk of having depression increased. Some researchers found that emotional processing could have an influence on psychiatric disorders [21]. Since people with depression symptoms constantly understood the world with a pessimistic perspective, emotional processing could be the cause of depression symptoms. This theory was also supported by the existing literature. Researches revealed that several emotional processing problems could contribute to the formation of depression. For example, according to Joormann and colleagues, the girls with a higher risk of depression had more problems with recognizing emotional faces, they tended to make more mistakes in identifying the angry face [22]. It is clear that deficient facial recognition could be a factor in forming depression.

Besides, rumination was also a typical deficient of emotional processing that could contribute to depression. Rumination could be defined as repetitive, uncontrolled, past-oriented thoughts about negative concepts [23]. People who suffered from rumination could have a higher risk for affective disorders [24] and somatic symptoms [25]. And researches also showed that rumination could lead to an increase in depression and anxiety symptoms. Studies also reported that there was a direct

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association between rumination and poor sleep [26]. One study revealed that poor sleep could lead to higher worries of being threatened in adolescents [27].

Although these deficient in emotional processing were reported from both adult and adolescent, young children were experiencing a series of neuromaturation development, including changes in the brain structure and rearrangement of the neurological circuitry [28]. These changes could impact adolescences' cognition of normative, social contact and other emotional processing, which could make adolescents more vulnerable to the risk of depression due to the emotional processing deficient caused by sleep problems. Thus, emotional processing played internal key roles in the relationship between sleep problems and depression.

5. Conclusion

In this article, we discussed three factors that were related to sleep problems and depression symptoms in adolescents which were academic performance, social media abuse and emotional processing. After the analysis of the existing literature, we found the hypothesis that academic performance was a mediator that influence the relationship between sleep problems and depression was not supported. The social media abuse which was supported by many pieces of research, but it is influencing the relationship as an external factor. The emotional processing was proved to be the core internal factor that mediated between sleep problems and depression in adolescence. With founding been made, future therapy for depression could focus more on the change of patients' emotional processing.

6. Limitation and Future Direction

In this paper, all the discussions were based on previous researches, which could be subject to bias. Besides, there was not enough experimental evidence on neurology level which could be necessary for understanding the relationship between sleep problems and depression. With more research on the physiological mechanism, the basement of the relationship between sleep problems and depression can be revealed.

Based on the analysis above, three future directions can be focused on: First, the definition of emotional processing is not very clear, more detailed analysis about the effect of emotional processing is required. Second, laboratory experiments on neurologic level should be conducted to further explore the neurologic mechanism between sleep problems and depression in adolescents. Third, effective clinical programs for the prevention and treatment of adolescent depression could be explored in terms of drugs to improve sleep disorders and psychological interventions.

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