## Research Paper

# Neurocycle Mind-management Approach: Effect on the Resiliency and Wellbeing of Female University Students

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# ABSTRACT

**Background:** The neurocycle model has been developed based on cognitive neuroscience studies and can be applied to manage the functioning of the mind.

**Objectives:** The present study investigated the effectiveness of the neurocycle mind-management approach in the resiliency and wellbeing of female university students.

**Materials & Methods:** This single-subject experimental study was conducted based on the AB model. The research population comprised all single female university students aged 20 to 30 years studying at Khatam University in 2022. The participants were 3 students who attended the training intervention, and one was the control. The study data were collected using Connor and Davidson's (2003) resilience scale and Ryff's (1989) psychological wellbeing scale. Data analysis was performed through chart analysis, clinical improvement rate, and reliable change index.

**Results:** The obtained data revealed that the students' resilience and psychological wellbeing scores increased compared to the baseline and control values. The overall improvement rates of the participants in terms of resilience and psychological wellbeing were 45.23% and 43.89%, respectively, though not clinically significant. In all three participants, the reliable change index in both variables was higher than 1.96, so the impact of the intervention was statistically significant. Based on the follow-up phase results, the effects of the intervention increased after 1 month from the last intervention session, but the improvement was not significant.

**Conclusion:** The neurocycle mind-management technique can be explored and used as an effective intervention to improve female university students' resilience and psychological wellbeing.

**Keywords:** Psychological wellbeing, Cognitive neuroscience, Female, Students

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## Highlights

• Based on the neurocycle mind-management approach, resilience, and psychological wellbeing have common pathways, so their overlap explains the interaction of learned components of resilience and psychological wellbeing with mind management.

• This approach highlights the quality of self-regulation after interventions to improve individual awareness and insight.

• The students who participated in the neurocycle mind-management program reported higher levels of resilience and psychological wellbeing.

## Introduction

Mental disorders have a high prevalence compared to other medical conditions. About 919 million people suffer from mental disorders worldwide, and according to the World Health Organization (WHO), 1 out of every 4 people suffers or will suffer from a psychiatric disorder during their lifetime. Besides, about 13% of the adult population has suffered from a mental disorder at any time since 2019 [1]. About one-fifth of people in Iran suffer from a mental illness or substance disorder, accounting for nearly 10% of the population [2]. Students' mental health in national and international higher education settings is recognized as an important public health issue. The increasing prevalence and severity of mental health disorders among university students are critical issues for universities and their communities [3]. Anxiety and depression have followed an upward trend in the past 8 years. Since excessive stress and its negative consequences are common among university students of different academic levels and fields, effective interventions are advisable to improve their psychological wellbeing and reduce burnout [1, 2].

Resilience is one of the components of positive psychology and is the ability of an individual to successfully overcome and adapt to threatening and stressful conditions [4]. The American Psychological Association (APA) defines resilience as the process of adapting well in the face of adversity, trauma, tragedy, threats, or significant sources of stress [5]. Resilience can improve psychological wellbeing through strengthening self-esteem as a mediating mechanism [6]. Accordingly, neuroscience studies of brain circuits have shown that training mind management, resilience, and psychological wellbeing have common paths, and their overlap explains the interaction of learned components of resilience and

psychological wellbeing with mind management. Previous neuroscience studies have highlighted that training interventions can improve self-regulation quality and enhance individual awareness and insight [1].

Psychological wellbeing is another variable of positive psychology, which has a long history in philosophy and psychology and has been addressed in positive psychology studies [7]. According to Ryff and Singer (1996), the psychological wellbeing model includes positive mental health criteria to measure a person's wellbeing and positive functioning [8].

Resilience and psychological wellbeing are among the cornerstones of positive psychology that received considerable attention in recent years, and researchers have proposed various therapeutic and educational solutions to improve them [9]. Based on evidence-based studies, promoting the level of psychological wellbeing leads to enhancing overall health and improving disease outcomes [10]. According to neuroscience studies, resilience against stress is the key element of a healthy brain because the developing brain has neuroplasticity [11]. Researchers working on psychological wellbeing have emphasized the importance of knowing the brain networks and circuits related to the components of these constructs, as well as the underlying mechanisms of interventions for more accurate and targeted training, treatments, and evaluations [12-14]. Thus, many studies have addressed the interventions aiming to improve these constructs.

Caroline Leaf neurocycle model has been developed based on neuroscience studies and clinical findings. The model is rooted in Leaf theory about the mind levels and its connection with the brain [15]. This model addresses the applicability of mental self-care training to effectively manage the mind. Neurocycle is a 5-step process that helps people use their brain so that the brain's

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neuroplasticity is aligned with their interests and health. According to this model, people can improve their mental and physical health, career and academic success, interpersonal relationships, and quality of life by taking an effective step through mental self-care [15, 16].

Based on previous studies, educational protocols should be developed to account for individual differences [12]. Given the significance of individual and cultural differences in neuroscience coaching [16], single-case experiments are necessary to profoundly explore individual differences and develop a model based on these differences. Furthermore, previous studies [17-19] have tried to develop and test integrated and efficient models to promote resilience and psychological wellbeing. For example, the neurocycle model has specific steps and constructs based on neuroscience clinical studies. These findings can lay the results for integrating models and testing them in different populations. The increasing trend of stress and mental disorders shows insufficient human knowledge about the most effective ways of preventing and treating these disorders. Based on recent studies, individual differences should be considered when developing models and interventions to improve the mental health of people in the community. Thus, following the Caroline Leaf model, the present study investigated the effectiveness of mental self-care training in female university students' resilience and psychological wellbeing.

## Materials and Methods

### Study design, statistical population, inclusion and exclusion criteria

The present study employed a single-subject research design of the AB type. In the single-subject design, the dependent variable is repeatedly measured before the intervention or the change induction program starts. The observation period before the intervention is referred to as the baseline stage and is indicated by the letter "A," aiming to obtain a longitudinal profile of the dependent variable without intervention and treatment. The baseline data are the basis of comparison against the post-intervention/treatment data. Repeated measurements continue during the implementation of the intervention and are usually represented by the letter B. The purpose of the treatment phase is to collect the longitudinal profile of the dependent variable during the implementation of the intended intervention or program to influence the dependent variable. Then, the baseline time series are compared with the implementation of the intervention or program to draw the necessary conclusions about changes [19].

The participants were selected from 30 single female students aged 20 to 30 years. The students studied in fields other than psychology and counseling at Khatam University in 2022. The students were invited to attend the intervention program through a call released on the Telegram channel of Khatam University in September 2022. The participants were 4 students selected through purposive and convenience sampling from among the 30 candidates who scored one standard deviation above or below the average resilience and psychological wellbeing scores on the Connor-Davidson resilience scale and Ryff's psychological wellbeing (PWB) scale. The selected students met the inclusion criteria and were randomly placed into the intervention group (3 students) and the control case (1 student). The participants in the intervention group received self-care training in 12 sessions, while the control did not receive any training intervention. However, to comply with ethical protocols, 4 training sessions were conducted for the student in the control group at the end of the study.

The criteria for enrollment in the study comprised all volunteer female students of technical and engineering, English language, art, management, and finance at Khatam University and the age range of 20-30 years. The inclusion criteria were as follows: Obtaining the average resilience and psychological wellbeing score, being single (not divorced or widowed), lacking specific physical and psychological disease, not taking neuropsychiatric drugs, not receiving other counseling and psychotherapy interventions, not participating in psychological training courses, and the willing to participate in the training sessions. The exclusion criteria were as follows: The absence of more than 3 sessions, not completing the assigned tasks, and unwillingness to continue the training sessions.

### Study instruments

#### Connor-Davidson resilience scale

The resilience scale was developed by Conner and Davidson (2003) based on a review of the literature on resilience from 1979 to 1999. The scale items are scored on a 5-point Likert scale ranging from 0 (not true at all) to 4 (true nearly all the time). The minimum and maximum scores are 0 and 100, respectively, with higher scores reflecting greater resilience. Since the reliability and validity of the subscales have not been confirmed, only the overall resilience score is valid for research studies [20]. In this study, the reliability of the translated version of the scale was established as 0.87 by the test re-test.

### Ryff psychological wellbeing scale

The initial version of the Ryff psychological wellbeing scale was developed in 1989. The scale measures 6 aspects of wellbeing: Self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life, and personal growth. Each subscale contains 14 statements. The scale was developed for adults and includes 84 items on a 6-point Likert scale (1=strongly disagree to 6=strongly agree). Bayani et al. assessed the scale's reliability using the test re-test method, and the corresponding value was 0.82 [21].

### Study procedure

The content of the training intervention was developed based on a review of the theoretical and empirical literature on the Caroline Leaf neurocycle model. Moreover, the training intervention's objectives, the content's structure and organization, and the number of sessions were determined based on previous works in this field: "Cleaning up your mental mess" [14] and "switch on brain power" [22]. The materials on the structure and function of the brain and the neuroscience of stress were developed based on the "synopsis of psychiatry" [23], "an affective neuroscience model of boosting resilience in adults" [18], "resilience training that can change the brain" [15], and "the plasticity of wellbeing: A training-based framework for the cultivation of human flourishing" [11]. After obtaining the necessary permits, the participants were selected from female students at Khatam University in the summer of 2022. The participants attended the briefing and basic evaluation sessions. Afterward, the training intervention was conducted for the students in the intervention group in 12 sessions. The first 4 sessions were held for all group members through PowerPoint presentations, interaction and discussions, questions and answers, and practices. The remaining 8 sessions were held individually for each participant. The intervention program was held within 6 weeks (2 sessions per week) in Building No. 1 of Khatam University. Table 1 presents the content of the training intervention.

### Data analysis

Data analysis was performed through chart analysis, the clinical improvement rate, and the reliable change index (RCI) utilized by excel and SPSS software, version 24.

## Results

All three participants in the intervention group were students at Khatam University.

Participant A was a 27-year-old PhD candidate, and her average baseline resilience and psychological wellbeing scores were 61 and 244, respectively. She used to refer to counseling sessions for stress control. Her main complaint was her inability to express anger and obedience to others to satisfy them. Thus, accepting multiple responsibilities at first seemed to be a supportive factor. Still, during the meetings, it was revealed to be an ob-

**Table 1.** The content of the training intervention

| Session | Description of the Content |
|---|---|
| 1 | Introducing the group members and the basics of the training program |
| 2 | Introducing the structure and function of the brain |
| 3 | Introducing the mind and its levels according to Leaf theory; the connection between the brain, thought, and mind; the neuroscience of stress with a focus on answering the metacognitive questions of whatness, whyness, and howness |
| 4 | Teaching the 5 steps of the neurocycle and the neurological basics of abdominal breathing and practice |
| 5 | Assessing the functioning of the mind in 5 steps of the neurocycle and various writing methods |
| 6 & 7 | Thinking in the functioning of the mind; focusing on thinking, exploring, and discovering relationships, revisions, and recreations |
| 8 & 9 | Emotions in the functioning of the mind; focusing on emotions, exploring, and discovering relationships, revisions, and recreations |
| 10 & 11 | Choices in the functioning of the mind; focusing on choices, behavior, and speech, exploring and discovering relationships, revisions, and re-creations; assessing different scenarios and choices |
| 12 | Summing up the discussions in previous sessions in the form of a table<br>A comprehensive review of writings, exploration, managing the mind functions, questions and answers |

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stacle to resilience, leading to substantial stress. During the sessions and with mind function care exercises, the participant pointed out the effects of writing and inquiry based on the neurocycle model in focusing attention and mental organization. The participants' scores for resilience and psychological wellbeing variables mainly showed an upward trend.

Participant B was a 30-year-old master's student, and her average baseline resilience and psychological well-being scores were 60 and 240, respectively. Despite her academic and occupational achievements, she developed a sense of low self-acceptance and self-confidence. The feelings of not being seen and worthlessness prevented her from paying attention to available support resources. She stated that by learning to ask questions and create a link between events and patterns, she automatically reviewed the cycle of the mind's functions before thinking and acting and chose a different type of reaction by changing her perspective. The participant's scores for both variables were usually upward. However, there were fluctuations in the initial sessions, which, according to the participant, resulted from encountering aspects of herself that were unknown to her.

Participant C was a 26-year-old master's student, and her average baseline resilience and psychological well-being scores were 62 and 243, respectively. She repeated that she had no tolerance for being in suspense. The continuous look exercise was performed in different fields because all-or-nothing thinking was one of the obstacles to establishing communication, leading to a sense of inadequacy and indecision. She stated, "now I think more before reacting, or if I want to show a reaction, I will find out later how to approach it and weigh my choices." Her scores in both variables showed an upward trend despite fluctuations, especially in the first sessions.

Participant D was a 25-year-old master's student, and her average baseline resilience and psychological well-being scores were 62 and 243, respectively. According to her, academic achievements, a good relationship with her mother, and having a close friend were the most important factors that helped her with many problems. She was not on good terms: "Occasional arguments with my father and his unreasonable strictness annoy me and make me feel stressed." Her scores for both variables did not change significantly in different phases of the study, except for some fluctuations in some components, such as relationships.

The data for resilience and psychological wellbeing collected from the baseline, intervention, and follow-up phases are presented in Tables 2 and 3 and Figures 1 and 2. As seen in the Table, the final improvement rate was calculated without considering the improvement rate in the control person.

As seen in Table 2 and Figure 1, the upward trend of the participants' scores compared to the control shows the effectiveness of the intervention in improving their resilience scores. The scores for participant A show a pretty regular upward trend with fewer fluctuations. The scores for the other two participants also show an upward trend, except for the fourth session, which shows a slight drop in their scores. Participant C shows more than 50% improvement in the resilience scores after the 12th session and follow-up phase. Thus, in addition to the upward trend of the scores, the intervention was also clinically significant for this participant. Moreover, participant A shows an improvement of slightly less than 50% after the follow-up phase, indicating the clinical significance of the intervention for this participant. The total improvement in the 3 participants' resilience scores shows positive and effective changes, but these changes are not clinically significant. Overall, the increased improve-
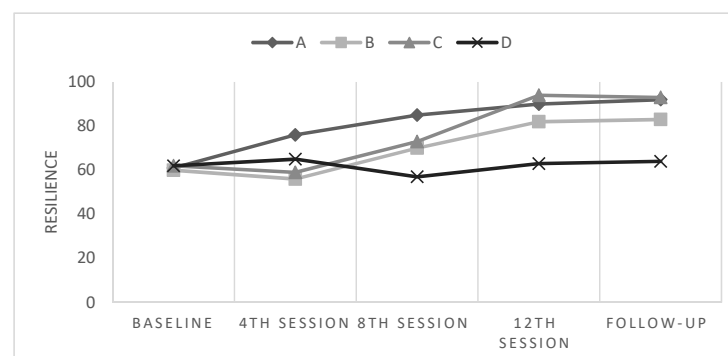


**Figure 1.** The changes in the participants' resilience scores

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**Table 2.** The changes in the participants' resilience scores in the baseline, treatment, and follow-up phases

| Resilience | Participant A | Participant B | Participant C | Control |
|---|---|---|---|---|
| 1st baseline | 62 | 59 | 64 | 61 |
| 2nd baseline | 59 | 61 | 60 | 63 |
| Average baseline | 61 | 60 | 62 | 62 |
| 4th session | 76 | 56 | 59 | 65 |
| 8th session | 85 | 70 | 73 | 57 |
| 12th session | 90 | 82 | 94 | 63 |
| Improvement (%) | 47.5 | 36.6 | 51.6 | 1.61 |
| Total improvement (%) | | 45.23 | | |
| RCI | 34.52 | 26.19 | 38.09 | 1.19 |
| One-month follow-up | 92 | 83 | 93 | 64 |
| Final improvement (%) | 50.8 | 38.3 | 50 | 3.22 |
| Total final improvement (%) | | 46.36 | | |
| Follow-up RCI | 36.90 | 27.38 | 36.90 | 2.38 |

RCI: Reliable change index.

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**Table 3.** The changes in the participants' psychological wellbeing scores in the baseline, treatment, and follow-up phases

| Psychological Wellbeing | Participant A | Participant B | Participant C | Control |
|---|---|---|---|---|
| 1st baseline | 244 | 245 | 241 | 242 |
| 2nd baseline | 244 | 241 | 239 | 244 |
| Average baseline | 244 | 243 | 240 | 243 |
| 4th session | 300 | 232 | 233 | 240 |
| 8th session | 325 | 290 | 298 | 248 |
| 12th session | 360 | 329 | 357 | 242 |
| Improvement (%) | 47.54 | 35.39 | 48.75 | 0.41 |
| Total improvement (%) | | 43.89 | | |
| RCI | 95.86 | 71.07 | 96.69 | 0.82 |
| One-month follow-up | 359 | 331 | 361 | 244 |
| Final improvement (%) | 47.13 | 36.21 | 50.4 | 0.41 |
| Total final improvement (%) | | 44.58 | | |
| Follow-up RCI | 95.04 | 72.72 | 100 | 0.82 |

RCI: Reliable change index.

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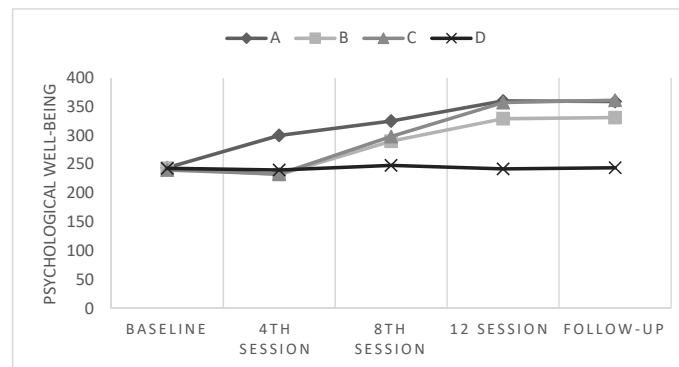
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**Figure 2.** The changes in the participants' psychological wellbeing scores

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ment in the resilience scores after the follow-up phase indicates the retention of the effects of the intervention and confirms the well-reinforced habit in the participants after the follow-up phase. The overall reliable change index was higher than 1.96 for all three participants, confirming that the impact of the intervention was statistically significant. Table 3 and Figure 2 display the variations in the participants' psychological wellbeing scores in the baseline, treatment, and follow-up phases.

As seen, the upward trend of the participants' scores compared to the control shows the effectiveness of the intervention in improving their psychological wellbeing. The scores for participant A show a pretty regular upward trend with few fluctuations. The scores for the other two participants (B and C) also show an upward trend, except for the fourth session, which shows a slight drop in their scores. The overall improvement in 3 participants' psychological wellbeing scores shows positive and effective changes, but these changes are less than 50% and not clinically significant. In contrast, participant C shows more than 50% improvement in the psychological wellbeing scores after the follow-up phase. Thus, in addition to the upward trend of the scores, the intervention was also clinically significant for this participant. Overall, the increased improvement in the psychological wellbeing scores after the follow-up phase indicates the retention of the effects of the intervention and confirms the habit (psychological wellbeing) has been well reinforced in the participants. The overall reliable change index was higher than 1.96 for all three participants, confirming that the impact of the intervention was statistically significant.

## Discussion

The study data confirm the effectiveness of the neurocycle mind-management approach in the resiliency and wellbeing of female university students. However, the intervention was not equally effective for all 3 participants due to personal, family, and social differences. The improvement rate in the resilience of participants A and C was clinically significant. In contrast, participant B showed significant progress compared to her baseline score, considering her living conditions, but her improvement was not clinically significant. According to the neurocycle model [15], depending on the complexity and depth of each person's problems at different stages of life, several cycles may be needed to clean up mental messes and replace them with healthy habits. Thus, participant B needed more interventions to show clinically significant improvements. In general, the absence of clinical improvements in the current study compared to other studies that employed "randomized pre-test and post-test designs" could be attributed to the differences in research methods and the limitations of group designs, including the inability to provide accurate information on people's reaction profile over time and their mere focus on the changes in just two points of time: Pre-test and post-test [22]. Based on the literature, resilience is a dynamic process that fluctuates over time and in different situations and is a growing entity [18]. One of the common points in different definitions of resilience is the type of interaction between protective and risk factors [23]. Furthermore, since acceptance is one of the characteristics of resilient people [24] and it is also considered the basic step in the neurocycle model [15], people seek to face various life events by recognizing and accepting their weaknesses and strengths and create a balance between protective and risk factors, and thus function more effectively. This fact can explain the different perfor-

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mances of the participants in different situations. Moreover, an individual may be more resilient in one situation but less resilient in another context. Accordingly, previous studies have indicated that resilience is a complex and multidimensional construct that can be affected by various factors [25-28]. Hence, it is important to recognize the many factors that affect resilience. In addition, purposeful inquiry in the neurocycle model effectively promotes resilience. This inquiry was reflected in the observations, statements, and scores of the participants and contributed to the conscious improvement of this construct. Liu et al. suggested that resilience is a multi-system construct: An interactive process between intra-personal, interpersonal, social, and ecological variables [29]. This condition explains the fluctuations observed in this construct in people, especially in the students in the present study. Accordingly, the student who did not receive training showed more variations in her resilience scores. However, the participants in the intervention group tended to react differently to issues in their lives and showed higher levels of resilience. In other words, they changed their attitudes toward life problems over time. Feldman also pointed out the importance of the element of time in the formation of effective resilience [30].

The present study results showed no significant improvement in the participants' psychological wellbeing. Nevertheless, the psychological wellbeing scores for all 3 participants increased considerably compared to the baseline. Psychological wellbeing is a multidimensional construct with common components of resilience, but resilience is one of the components of psychological capital that predicts psychological wellbeing [31]. Therefore, efficient and reliable progress in this construct requires time. The data in this study confirmed considerable differences in psychological wellbeing between the control case and the intervention group participants, confirming the neurocycle model's effectiveness in improving psychological wellbeing despite the lack of clinical significance. The clinically significant progress in the psychological wellbeing scores of participant C after the follow-up phase could be attributed to individual differences and numerous factors. This participant's upward trend of psychological wellbeing was in harmony with her statements about changing the way she viewed issues and changing the functioning of her mind, resulting in a different style of coping with problems.

Tang et al. illustrated the impact of an integration of mindfulness meditation program with mind-body training on psychological wellbeing by influencing self-control systems (31).. The participants in the present study reported higher levels of physical and mental self-aware-

ness and the interaction of the two factors as the training intervention focused on their physical and mental health. The first step in the neurocycle model is the acceptance of physical and mental symptoms. Moreover, Weiss et al. confirmed the impact of interventions on psychological wellbeing [32]. However, the degree of effectiveness was different from the data in the present study, possibly due to differences in intervention methods and single and group case experiments. According to neuroscience studies [12, 15, 19], the brain circuits involved in training mind management, resilience, and psychological wellbeing have common pathways, and their overlap accounts for the interaction of learned components of resilience and psychological wellbeing with mind management. All these studies have highlighted improving the quality of self-regulation following training programs to enhance awareness and individual insight. After effective training and performance, brain networks and circuits, including different parts of the limbic system, especially the amygdala and hippocampus, different parts of the prefrontal cortex, especially the medial prefrontal cortex and lateral prefrontal cortex, the reward network, and the default mode network interact efficiently, leading to behavioral and verbal reactions to the functioning of the mind. These functions include thoughts, feelings, and individual choices in emotion regulation, impulse control, effective and purposeful thinking, and effective communication. Consequently, the components of resilience and psychological wellbeing interact [15, 19].

The present study employed a holistic model to assess the overall resilience and psychological wellbeing scores. The results demonstrated the upward trend of the two variables and highlighted the basic step in the neurocycle model: Recognition and acceptance of warning physical and mental symptoms, as well as the role of the acceptance in both constructs.

The observations and interviews with the participants indicated they need a deep and accurate knowledge of themselves. Thus, they started searching about themselves, their learnings, and skills to investigate different aspects of personal, family, and social impact in their choices, their conditions, and the relationship between these aspects and their past and present. Accordingly, we need to conduct longitudinal studies to address the level and type of effectiveness of the neurocycle model in promoting resilience and psychological wellbeing and, finally, the quality of life of people.

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Since the neurocycle model requires deep introspection and precise and purposeful inquiry of oneself to solve the poisonous memories of the past, an effective plan is developed for the present, and a correct goal setting is formulated for the future. Therefore, attention should be paid to time based on people's needs, personalities, family, and social factors. Resilience is the concern of every human being at different levels. Hence, gaining applied neuroscience knowledge tailored for each individual and group can effectively create a new look at the internal capabilities to promote resilience and psychological wellbeing. By adopting this model and adapting it to their approach, psychologists and counselors can benefit from it to promote the resilience and psychological wellbeing of the clients.

One of the limitations of the present study was related to the inaccuracy of self-report tools due to the possibility of imprecise responses. Since resilience and psychological wellbeing are affected by different life conditions, the ongoing personal, family, and social events were uncontrollable during the intervention. As a result, paying attention to the mentioned factors when applying the neurocycle model, conducting future studies, and organizing effective programs for different people and groups can lead to more reliable outcomes.

## Conclusion

The study findings indicate that learning a correct, scientific, and structured approach to managing the mind effectively solves psychological distress and consequently improves the level of resilience necessary for endurance against the ups and downs of life and improving psychological wellbeing.

## Ethical Considerations

### Compliance with ethical guidelines

The study process was in compliance with the ethical guidelines of the Declaration of Helsinki 2013. The article was approved by the Ethics Committee of Shahid Beheshti University (Code: IR.SBU.REC.1401.070). To comply with the ethical principles of voluntary participation, written informed consent was obtained from the participants for conducting and recording the interviews. The participants were also reassured of the confidentiality of their information.

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