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Perspectives and Possibilities of Using Artificial Intelligence During Autogenic Training for Psychophysiological State Correction

Abstract

The article explores the development of autogenic training for the correction of psychophysical states using artificial intelligence tools. The research aims to organise the application areas of artificial intelligence for diagnosis and correction of psychophysical states through autogenic training. The results indicate that autogenic training is an important approach in the spectrum of treatment methods for psychophysical disorders, with its main advantages being the flexibility of the technique and its ability to induce relaxation and psychophysiological self-regulation through passive concentration and repetition of specific phrases. The analysis shows that while the practice is stable and consists of sequential procedures, it can be adapted to different techniques and needs. Here, the use of artificial intelligence (AI) can significantly improve the personalisation of the treatment process and its effectiveness. The application of AI in the context of autogenic training opens up new perspectives for the diagnosis and treatment of psychophysical disorders. AI can optimise psychotherapeutic interventions by adapting training sessions to the individual needs of the user, thereby achieving better results in relaxation and psychophysical recovery. A distinctive feature of AI is also its ability to provide detailed feedback and track user progress, contributing to more effective adjustment and improvement of the training process. The integration of AI with virtual and augmented reality technologies can further enhance the autogenic training experience, creating a more immersive and controlled environment for relaxation. The development of digital tools and mobile applications based on AI has already demonstrated its positive impact on the psychophysical health of users, paving the way for more innovative and effective solutions in the future. Thus, the use of AI in autogenic training for the correction of psychophysiological states promises significant prospects for improving the quality of life and well-being of individuals.

Keywords

artificial intelligence, autogenic training, psychophysical disorders, psycho-correction

JEL: I10, I12, I18

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1 Introduction

In today's world, where rapid technological progress affects all aspects of human life, the use of artificial intelligence (AI) in medicine and psychotherapy opens up new opportunities to improve the psychophysiological state of a person. One promising area is the application of AI in autogenic training – a self-regulation method aimed at achieving relaxation and psychophysiological correction. The relevance of this topic lies not only in the increasing penetration of AI into various fields, but also in the lack of scientific-theoretical underpinning and empirical research on their joint use in the context of autogenic training.

Despite the significant potential and interest in the use of AI to support mental health, there is currently a limited number of studies that specifically investigate the integration of artificial intelligence into autogenic training processes. This gap in the scientific literature makes the topic "Prospects and possibilities of using artificial intelligence in autogenic training for the correction of the psychophysiological state" particularly relevant. The study of this topic can not only expand the understanding of AI's potential in psychotherapeutic practice, but also help to improve autogenic training techniques, making them more personalised, effective, and accessible to a wider range of people in need of psychophysiological correction.

The topic of the prospects and possibilities of using artificial intelligence during autogenic training to correct the psychophysiological state is not widely covered in the scientific literature, so research in this area typically includes a variety of approaches and technologies. Currently, there is great interest in works that explore the autonomic nervous system and its impact on mental disorders, such as Alvares et al. (2016), who focused on autonomic nervous system dysfunction in the context of psychiatric disorders. In addition, the study by Arango et al. (2021), which analyses risk and protective factors for mental disorders beyond genetics, is important. Research that focuses directly on the use of artificial intelligence in autogenic training could include analysing medical record texts to predict suicide risk, as in the study by Poulin et al. (2014). Such approaches could provide valuable insights into how AI technologies can be applied to enhance the effectiveness of autogenic training in correcting psychophysiological states.

2 Causes and Factors of Psychophysical Disorders Emergence

The causes of mental disorders faced by today's generation are complex and multifactorial, requiring a deep understanding of the interaction of biological, psychological and social determinants.

- Biological factors include genetic predisposition, neurotransmitter dysfunctions, and structural and functional abnormalities of the brain. Current research highlights the importance of genetic transmission of certain mental disorders, although there is no single "mental health gene"; rather, it is a complex interaction of many genes.
- Psychological factors include personality traits, coping styles, traumatic events and cognitive processes. Psychological resilience, cognitive schemas and coping mechanisms play a crucial role in the development and course of mental disorders.
- Social factors include the influence of family, culture, socioeconomic status and interpersonal relationships. Social isolation, social support, cultural norms and stigma associated with mental health play a significant role in the etiology of mental disorders.

The aetiology of mental disorders is not static. Genetic factors can be modified by environmental influences and also vary with the life stages of an individual. This model also takes into account epigenetic mechanisms, which allow external factors to influence genetic expression without changing the DNA itself (Arango et al., 2021).

Recent studies have shown that another common cause of mental disorders is the inappropriate or excessive use of medications, especially psychotropic drugs such as antidepressants and antipsychotics, which can affect the functioning of the autonomic nervous system, causing or exacerbating mental disorders (Leung et al., 2012). Research suggests that some psychiatric disorders and their association with autonomic nervous system dysfunction may be related to the use of certain medications. For example, data analysis from several studies has shown a decrease in autonomic nervous system activity in people with psychiatric disorders compared to healthy individuals, with this association being particularly evident in people with psychotic disorders. This highlights the importance of careful selection and monitoring of medication therapy in the context of psychiatric practice (Alvares et al., 2016).

Analysis of the major risk factors for the development of mental disorders has shown that changes in neuropsychology, neuroanatomy, genetics and neurochemistry are significant risk factors for the development of mental disorders. Neuropsychological aspects relate to cognitive functions and behavioural responses that may be affected by abnormalities in brain activity. Neuroanatomical factors include structural differences in the brain, such as changes in the size or activity of certain brain regions, which are associated with different mental states. The genetic component points to the heritability of certain mental disorders, with genomic studies revealing associations between specific genetic variants and an increased risk of developing mental illness. Neurochemical changes, involving the levels and actions of neurotransmitters, also play a critical role in the regulation of mood, cognition and behaviour, thereby influencing the development of mental disorders.

The interaction of these factors, especially in the context of negative life events or stressful conditions, can significantly increase the risk of developing mental disorders, highlighting the complexity and multifactorial aetiology of these conditions (Arango et al., 2021). The combination of factors and predispositions for the development of mental disorders collectively cause changes in the functioning of the autonomic nervous system (Alvares et al., 2016). The autonomic nervous system plays a key role in maintaining internal balance and adapting the body to changing conditions by controlling involuntary functions such as heartbeat, breathing, digestion and stress responses. Dysfunctions in this system can lead to impaired stress responses, which can contribute to the onset or exacerbation of various mental health conditions, including schizophrenia, depression, bipolar disorder, and anxiety and obsessive-compulsive disorders. This also applies to post-traumatic stress disorder and addiction. Inadequate regulation of the autonomic nervous system makes the body less effective in coping with stressful situations, which can act as a catalyst for the development or exacerbation of mental disorders (Alvares et al., 2016).

3 Features of Correction in Psychophysical Disorders

The treatment of psychophysical disorders involves a wide range of methods, including medication, psychotherapy, cognitive behavioural therapy and various relaxation and self-help techniques. One such method is autogenic training, a relaxation technique developed by the German psychiatrist Johann Heinrich Schultz in the 1930s.

The process of autogenic training typically begins with a focus on heaviness and warmth in the arms and legs, promoting a reduction in muscle tension and a sense of relaxation. Gradually, the practitioner moves to other parts of the body and internal organs, focusing on normalising the heartbeat, regulating breathing and achieving a general sense of calm and relaxation.

This technique requires regular practice and is usually done in a quiet place without external distractions. Autogenic training can be beneficial in reducing stress, improving sleep, reducing symptoms of anxiety and depression, and improving general well-being (Kanji, 1997).

Autogenic training (AT) is based on three key psychophysiological principles (Schultz, 1969):

– Reducing exteroceptive and proprioceptive stimulation. This is achieved by reducing the influence of external stimuli and internal sensory signals. The practitioner seeks to minimise sensations and perceptions that may distract from the relaxation process, thereby providing a calm and controlled environment for training.
– Mentally repeat psychophysiologically adapted verbal formulas. The student actively uses specialised self-hypnosis formulas aimed at inducing feelings of heaviness and warmth in different parts of the body to reduce muscle tension and increase blood flow. These formulas serve as tools for achieving a psychophysiological state of relaxation.
– "Passive concentration". Instead of actively trying to focus attention or control thoughts, passive concentration involves complete and relaxed immersion in the process of self-hypnosis. This method emphasises the importance of uncritical acceptance of inner feelings and experiences, promoting deep mental relaxation without active mental intervention.

The treatment technique, autogenic training, is organised into a strict sequence of six standard exercises (SE) developed by Johannes Schultz and his student Wolfgang Luthe. Each exercise targets specific aspects of physical and mental relaxation, from the sensation of heaviness in the limbs to achieving deep relaxation of the internal organs (Ernst et al., 2000).

1. Heaviness and warmth (standard Schultz and Lute technique). The basis of AT, focusing on the sensation of heaviness and warmth in different parts of the body, promoting muscle relaxation and improving blood circulation.

2. Heaviness, warmth, breathing, personal formulas (modified Schultz technique). Supplements the basic sensations of heaviness and warmth with a focus on rhythmic breathing and the use of personal positive affirmations or formulas for psychological well-being.

3. Heaviness, warmth, coolness, calmness, peaceful relaxation (Luthe's technique). Includes the sensation of coolness along with traditional elements of AT, helping to achieve a deeper level of relaxation and mental calm.

4. Heaviness (Budzynski's taped technique). A simplified version of AT that focuses solely on the sensation of heaviness in the body, often used with recorded instructions to facilitate practice.

5. Heaviness, warmth, breathing patterns, neck and shoulders, mental imagery of body alignment (Schultz's extended technique). This technique includes additional attention to breathing, relaxation of the neck and shoulder muscles, and the use of mental imagery to increase the effectiveness of relaxation.

6. Recorded AT phrases with music (Luthe's technique with music): A combination of AT verbal instructions with music to produce a deep state of relaxation. The music acts as an additional relaxing element and enhances the effect of the verbal instructions.

These practices are popular all over the world and have proven procedures that demonstrate good effectiveness (Yurdakul et al., 2009).

Autogenic training is carried out through a series of regular sessions that can be practiced in different positions, depending on the person's personal comfort. Consider the stages that generally reflect the process of autogenic training.

Stage 1. Preparation for the procedure.

– The patient chooses a quiet, comfortable place where they will not be disturbed during the entire session.
– The patient chooses a position for practice: lying on the back, sitting in a comfortable chair with a backrest or in a meditation position. It is important that the position is comfortable and does not cause muscle tension.

Stage 2. Relaxation.

– One should close his/her eyes to reduce visual stimulation and facilitate relaxation.
– Take a few deep, calm breaths to relax the body and mind.

Stage 3. Passive concentration.

– The exercise begins with passive concentration on the feeling of heaviness in the body. Inwardly repeat the phrase "My arms are heavy", allowing the feeling of heaviness to spread to every part of the body.
– The patient should focus on the sensation of warmth, repeating a phrase such as "My hands are

warm", feeling the heat spread and relaxing the muscles.

Stage 4. Deeper relaxation focus.

– Patients take turns focusing on other sensations, such as heaviness and warmth in the legs, a feeling of calmness in the heart, rhythmic breathing, etc., depending on the technique chosen.
– For each sensation, passively focus on repeating the appropriate phrases, allowing both mind and body to rest and sink into a state of deep relaxation.

Stage 5. Ending of the session.

– At the end of 15-20 minutes, it is important to switch attention to the outside world.
– Before opening the eyes, the patient takes a deep breath and, if necessary, stretches to return energy to the body.

During autogenic training, it is important to maintain a passive state of attention, allowing sensations and relaxation to come naturally, without any active effort on one's part. This practice helps to reduce stress levels, improve well-being and promote overall health (Luthe, 2009).

In 10-20% of patients, a more intensive method called autogenic neutralisation may be required; autogenic modification, autogenic feedback training and autogenic behavioural therapy are newer techniques resulting from interdisciplinary interaction (Luthe, 2009).

4 Prospects and Opportunities of Artificial Intelligence for the Development of Autogenic Training

The integration of artificial intelligence (AI) in the development and improvement of autogenic training (AT) methods offers a promising way to increase the effectiveness and personalisation of these relaxation techniques. The application of AI in the development of treatment methods can transform approaches to prevention and intervention in mental health. Consider the areas where AI technologies are being used to correct psychophysical states.

1. Detection and prevention of suicide attempts. Data collection and analysis can facilitate the early identification of individuals in crisis and the implementation of urgent measures to provide psychological support and suicide prevention (Kessler et al., 2017). By analysing various risk factors, machine learning algorithms can identify groups and localities at high risk of suicide, contributing to resource mobilisation and policy reform in this area. Specifically, the use of AI allows for a more accurate determination of risk hierarchies, informing professionals of mental health needs and improving the integration of care plans.

2. Diagnosis and treatment of depression. Deep learning technologies can help diagnose depression by analysing neuroimages, such as MRI scans, which can detect changes in the brain associated with mental disorders (Kang et al., Pamer et al., 2008). Using AI to analyse data without prior feature selection can make the process more objective and less prone to bias.

3. Optimisation of psychotherapeutic interventions. The application of AI to large clinical datasets can bring significant benefits to psychotherapy, particularly by informing the outcomes of new treatments and helping to standardise clinical practice (Pastor et al., Nguyen et al.). Digital tools, such as robotic companions or mobile devices, can remind patients of the need to reduce stress, communicate with family and friends, and receive ongoing supportive therapy.

These applications of AI in mental health highlight the potential of the technology to significantly improve the diagnosis, treatment and overall management of psychophysical disorders, making healthcare more efficient and tailored to individual needs.

Artificial intelligence (AI) can contribute to various aspects of autogenic training (AT), from individual session planning to real-time feedback and progress tracking. The application of AI in this context can be divided into five main directions.

1. Personalisation of training programmes. AI algorithms can analyse individual user data, in cluding physiological responses and personal preferences, to tailor training sessions to each person's unique needs. By studying a user's past experiences, AI can adjust areas of focus (e.g., heaviness, warmth, breathing patterns) and the level of complexity of sessions to optimise relaxation and effectiveness. Development of models that predict the most effective AT techniques for an individual based on their historical responses to different exercises. AI can help develop systems that adjust AT parameters (e.g., duration, focus and instructions) in real time based on user feedback and physiological signals (heart rate, muscle tension, etc.).

2. Improved guidance and feedback. AI can provide real-time instruction and feedback during exercise, using sensors to monitor physiological responses and ensure that exercises are performed correctly for maximum benefit. Voice assistants under development can assist users during workouts by offering personalised instructions and adjustments based on the user's physiological data in real time.

3. Integration of biofeedback mechanisms that monitor variables such as heart rate, skin temperature and muscle tension to provide immediate feedback, allowing users to adjust their techniques for better relaxation.

4. Tracking and analysing progress. AI systems can track an individual's progress over time, analyse data to provide insights into the effectiveness of different AT techniques for the user, and suggest modifications to improve outcomes. Use AI-based analytics to process and interpret complex data sets from user sessions to identify patterns, trends and areas for improvement. Developing sophisticated

visualisation tools that show users their progress over time, highlighting the effectiveness of different methods and directions for further development.

5. Integration of Virtual Reality (VR) and Augmented Reality (AR). The integration of VR and AR can enhance the learning experience by creating immersive environments that promote relaxation and concentration, while AI tailors these environments to individual preferences and needs. Using VR/AR to create calming environments allows the patient to be immersed in an atmosphere that enhances the training experience, such as virtual nature scenes or peaceful landscapes. Integrating AI-driven interactive elements into VR/AR environments allows real-time scenario adjustments based on user interactions and physiological responses to deepen relaxation.

Similar technologies are already starting to be integrated into smartphones, enabling voice assistants to recognise and respond to users' mental problems. AI-based applications are being developed to facilitate autogenic training at home. Interactive mobile tools are effective solutions for the treatment of psychophysiological disorders. Modern technologies offer various applications to support the practice of autogenic training at home in order to reduce stress and improve relaxation. Among them, Breathly helps to start with breathing exercises, Notebook helps to organise thoughts and record training steps, Insight Timer and Calm offer different meditation sessions and music for relaxation, and there are specialised devices and online courses such as Core Meditation Trainer and courses from Stonebridge College and Udemy that help to deepen the understanding and practice of autogenic training (Romans, 2023).

The development of technologies in the field of mental health support and relaxation is constantly progressing, and it is expected that in the near future even more advanced programmes will appear that will be actively used in psycho-correctional centres. These innovative solutions may include expanded capabilities for personalised therapy, the use of artificial intelligence to tailor programmes to the specifics of the user's condition, and integration with biometric sensors for deeper monitoring of physiological indicators. Such programmes are expected to significantly improve the effectiveness of psycho-correctional procedures, providing a more personalised and high-tech approach to mental health recovery.

5 Assessment of the Effectiveness of Autogenic Training

In order to measure the effectiveness of autogenic training, it is possible to use a methodology adapted from Spielberger's Anxiety Scale, in particular by evaluating the current state of the participants through indicators of vegetative control of the myocardium (VCM). It is also important to assess the functional state, subjective self-assessment indicators and an increase in indicators of unconscious psychomotor reactions, which often indicate the current state and the degree of changes in CNS functioning, including the asymmetry coefficient indices along the X and Y axes.

Subjective evaluative indicators of the SMIL profile, taking into account the above scales and the Maslach Burnout Inventory (MBI) methodology developed by Christina Maslach and Susan Jackson, should be used to identify negative dominant states. The dominant current state is largely determined by the individual's response type and manifests as an intensification, exacerbation, or mitigation of personality traits.

Therefore, the application of this adapted methodology allows for the assessment of the impact of autogenic training on the psychophysiological state of the individual, revealing changes in anxiety levels, self-regulatory abilities and psycho-emotional stability. Measurements taken before and after a 30-day training course provide valuable information for assessing the effectiveness of autogenic training and for developing personalised self-improvement programmes.

6 Conclusions

Autogenic training is an important approach within the spectrum of methods for treating psychophysical disorders. By focusing on sensations of heaviness and warmth in different parts of the body, individuals can achieve a state of deep relaxation, thereby reducing stress, improving sleep and alleviating symptoms of anxiety and depression. The adaptability of the practice, as evidenced by various modified techniques, extends its applicability to different individual preferences and needs.

The integration of artificial intelligence into autogenic training opens new perspectives for increasing the effectiveness and personalisation of relaxation methods. The application of AI can significantly improve the diagnosis and treatment of psychophysical disorders, particularly depression and suicide prevention, by optimising psychotherapeutic interventions. A distinctive feature of AI is its ability to adapt training sessions to the individual needs of the user, provide appropriate feedback and track progress, allowing for better results in relaxation and psychophysical recovery. The integration of AI with virtual and augmented reality technologies can further enhance the autogenic training experience, providing a more immersive and effective environment for relaxation. The development of digital tools and mobile applications based on AI has already demonstrated a positive impact on psychophysical health and promises even more innovative solutions in the future.

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