



The Effect of Alexithymia on Adolescent Risk-taking Behavior

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Abstract: Alexithymia and risk-taking behavior of adolescents are important factors affecting their physical and mental health. Studies have found that alexithymia can affect adolescents' risk-taking behavior. In order to clarify the direct and indirect influence of adolescent alexithymia on risk-taking behavior, this study reviewed the relevant literature. The result of research showed: Alexithymia is a factor that may influence risk-taking behavior through emotion regulation, loss chasing, and executive function. Risk-taking as a teen's strategy for dealing with bad emotion. Individuals with alexithymia are insensitive to loss and tend to chase it, so that they make more risky choices when faced with loss than non-alexithymia individuals. In addition, individuals with alexithymia may have deficits in executive function, affecting rational decision-making and participating in more risk-taking activities. In the future, researchers should try to explore whether specific emotions, such as regret, influence the risk-taking behavior of individuals with alexithymia. Response inhibition can be improved through training, thereby reducing risk-taking behavior in adolescents. In the future, different intervention methods can be studied and applied to different specific risk-taking behavior interventions.

Keywords: alexithymia, risk-taking behavior, emotion regulation, executive function

1. INTRODUCTION

Adolescence is the transition period of an individual from childhood to adulthood. During this period, adolescents experience rapid physical development and intensified psychological conflicts, which easily lead to maladaptation and a series of problem behaviors, including implicit problem behaviors, such as anxiety, depression and other psychological sexual behaviors) and explicit problem behaviors, such as disciplinary violations, aggression, impulseness and other disruptive sexual behaviors. Risk-taking behavior is one of the prominent behavioral problems of adolescents. The risk-taking behaviors of adolescents studied abroad mainly involve alcoholism, drug addiction, violent crime, dangerous driving, unsafe sex, etc. (Grunbaum et al. 2004; Steinberg, 2008). Domestic scholars' research on adolescent risk-taking behavior mainly focuses on smoking, drinking, drug use, self-harm, suicidal tendencies, etc. (Fang, 1994).

The study found that the detection rate of alexithymia in adolescents is about 7.3% to 23.6% (Gatta et al., 2014; Prino et al., 2019). Adolescents' level of alexithymia affects their mental health or behavior. Bréjard et al. (2008) found that individuals with alexithymia, especially those with difficulty in recognizing emotions, showed more risk-taking behaviors, such as high-level alexithymia adolescents with more severe mobile phone addiction and aggression. However, some studies suggest that alexithymia or emotional openness dimensions are not associated with normal risk behaviors in adolescence (Zimmermann, 2010). It can be seen that there is no consistent conclusion on whether alexithymia leads to risk-seeking or the formation of risk-taking behaviors in adolescents, and further research is needed. This article attempts to explore the direct and indirect effects of alexithymia on adolescent risk-taking behavior based on the meaning of alexithymia and risk-taking behavior and the characteristics of adolescents' physical and mental development.

2. IMPLICATIONS OF ALEXITHYMIA AND RISK-TAKING BEHAVIOR

2.1. The Meaning of Alexithymia

Nemiah et al. (1976) proposed that alexithymia is associated with difficulties in recognizing and describing one's own emotions, and that alexithymia is characterized by difficulty recognizing subjective emotional feelings, distinguishing between emotions and emotionally aroused physical

sensations, describing feelings to others, and reduced imaginative activity, They are easily influenced by external stimuli and have an extroverted cognitive style. Taylor et al. (2003) defined alexithymia as a stable personality trait, and they compiled the Toronto Alexithymia Scale (TAS), which mainly included TAS-26 and TAS-20. The TAS-20 is more widely used and consists of three dimensions: difficulty in emotion recognition, difficulty in describing emotions, and externally oriented thinking. The externally oriented thinking dimension indirectly assesses individual fantasies and imaginative activities. Difficulty in emotion recognition refers to the difficulty an individual has in recognizing the emotions of oneself and others, such as being unable to accurately identify changes in other people's facial expressions. Difficulty in describing emotions mainly refers to the inability to describe their own emotions well, such as being unable to express their emotions with accurate vocabulary. Externally oriented thinking refers to the fact that individuals pay little or no attention to inner feelings in life, and are often stuck in the details of daily life (Taylor, 2000). Research by Bird and Cook (2013) shows that alexithymia is characterized by a lack of understanding the feelings and experiences of others or the ability to share emotional states with others. Previous studies have generally used the critical score of TAS/TAS-20 to divide individuals into alexithymia and non-alexithymia. Ling Yu et al. (2015) found that there are three different potential categories of adolescent alexithymia, and there is a poor emotional expression group between the alexithymia group and the emotional expression group. Although these individuals do not meet the criteria for alexithymia, they have some alexithymia characteristics.

2.2. The Meaning of Risky Behavior

Risk-taking behavior is a special type of decision-making that individuals make when faced with risky situations. Ben-Zur and Zeidner (2009) believe that risk-taking behavior refers to the behavior of individuals who know that doing something may have negative consequences, but insist on doing it in order to seek benefits. Gullone and Moore (2000) argue that adolescent risk-taking is an activity that balances potential losses and visible gains. There are two types of common risk-taking behaviors among adolescents, one is risky sports (for example, skiing, surfing, martial arts, rock climbing, etc.), and the other is negative risk-taking behaviors (for example, suicide, drinking, drug use, gaming addiction, etc.). Some scholars believe that participating in active risk-taking behaviors may be an important task for adolescents' physical and mental development, which can develop their independence, self-awareness, and decision-making ability under strong emotions (Bridget, 2012). However, some risk-taking behaviors may cause certain negative consequences or losses. For example, excessive drinking can lead to a decrease in the individual's attention span and cognitive impairment (Giancola et al., 2011). According to the physical and mental development characteristics of adolescents, if they do not receive correct guidance, they may take actions that threaten their own interests and the interests of others.

3. THE EFFECT OF ALEXITHYMIA ON RISK-TAKING BEHAVIOR

Study suggests that diminished emotional arousal in people with alexithymia is associated with poor performance on risky decision-making tasks (Lundh & Broman, 2006; Suzuki et al., 2003). Bréjardet al (2008) found that people with alexithymia have more risk-taking behaviors. The influencing factors of adolescent risk-taking behavior include internal trait factors and external environmental factors. The internal trait factors are reflected in the relationship between personality and adolescent risk-taking behavior (Hou et al., 2021). While alexithymia is a stable personality trait, the activity of the insula and ventromedial prefrontal cortex decreases when individuals perform emotional processing tasks, and these two brain regions play an important role in risky decision-making that requires emotional processing (Aleman, 2005; Michiko et al., 2003). Therefore, adolescent risk-taking behavior is likely to be directly affected by alexithymia personality traits.

Most of the studies tend to think that alexithymia is related to risk-taking behavior, so this paper argues that adolescent risk-taking behavior is indirectly affected by alexithymia. But how does alexithymia indirectly affect adolescent risk-taking behavior? This article will discuss the mediating factors of alexithymia affecting adolescents' risk-taking behavior, including emotion regulation, executive function, and loss-chasing.

3.1. The Mediating Role of Emotion Regulation Ability in Alexithymia on Risk-taking Behavior

Some studies have found that personality indirectly affects risk-taking behaviors by activating certain needs or motivations, so that needs or motivations are satisfied. As a personality trait, alexithymia may also affect individual risk-taking behaviors. But some researchers regard alexithymia as a learned behavior, and difficulty recognizing and describing feelings as an individual's strategy for coping with stress and unpleasant events in life (Clayton, 2004). Badura further supports alexithymia as a symptom of post-traumatic stress (Elzinga et al., 2002). Research suggests that there are two motivations for risk-taking behavior: it may come from the desire to pursue or enhance positive emotions and well-being, or the desire to escape from aversive emotional states (Badura, 2003; Cooper et al., 2000). It is difficult for individuals with alexithymia to identify and describe feelings, which may be the avoidance of disgusting emotional experiences, and then take risky behaviors to deal with the disturbance caused by bad emotions.

When people avoid experiencing and processing emotions to "hide" from unwanted influences, it may inhibit the development of appropriate emotion regulation skills, ultimately affecting the individual's physical and mental health (Panayiotou et al., 2015). Adolescents lack the skills to deal with emotions and are likely to mitigate the negative effects of emotions through risk-taking behaviors (Cooper et al., 1992). For example, people with alexithymia may overuse substances or have other risky behaviors. However, this will inhibit the development of their emotional regulation awareness and ability in the long term, and aggravate the situation of individuals taking risks to solve emotional problems. A more in-depth study found that teens with poor emotional understanding had more internalization problems, while teens who lacked the ability to express their emotions tended to "vent" their emotions in risky behaviors (Penza-Clyve & Zeman, 2002). However, some studies suggest that alexithymia or emotional openness dimensions are not associated with normal risk behaviors in adolescence (Zimmermann, 2010).

Risk-taking behavior is a strategy for adolescents to deal with negative emotions, but their specific behaviors are different under different emotional experiences. Difficulties in anger emotion regulation are significantly associated with a range of aggressive and destructive risky behaviors. Conversely, there is an association between sadness emotion regulation and the number of sexual partners. Thus, emotion regulation, especially anger, may predict adolescent engagement in risk-taking behaviors (Hessler & Katz, 2010).

Therefore, this study believes that whether alexithymia is a personality trait or a learned behavior, adolescents with high levels of alexithymia have insufficient emotional expression and regulation, and their emotional processing strategies will be affected. That is, the inability of individuals with alexithymia to understand and express emotions prevents them from processing them, ultimately it tends to take risk-taking behavior as a strategy to alleviate negative emotions or unpleasant events in life. Similar conclusions were reached by Howe-Martin et al. (2012) in their 2012 study.

3.2. The Mediating Role of Loss Chasing in Alexithymia on Risk-taking Behavior

Loss chasing refers to the behavior of increasing the bet after losing the bet, which belongs to the research field of gambling. That is, gamblers will not stop gambling in order to make up for past losses, but increase their bets to win back the money they lost before. Gambling, in a broad sense, refers to people's choices or decisions in the face of uncertain events or factors. Researchers can explore individual risky behaviors from gambling. For example, the Iowa Gambling Task is used to find the decision-making dysfunction of the subjects. In the study of decision-making cognition in gambling, factors such as framing effect, decision-making content, decision-making process, and strategy use will affect the perception and assessment of risks and the prediction and acceptance of risks. Research on gambling behavior shows that chasing losses is a key factor in gambling problems (Dickerson et al., 1987). Kim and Lee (2011) found that the experience of loss can help inhibit behaviors, indicating that individuals are sensitive to loss. However, in the Iowa Gambling Task of Franken et al. (2006), subjects who experienced monetary loss made more risky choices than subjects who gained. This result proves that individuals are less sensitive to losses and thus make more risk-taking behaviors. So are subjects who experience continuous losses more cautious? The researchers found that problem gamblers who experienced repetitive losses in the Balloon Analogue Risk Task (BART) recovered faster, reflecting their insensitivity to losses and chasing losses, and their risk-

taking tendencies did not significantly decrease. Ciccarelli et al. (2017) supported this conclusion by finding that the average inflation of pathological gamblers in Bart tasks was higher than that of healthy controls, showing an increased risk-taking tendency, and a study showed that adolescent problem gamblers had the same behavior pattern.

There was a significant positive correlation between alexithymia and chasing loss. People with high levels of alexithymia tend to chase losses, and there are significant differences between alexithymia and non-alexithymia individuals in the neural structure of chasing losses (Bibby & Ross, 2017; Campbell-Meiklejohn et al., 2008). However, in the alexithymia structure, in addition to externally oriented thinking, difficulty in recognizing emotion and describing emotion were associated with loss chasing (Bagby et al., 1994). Alexithymia may chase loss because of insensitivity to loss. Bibby and Ferguson (2011) designed risk-free and risky loss aversion tasks and found that alexithymic individuals make more lossy choices in risk-free and risky decision-making and have less loss aversion. Loss aversion means that the impact of losses is greater than the impact of gains, that is, when people face the same amount of gains and losses, losses make them more difficult to accept (Tversky & Kahneman, 1981). Thus, Bibby and Ferguson (2011) showed that alexithymic individuals have a reduced sensitivity to loss and are willing to continue gambling in the event of a loss.

Bibby adapted the Cambridge Gambling Task (CGT) in a 2017 study to examine loss-chasing in alexithymia. The task requires the subjects to put a certain percentage of bets and choose the color block that may hide the yellow label from the random number of blue and red color blocks. Which color block has a yellow label is extracted by the computer. Betting points increase with wins and decrease with losses. The unmodified CGT task increased stakes gradually from 100%, but increased from zero in this study. The results showed that participants with high alexithymia lost the chase and increased their bets by 22.7% after winning, which was about the same as non-alexithymia participants. But after the loss, they bet even more, increasing by 27.0%. Some researchers have suggested that the results of high alexithymia chasing losses were not significant enough, as participants typically placed no more than 40% of their available bets. The new study increased the value of the initial bet and thus increased the likelihood of incurring larger losses, with subjects asking for larger bets in a shorter period of time. It was found that the magnitude of the chasing loss effect in high alexithymia was approximately twice as large as that in low alexithymia, affected by the magnitude of the loss (Bibby, 2016). Another study in adults have come to the same conclusion (Bibby & Ross, 2017).

People with alexithymia chase losses that influence their risk-taking behavior. Ferguson et al. (2009) used the Iowa Gambling Task (IGT) to verify this conclusion. In conclusion, individuals with alexithymia have a reduced sensitivity to loss and may experience loss-chasing. As a result, they had an increased tendency to take risks in gambling tasks or simulation balloon tasks.

3.3. The Mediating Role of Executive Function in Alexithymia on Risk-taking Behavior

Executive Function (EF) originated from the study of damage to the prefrontal cortex and is a high-level cognitive processing process, including planning, attention and inhibition, sorting, working memory, and cognitive flexibility. In the early days, scholars regarded executive function as a cognitive model of a single cognitive structure (Baddeley, 1992; Norman & Shallice, 1986). Miyake et al. (2000) used latent variable analysis to demonstrate that executive function is a multidimensional structure. Smith and Jonides (1999) proposed that executive function can be divided into five factors: attention and conflict inhibition, task management, planning, monitoring, coding. Diamond (2013) believes that executive function is a general term for many advanced cognitive skills that achieve self-regulation of attention, behavior and emotion through the use of inhibitory control, working memory and cognitive flexibility.

Zhang Lei et al. used experimental tasks such as Stroop task, number span test and mathematical symbol test to find that people with alexithymia have executive function deficits (Zhang et al., 2008). Neuropsychological experiments have found that the executive function impairment of alexithymia individuals is highlighted in response inhibition. However, some scholars believe that alexithymia does not have defects in attentional switching and attentional inhibition. (Alberto et al., 2007; LI & Claire, 2007).

Diamond (2013) highlighted the role of inhibitory control in executive function. Inhibitory control refers to an individual's ability to overcome the inherent dominant reaction tendency or external temptation in attention, behavior, thinking or emotion to make adaptive or desired behaviors. There are two types of inhibitory control: response inhibition and conflict inhibition (Brydges et al., 2012). Response inhibition is the ability to restrain one's own response when the external environment or internal demand changes, and it is a necessary condition for regulating behavior (Adams et al., 2013). Adverse response inhibition is associated with impulsive or stimulus-driven behavior, manifested as an inability to interrupt behavior when new negative information emerges, and a decreased ability to judge whether current behavior is hindering the achievement of long-term goals. Nigg et al (2004) found that adolescents with alcohol abuse have poor response inhibition. Another study also found that response inhibition predicted alcohol use problems, illicit drug use, and self-harm among adolescents (Nigg et al., 2006).

According to the self-regulatory balance model, disturbances in inhibitory control and reward mechanisms may be responsible for problem behaviors such as Internet addiction (Heatherton & Wagner, 2011). High risk tendencies in adolescents are mainly attributed to an imbalance between high sensitivity to rewards and immature inhibition/self-control control systems. But research has shown that not all forms of risk-taking are related to executive function (Crone et al., 2016). This may be because working memory in executive function enables individuals to perform better on risk-taking tasks (Blair et al., 2018; Romer et al., 2011). Moreover, it is necessary to distinguish different types of risk-taking behaviors, such as whether individuals make decisions under known risk conditions or ambiguous conditions (Ogilvie et al., 2020).

It can be seen that the executive function of people with high level of alexithymia has certain damage, especially the ability of response inhibition, which predicts the individual's risk-taking tendency. Poor response inhibition ability is difficult to inhibit problem behaviors such as Internet addiction and alcoholism. However, the specific causal relationship needs further research to verify.

4. CONCLUSIONS

People with alexithymia can be trained to reduce risk-taking behavior. Alexithymia of cancer patients improved after receiving psychotherapy, suggesting that alexithymia may be improved with psychological intervention (Porcelli et al., 2011). People with alexithymia have deficits in executive function and affect behavioral choices, so it may be possible to reduce risk-taking behaviors by improving their executive function. There is a study that suggests that response inhibition in executive function can be improved by training (Zhao et al., 2015). Subjects perform stop-signal training to alter habitual responses or behaviors while altering the motivational value of stimuli, tasks, or situations, such as in the treatment of problem gamblers. This training may be more effective for impulsive gamblers than emotionally vulnerable problem gamblers (Stevens et al., 2015). Similar response inhibition training tasks can also alleviate addictive use of food and alcohol, and studies have demonstrated that online practice of food-related response inhibition tasks can effectively induce weight loss. Therefore, adolescents can improve executive function by strengthening response inhibition. They can increase control over habitual behaviors to reduce risk-taking behaviors.

This paper argues that the influence of alexithymia on risk-taking behavior is manifested in the lack of good coping strategies for individuals with alexithymia. When they experience negative emotions, they mitigate the negative effects of emotions through risk-taking behaviors. People with alexithymia tend to chase losses (Bibby & Ross, 2017). This may be due to its decreased sensitivity to loss. People with alexithymia may have deficits in executive function, predicting risk-taking tendencies in individuals (Velotti et al., 2019). This paper mainly discusses the relationship between inhibitory control in executive function and risk-taking behaviors, and individuals with poor inhibitory control have more risk-taking behaviors. In addition to the indirect effects of alexithymia's emotion regulation ability, chasing loss, and executive function on risk-taking behavior, there may be other influencing factors that should be further investigated in the future.

Lerner et al. (2000) found that individuals with different emotions have different risk perceptions. Individuals with fear emotions have more positive judgments about future events, while angry people have more negative judgments. Are there differences in risk-taking tendencies among people with alexithymia when they experience different emotions? Previous studies have revealed that difficulty in

anger regulation is significantly associated with a range of aggressive and destructive risky behaviors, whereas sadness regulation is associated with the number of sexual partners (Hessler & Katz, 2010). We can consider whether other emotion-specific regulation strategies influence adolescent risk-taking behavior. For example, to examine whether regret mediates the relationship between alexithymia and risk appetite, and how regulation of regret affects risk-taking behavior (Panno et al., 2019).

People with high levels of alexithymia tend to chase losses, and a number of studies have confirmed this result, but how people with high levels of alexithymia choose to take risks by chasing losses requires in-depth research. Most of the studies have used the BART task to study participants' chasing loss and risk-taking behavior, so whether the same conclusion can be obtained using the delay discount task or other tasks? Response inhibition can be improved through training (Stevens et al., 2015; Zhao et al., 2015). Individuals change habitual responses or behaviors through stop-signal training, which is also used to improve problem behaviors such as gambling and substance addiction. We can design training programs for adolescents with alexithymia to explore if a specific risk-taking behavior changes after training.

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