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Review Article

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From High-Risk Behaviors to Problem-Solving Strategies: Acceptance and Commitment Therapy Effects on Addiction Susceptible Adolescents in Cyberspace

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Abstract

This study aimed to evaluate acceptance and commitment therapy (ACT) effectiveness in reducing high-risk behaviors and elevating problem-solving strategies in adolescents with addiction susceptibility in cyberspace. This study is longitudinal with quantitative methods of data collection and analysis. The target community in this research was 60 female students randomly selected from a Persian high school in Iran. Participants were randomly divided and placed equally into the experimental and control groups. The participants' entry criteria were gender, aged from 15 to 18 years, addiction susceptibility, and high-risk behaviors cut-off points. Eight training sessions of ACT were presented in cyberspace for the experimental group between the pre-test and post-test intervals. Data collection instruments were the Iranian youth risk-taking scale, problem-solving strategies, and Iranian adolescents' addiction susceptibility questionnaires. Participants were followed up after two months. The results using multivariate analysis of among subjects ANOVA showed ACT significantly influenced high-risk behaviors and its' sub-scales except for the violence (p < .001).Furthermore, ACT affected the problem-solving strategies and its' sub-scales instead of control, creativity, and confidence (p < .001). Ac-

cording to the findings, ACT decreased high-risk behaviors such as drug abuse, smoking, and unprotected sexual behaviors. These changes might be due to decreased helplessness and avoidance as well as increased acceptance and tendency to solve problems. Instead, problem-solving strategies were improved through ACT cyber treatment.

From High-Risk Behaviors to Problem-Solving Strategies: Acceptance and Commitment Therapy Effects on Addiction Susceptible Adolescents in Cyberspace

Adolescence is a critical period as long as mental, social, and physical dimensions are concerned, in which high-risk behaviors such as drug abuse would appear. Progressive abuse of alcohol, tobacco, marijuana, etc…, increases the risk of substance addiction in this period [1]. *Addiction susceptibility* is a form of genetic-psychosocial potential that develops pathologically in life spam [2]. According to this theory, addicts' developmental routes are different from normal people from childhood to dolescence; nevertheless, they grow up in a way that makes them vulnerable to drug abuse. Addiction disorders and substance dependencies occur in a few numbers of abuser societies [3]. It means alcohol and substance abuse are not unusual in teenagers, pointing that they will not certainly suffer from drug abuse disorders. Actually, these behaviors represent the readiness to become afflicted and are triggered from early childhood through adulthood; as a result, it will be continued severely via their life long [4]. Social communications and behavioral patterns are the important founders of addiction in psychology which lead to unpleasant consequences in societies. They are identified as *high-risk behaviors*, which are more widespread in adolescents and youth as half of the community members. Therefore, increasing the high-risk behaviors' frequency may threaten the communities' health stability and perseverance that leads to the disruption of national security [5]. Violence, rubbery, self-harm, tattoo, joint injection, and unprotected sexual behaviors are examples of high- risk conduct. These behaviors cause negative and destructive psychosocial consequences, which make many societies involved with a various problems [6].

To our shock, high-risk behaviors are always comorbid with the lack of problem-solving skills in eenagers. It seems that the parents and teachers had eventually solved their problems in childhood despite the degree of their difficulties. However, when they reach adolescence, they tend to find their solutions based on their desire for independence and freedom; nevertheless, adolescents have not been trained in problem-solving strategies throughout their lives [7]. Problem-solving strategies are the skills, which control the emotional effects of high-risk situations that in turn lead to decline of psychological distress. Therefore, there might be a significant correlation between the problem-solving and psychological distress. It means that upgrading the problem-solving level predicts a decrease in violence, harmful behaviors, and increased mental health [8]. Furthermore, the findings of Bell and Zunlla represented problem-solving strategies have significantly influenced violent behaviors and could have been impressive in conduct disorder treatment [9].

The third wave therapies, known as postmodern approaches, believe that emotions should be discriminated in the conceptual context of phenomena. That is why they train the clients to accept their emotions "now and here" and subsequently to mix the mindfulness and change behavioral methods to elevate the flexibility [10]. There were considerable therapy methods for high-risk behaviors, such as cognitive behavioral therapy and behavioral therapy methods that concentrate on changing patients' beliefs and behaviors. *Acceptance and commitment therapy* (ACT) is one of the third waves of cognitive-behavioral therapies which focuses on the psychological connection with thoughts and feelings instead of changing the beliefs. The purpose of ACT is to help people to achieve a valuable and satisfactory life through psychological flexibility. Steven Hayes who mentioned six core processes for psychological flexibility (acceptance, cognitive diffusion, contacting the present moment, self as context, values, & committed action) developed psychological flexibility's model [11]. We divide these six cores into two areas of mindfulness and

behavior regulation, which create psychological flexibility together.

Literature Review

The results of Kiani et al. showed ACT affected the methamphetamine craving and emotional regulation of addicted male adolescents [12]. However, they did not mention risky behaviors and problem-solving skills in participants, as well as a quasi-experimental research method that reduces the effect size. Noteworthy, human personality depends on behavior systems [13], so the adolescents with behavior activation systems (BAS) are more likely to get inflicted in risky behaviors such as alcohol, drug abuse, and smoking; whereas, behavior inhibition systems (BIS) prevent them from these kinds of pathological behaviors [14]. Consistently, the other studies concluded that the ACT could reduce teenagers' cognitive avoidance and improve school performance [15]. Moreover, findings represented this therapy successfully influenced in general psychological functioning, coping skills, and quality of life [16] as well as maladaptive coping styles, mental well-being, and psychological distress after treatment [17].There are indications that youth-ACT is effective to reduce the severity of psychiatric symptoms as well as improving general functioning [18];however, the lack of randomized experimental research designs was the main limitation of these studies. Studies on teenagers' high-risk behaviors indicate that training programs for coping and social skills could reduce the addictive potential behaviors [19]; however, distinct negative-reinforcement mechanisms associated with risky substance abuse tendencies lead them to high-risk behavior again [20]. It means we should strengthen people's flexibility and problem-solving to inoculate against substance abuse. As Morris and Mansell mentioned, weakness in cognitive and behavioral flexibility maintains psychopathological behaviors same as violence, alcohol, and unprotected sex. It reveals the training programs involved in cognitive flexibility needed to increase self-control and coping strategies [21]. ACT is one of the most effective therapy protocols in these areas [22].

A series of clinical trials have focused on the effectiveness of ACT to treat a variety of substance abuse disorders, including poly-drug use [23] (Menendez, et al., 2014), opioids [24], methamphetamine[25] and smoking [26]. However, most of the purpose samples were adults whereas there is no evidence to declare ACT results in adolescents' addiction as well. Especially, findings of follow-up represent effects that are often not long lasting. For these reasons, addiction susceptibility should be regarded as the most important predictors for future substance abuse that usually is accompanied by high-risk behaviors and a lack of coping strategies. Therefore, further studies are needed to achieve convincing findings in this area.

Aims and Hypothesis

The present study aimed to investigate the effectiveness of ACT on high-risk behaviors an problem-solving strategies of adolescents with addiction susceptibility. Supposing that ACT could care and reform these variables in high-risk teenagers, a fundamental step would be taken certainly to prevent addiction and substance abuse disorders in adulthood. Referring to the literature, this therapy method was effective in substance abuse reduction and abundance as well as in psychological well-being; however, prevention is always more proper than clinical treatment. Adolescence is the period that inoculation methods regarding flexibility, acceptance, and coping with difficult situations should be applied to inhibit them from engaging in high-risk behaviors. These interventions probably prevent them suffering from addiction disorders in adulthood. Moreover, we tried to investigate the ACT impact on high-risk behaviors and problem-solving strategies in adolescents with addiction potential to achieve the above purposes. Thus, the question is whether cyberspace ACT therapy could influence the high-risk behaviors and problem-solving strategies in adolescents with addiction potential.

Method

This longitudinal-experimental study was conducted from January to April 2021 in the pandemic period in a Persian high school female student in Iran. The independent variable of this study was group training using ACT in cyberspace, and outcome measures were the high-risk behaviors and problem-solving strategies. Before sampling, we measured 150 participants, which participated availably in the study to find the adolescents with the cut-off points of high-risk behaviors and addiction susceptibility. The target community in this research was 60 participants selected randomly and placed equally into the experimental and control groups. The entry criteria for the study were age from 15 to 18 years, gender, being a student, the cut-off points of addiction potential upper than 15, and the cut-off point of high-risk behaviors upper than 80. According to the educational department counseling, we conducted this study in one high school in which risky behaviors were reported more than the others. All of our participants were female adolescents. High-risk behaviors such as violence, rubbery, self-harm, tattoo, joint injection, unprotected sexual behaviors… etc. are not acceptable social behaviors for both young girls and boys; however, the consequences of these behaviors might be so irrecoverable for young women in the communities that blame women more than men for criminal behaviors. Female teenagers may be blamed, rejected, or humiliated by society for a long time that it may harm their life career.

Ethical Concentration

We observed the ethical criteria in three steps: First, we obtained the consent of parents as well as the participants because the participants were under the age of 21. Second, we explained the procedure of research to the participants and regarded all of the security items such as confidentiality of information and protection from harms. Finally, all participants had the right to withdrawal from the study in any period of the research.

Data Collection Tools

Addiction Susceptibility Questionnaire in Iranian Adolescents (ASQ-AV). Zeinali developed this questionnaire, as well as its' cut-off point is about 15 [27]. We should note that all selected participants' addiction susceptibility was upper than 15 in both experimental and control groups in this study. Cronbach's alpha evaluated the internal consistency of ASQ-AV as .85.Moreover, criterion validity between substance use risk *profile scale* (SURPS) [28] and ASQ-AV was estimated approximately .83 [27].

Prevalence of Iranian Youth Risk-Taking Scale (YRS-48). This questionnaire was developed by Zadehmohammadi, et al. in 48 items to measure the prevalence of risky behaviors such as drug abuse, violence, smoking, and unprotected sexual behaviors. The cut-off point of this scale was 80 in 487 sample groups. The constructive validity for YRS-48 was efficiently evaluated by exploratory factor analysis (*KMO* = .93). Furthermore, the internal consistency for the total score and its' subscales were evaluated by Cronbachs' alpha between .77 and .93 [29].

Problem-Solving Styles Questionnaire (PSSQ).

Cassidy and Long developed this questionnaire involving six factors: helplessness (feeling inability in problematic situations), control (internal and external), and avoidance (to escape instead of coping), which are the appropriate problem-solving styles [30]. Reciprocally, creativity (planning for various solutions), confidence (belief in self to solve the problems), and tendency (to cope with and to solve the problems) are the inappropriate problem-solving styles in turn. They reported Cronbach's alpha from .51 to .86 for total scores of PSSQ and its components. In another study, Cassidy confirmed the appropriate validity of this questionnaire using factor analysis (*KMO* = .87) [31]. Furthermore, the content validity of PSSQ was acceptable in Iran, and its internal consistency was reported as .70 [32].

Acceptance and commitment therapy (ACT) protocol. Hayes, et al. adjusted the protocol of ACT as a systematic guide in 8 sessions (120 minutes weekly) [10]. The bellow table shows each session's descriptions, purposes, and exercises. *[Table 1]*

Analytical Procedure

A pre-test was administered to experimental and control groups before holding the eight training sessions using the ACT method by adobe-connect in cyberspace. Subsequently, the post-test was conducted after the last session. This measurement was performed individually and under the supervision of the examiner by activating the participants' camera to control possible ambiguities. Finally, the follow up was after eight weeks from the last session. We selected a two-month follow-up to ensure the participants' exercises would continue after the training sessions and they were completely involved in the ACT. Hayes, et al. believe ACT therapy is a short-term treatment and can significantly affect clients' behavior from 8 to 13 sessions. Therefore, we checked their exercises weekly in cyberspace. The demographic data of participants' age represented that 32 percent of them were at the age of 15, 28 percent in 16, 24 percent in 17, and 16 percent were in the age of 18. Therefore, the frequency table of the sample group showed that participants aged 15 were in higher frequency as well as participants aged 18 had lower frequency in this study. There was no missing data from the data collection phase, for the data were personally collected with accuracy. The data obtained from the research were analyzed by SPSS-24 software.*[Figure1]*

Results

Descriptive Statistics

The descriptive results of the addiction susceptibility of experimental (M = 90.80, SD = 12.20) and control (M = 90.33, SD = 12.80) groups represented their addiction susceptibility were above the cut-off point. The descriptive results of experimental and control groups are shown in the table below with respect to dependent variables**.** *[Table 2]*

The above table shows the average and standard deviation of the research variables. According to the table, all dependent variables decreased in the post-test, and follow-up. Although multivariate analysis of among subjects ANOVA (repeated measure for two groups with three observations) can be decisive in determining the significance of differences.

Statistical Analysis

We examined all the assumptions of multivariate analysis of among subjects ANOVA (repeated measure). First, Z scores of the Kolmogorov-Smirnov test were evaluated for testing the normality of dependent variables in three observations, which were significant ($p < .05$). Second, Box's M test was applied to evaluate the homogeneity of variance-covariance matrix in experimental and control groups, and the results of $F_{(1, 58)} = .67$ and ($p < .59$, rejected the null hypothesis. Third, the results of Levene's test were $F_{(1.58)} = .28$ and .33, for high-risk behaviors and problem-solving strategies respectively to examine the homogeneity of the dependent variables variance matrix. ($p < .27$, rejected the null hypothesis). The last hypothesis was to investigate the homogeneity of dependent variables covariance. For this purpose, Wilk's Lambda showed that values were significant at $p < .05$ level ($F_{(1, 58)} = 22.30$ and 24.70) for high-risk behaviors and problem-solving strategies, respectively. *[Table 3] [Figure 2]*

The results of repeated measure analysis of variance are shown in the table below, pointing that non-significant subscales were abandoned. *[Table 4]*

Discussion

This study aimed to evaluate the effectiveness of ACT training on adolescents' high-risk behaviors and problem-solving strategies. Moreover, we aimed to extend the knowledge boundaries of ACT training in adolescents suffering from addiction susceptibility. The researchers found interesting results after the intervention. The main findings are the following:

Firstly, ACT training significantly reduced vulnerable adolescents' high-risk behaviors. The findings represent ACT's capability to provide alternatives such as tendency and acceptance for controlling the avoidance. Furthermore, acceptance helps the unpleasant experiences to be less painful and does not influence in

Table 1. Headings of ACT in eight sessions

Session	Purpose, descriptions and exercises
1	Getting familiar with each other, establishing a therapeutic alliance, pre-test before the session. Introducing the ACT and its compatibility with addiction treatment.
2	Discussion and evaluation of the life experiences, assessing the tendency to change: Concept of "creative helplessness", take home as a list of "my creative helplessness.
3	Identifying and realizing the inefficient and useless strategies: What is acceptance? The differences between acceptance and hopeless & failure, acceptance take homes.
4	Behavior commitment, self-conceptualized fusion, and cognitive diffusion: Take homes on "my self-conceptualized fusions".
5	Separation between self and internal-external experiences. Self as a context, and undermining self-concept, mind fullness take homes.
6	Identifying and focusing on the life values: Meditating on self-capability to choose them, summarizing the presented topics, take homes on "focusing now and here".
7	Checking the values deeply, differences between values and goals, mistakes in choosing the values: What are the internal and external obstacles in following the values? Focusing on the path rather than the result.
8	To turn commitment into action, identify the plans to act according to values and goals, identify the recurrence of irrational tendencies and high-risk behaviors, and find encounter strategies, take home exercises via follow-up period. Getting post-test.

Table 2. Descriptive statistics of high-risk behaviors and problem-solving strategies

Variable		Group	Pretest		Posttest		Follow up	
			M	SD	M	SD	M	SD
High-risk Behaviors	Drug abuse	Exp.	48.50	14.17	46.46	14.12	46.13	14.00
		Cont.	48.13	15.00	47.86	14.09	48.10	14.85
	Violence	Exp.	1.90	0.90	1.33	0.60	1.40	0.91
		Cont.	1.60	1.30	1.49	0.90	1.45	0.91
	Smoking	Exp.	20.70	7.20	19.26	6.60	19.40	6.50
		Cont.	20.50	6.40	19.90	6.20	20.20	6.22
	Sexual Behaviors	Exp.	16.13	4.70	14.66	4.60	14.40	4.50
		Cont.	15.66	4.00	15.50	4.10	15.30	4.55
	Total	Exp.	90.80	12.20	84.70	13.00	84.00	12.90
		Cont.	90.33	13.12	90.00	13.12	90.70	13.00
Problem Solving Strategies	Helplessness	Exp.	3.50	1.10	2.85	0.85	2.11	0.77
		Cont.	4.10	1.11	3.91	1.00	4.00	1.11
	Control	Exp.	0.81	0.61	0.87	0.60	0.86	0.65
		Cont.	1.00	0.60	1.33	0.70	1.31	1.70
	Avoidance	Exp.	6.20	1.30	5.00	1.20	4.60	0.97
		Cont.	6.50	1.20	6.52	1.00	5.90	0.79
	Creativity	Exp.	0.33	0.48	0.33	0.45	0.35	0.41
		Cont.	0.37	0.50	0.30	0.50	0.30	0.48
	Confidence	Exp.	0.73	0.45	1.70	0.50	1.50	0.51
		Cont.	0.8	0.67	0.85	0.65	0.87	0.65
	Tendency	Exp.	1.40	0.90	2.00	0.90	2.4	0.90
		Cont.	1.10	1.00	1.00	0.90	0.70	0.70
	Total	Exp.	12.90	2.30	14.50	2.30	14.33	2.30
		Cont.	13.66	2.6	13.80	2.20	13.80	2.22

Table 3. Repeated Measure Analysis of Variance Results for Dependent Variables

Factor	Dependent variable	Total squared	df.	Mean of squares	F	Sig.	Eta square	Effect size
Group	High-risk Behaviors	300.50	1	300.50	21.80	0.001	0.60	0.69
	Problem Solving Strategies	29.20	1	29.20	5.60	0.001	0.28	0.67

Note. The Significant Levels and the Effect Sizes Represent the Power of Test Comparing the Group Changes after Three Observations.

H_{01}. ACT's influence on adolescents' high-risk behaviors is not significant. Rejected, ($p < .001$).

H_{02}. ACT's impact on adolescents' problem solving strategies is not significant. Rejected, ($p < .001$).

Table 4. Repeated Measure Analysis of Variance Results for Significant Subscales

Factor	Dependent variable	Total squared	Df.	Mean of squares	F	Sig.
High-Risk Behaviors	Drug Abuse	24.20	1	24.20	4.90	.05
	Smoking	5.40	1	5.40	4.40	.04
	Sexual Behavior	13.00	1	13.00	3.60	.05
Problem Solving Strategies	Helplessness	3.20	1	3.20	8.30	.007
	Tendency	6.70	1	6.70	9.10	.005
	Avoidance	3.80	1	3.80	4.80	.037

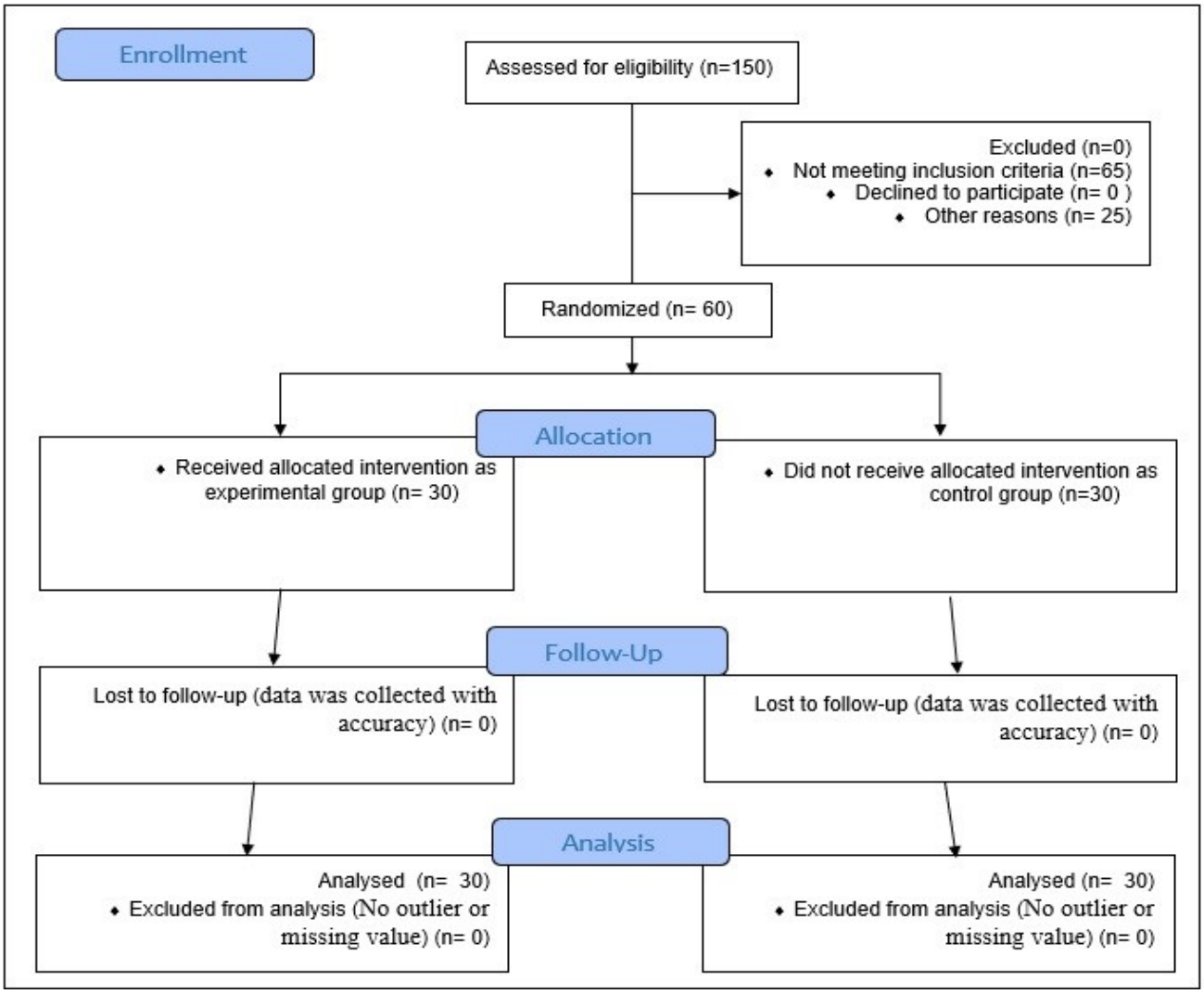

Figure 1. Diagram of Three Observations Associated with Treatment for Experimental Group as well as for Control Group without any Treatment.

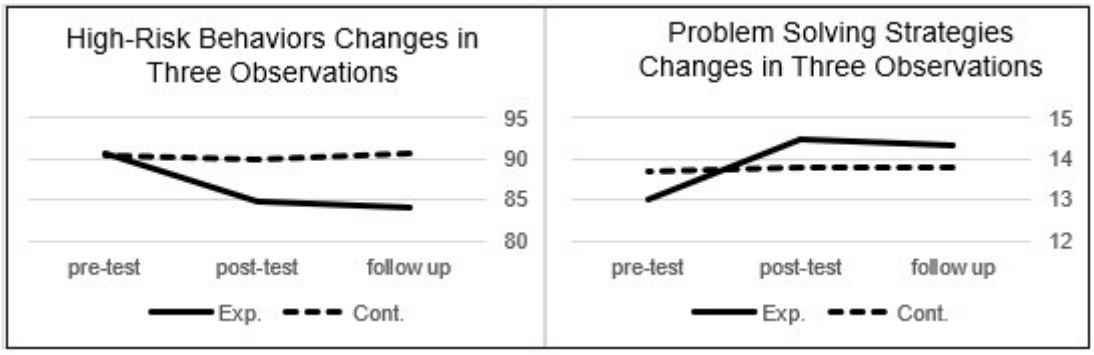

Figure 2. Diagram of Changes in High-Risk Behaviors and Problem-Solving Strategies of Experimental & Control Groups in Three Observations.

life. In fact, mindfulness processes resulte in self-attention for their methods directed self-focus to monitor the mental events rather than internalize them as a part of the self [33]. Hence, this therapy can help vulnerable teenagers to embrace and to regulate their negative emotions. On the contrary, cognitive diffusion helps the thoughts influence the behaviors such as the desire for alcohol and substances. Indeed, contexture-dependent and concept-dependent behaviors are located in the cognitive fusion and cognitive diffusion; therefore, when clients immerse in their thoughts, they might be incapable to separate their "self" from the "events". Whereas, they are trained to cope with their thoughts without soaking in events. These findings are in line with previous studies, which concluded ACT was effective in coping skills, self-regulation, cognitive avoidance as well as quality of life and social skills [16, 17, 18, 19].

Besides, our findings represented that the most significant factors, influenced by ACT therapy are drug abuse, smoking and unprotected sexual behaviors. It might be due to participants' problem-solving reinforcement, which helps people to find high-level solutions to deal with their life problems. In fact, increased cognitive flexibility by ACT therapy leads them to use self-control and coping strategies in risky situations [21, 22]. Violence, on the contrary, was not affected by this method. Moreover, drug tendency, smoking, and unprotected sexual behaviors are more likely to be genetic-social-based behaviors than violence [2]. It means that anger is an emotion that was internally raised; nevertheless, violent behaviors are externall triggered when people do not accept the situation and become compatible as well [34, 20]. In this way, ACT can change intrinsic behaviors structurally rather than learned behaviors, which means it works on self and inner changes rather than interpersonal relationships.

Secondly, problem-solving strategies were significantly influenced by ACT training in adolescents with addiction susceptibility. This finding is in line with Ball, Madanifard, et al., Chen, et al. and Baars, et al., who concluded that ACT could affect adults' problem-solving skills [35, 36, 37, 38]. To shed more light on this issue, it can be said that drug abusers are less likely to use the appropriate problem-solving strategies. On the contrary, they involve in inappropriate skills, including helplessness, avoidance, and control. This represents drug abusers are more likely to feel helpless and will not apply suitable thoughts and behaviors to solve their life problems. They use avoidance strategies more than normal people seem they refuge from drug abuse and enjoy as it leads them to avoid getting involved in daily challenges.

Finally, adolescents with addiction susceptibility are less likely to use creativity and confidence than normal teenagers. Interpreting that they are incapable of considering alternative solutions when faced with life fluctuations and fragile to look at the problem from different dimensions. This finding is in line with Bahramai and Asghari, and Serfaty, et al.,who represented that methamphetamine-addicted patients tend to be highly energized and happy despite their too many problems in life [25, 26]. Instead, they tend to act in accordance with their first solution and do not trust their own ability to deal with difficulties. Addiction susceptible people are awkward in planning and assortment in using alternatives. Since life is naturally overfilled with everyday problems, people should inevitably face with them; however, helplessness and avoidance patterns cause them to refuse. As a result, unsolved problems will be piled up and led to create a defective painful cycle, which increases the tendency to use painkillers to be anesthetized in face of pressure and pain. Despite the alternation in helplessness, avoidance, and tendency scores as problem-solving subscales, our findings showed no changes in creativity, confidence and control scores. We assumed that these variables are more related to peoples' intelligence and schemas that are the most severe structures to change. Therefore, they could not be conversed by short-term therapies such as ACT.

Limitations of Existing Research

The present study has powerful points such as training, intervention, and high effect size. Moreover, the findings of this study revealed significant information on high-risk behaviors and problem-solving strategies of teenagers with addiction susceptibility. However, it has some limitations that future researchers should consider. For instance, we considered only female adolescents in our study, while the results of ACT training on boys with addiction potential and its effect on both high-risk behaviors and problem-solving strategies are not clear for us. Moreover, the data was collected only from the participants' self-reports; nonetheless, the reports of parents and teachers were not regarded. Besides, the pandemic situation did not allow us to interact closely with the participants that may influence our observations in training sessions.

Implications for Future Research

Considering the above-mentioned limitations, we suggest acceptance and commitment therapy to be taught to male adolescents in environments that increase the likelihood of addiction to protect them from high-risk behaviors. In addition, data collection should be considered from three dimensions (self, parents, and teachers) to get more reliable and curable data from participants.

Conclusion

This study aimed to investigate the effectiveness of acceptance and commitment therapy on female adolescents' high-risk behaviors and problem-solving strategies with regard to their addiction susceptibility. The purpose was to enhance this field's knowledge boundaries and demonstrate the effect of acceptance and commitment therapy. Moreover, the results showed that cyberspace group training through acceptance and commitment therapy method had a significant effect on the reduction of high-risk behaviors, especially in the field of drug abuse, smoking, and unprotected sexual behaviors. Our findings represented that when people try to deal with alternative solutions, they tend to reduce avoidance and helplessness in problem-solving. On the contrary, ACT's impact on violence as a high-risk behavior, creativity, confidence and control as problem-solving subscales was not significant. The results indicated that the violence is mostly an outcome of learned behavior instead of innate behavior, and ACT is more likely influenced in internalized behaviors according to the theory of genetic-social based behaviors [2].

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