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### Title

Progressive Resistance Training And Depression - An Investigation Of Psychological Mechanisms And Cbt Intervention Efficacy

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PROGRESSIVE RESISTANCE TRAINING AND DEPRESSION - AN INVESTIGATION OF  
PSYCHOLOGICAL MECHANISMS AND CBT INTERVENTION EFFICACY

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## **Abstract**

The existing literature in the field of psychology has established a clear correlation between progressive resistance training and the alleviation of depressive symptoms. Most current research and mainstream thought attribute this phenomenon to the release of endorphins during exercise. While the effects of the neuroendocrine system certainly play a role in treating depression, it does not tell the entire story. Underlying the physical and neurochemical components of progressive resistance training are a number of psychological mechanisms capable of providing mental growth. This paper will review some of the current literature surrounding the psychological mechanisms in progressive resistance training and analyze their potential role in alleviating depression. Furthermore, this paper will explore whether the psychological mechanisms and adaptations accompanying progressive resistance training enable it to function as an effective cognitive behavioral therapy intervention.

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## **Introduction and Relevance**

Research exploring alternative treatment options for depression is exceedingly relevant at the present time. The COVID-19 pandemic substantially affected the mental health of the US population. According to the National Health Survey, in 2019, 18.5% of adults experienced varying levels of depression (mild, moderate, or severe) for the past 2 weeks. That same statistic skyrocketed and peaked at 30.2% in December 2020. The most recent measurement of this statistic indicates that approximately 21% of adults are still struggling with depressive symptoms (Cai et al., 2021). This increase in depression was not exclusive to the US as the COVID-19 pandemic increased global cases of major depressive disorders by roughly 27.6% (Santomauro et al., 2021). Removed from the context of the pandemic, the treatment of depression is still a pressing issue. World Health Organization projections suggest that by 2030, depression will be the leading cause of disease burden globally (Executive Board, 2012). With this in mind, the development of alternative and effective treatment plans for depression is necessary.

The American Psychological Association asserts that variations and combinations of psychotherapy and medication should be used as the primary depressive treatment options for adolescents, adults, and older adults (Guideline Development Panel for the Treatment of Depressive Disorders, 2022). Lifestyle approaches for treating depression often take a backseat to these two interventions and are treated as supplemental. However, structured exercise interventions have demonstrated a pronounced ability to help with symptoms of depression and their integration as a primary care option should be further encouraged (Md Zemberi et al., 2020).

A key element holding back the full integration of structured exercise interventions into psychological treatment plans may be the lack of centralized guidelines and an understanding of

exercise's antidepressant effect sizes across numerous populations and various styles of exercise. A recent umbrella study out of The University of South Australia took a massive step in bridging this gap by compiling 97 meta-analytic systematic reviews of randomized and controlled trials designed to increase physical activity in adult populations. In order to be included, the studies had to pertain to depression, anxiety, and psychological distress. Participants were adults of various age ranges whose conditions ranged from healthy, to having a mental health condition or having a chronic illness. Among other findings, effect sizes suggested that all forms of exercise are effective at reducing mild-moderate depression. The effect size of strength training was observed as the highest, mixed modalities were next, followed closely by stretch/yoga/mind-body modalities, and aerobic exercise (Singh et al., 2023).

Another reason why structured exercise interventions for treating depression may not be available to the general public is a lack of empirical clarity surrounding the mechanisms of different styles of exercise and how they could be effectively integrated as a treatment approach. If these types of interventions were to be adopted, a greater understanding of how and why they work in the context of depression could lead to the construction of more effective programs and approaches. This paper aims to contribute to the greater knowledge base by applying possible psychological explanations to progressive resistance training's antidepressant effects in an attempt to further elucidate why it functions so well and assess possible fit within a cognitive behavioral therapy intervention.

### **Progressive Resistance Training Programs**

Before delving into the psychological mechanisms associated with progressive resistance training, a foundational understanding of this style of exercise needs to be built. Progressive resistance training is also commonly referred to as weight training or strength training. It is a

form of exercise often used to increase muscle strength and size. This is accomplished by exercising against some level of resistance that is progressively increased as strength improves. Common forms of resistance include but are not limited to barbells, dumbbells, resistance bands, cables, machines, and body weight.

Progressive resistance training programs are often used to accomplish strength, muscle-building, or general health goals. A wide number of variables are involved in the construction of an effective progressive resistance training program, and they can be tailored to meet an individual at their current level of fitness and push them towards their goals. Variables such as exercise selection (Barbalho et al., 2021), exercise order (Simão et al., 2012), repetition ranges (Schoenfeld et al., 2021), intensity and volume of exercise (Mangine et al., 2015), frequency of practice (Schoenfeld et al., 2016), and rest in-between sets (de Salles et al., 2009) are all known to influence the overall effectiveness of a progressive resistance training program.

In terms of physical health, progressive resistance training is an effective form of preventative medicine that assists in reducing metabolic decline (Westcott, 2012), helps to divert diabetes (Flack et al., 2010), and staves off cardiovascular disease and obesity (Liu et al., 2019). Furthermore, progressive resistance training along specific parameters is the most effective exercise method for individuals who want to maximize muscle hypertrophy (Krzysztofik et al., 2019). This makes it an effective treatment for improving the functioning of older adults who experience muscular dystrophy through aging (Liu & Latham, 2009). These physical health benefits are well-known and make progressive resistance training programs an effective method of treatment and prevention for a number of physical ailments.

While a great deal of work has been done to understand what optimizes physical results from progressive resistance training programs, very little work has been done to operationalize



and optimize psychological outcomes. The correlation between depression and progressive resistance training has been well-studied, as it is already known to be efficacious in the treatment of depressive symptoms (Gordon et al., 2018). The reason why it has this effect is most likely a conglomeration of biological and psychological phenomena. Thermogenesis, monoamines, endorphins, distraction, and self-efficacy have all been proposed as mechanisms for why exercise exhibits its anti-depressant effects (Craft & Perna, 2004). This paper will elucidate some of these concepts, investigate the psychological mechanisms that may be active in the context of a progressive resistance training program for depression, and assess this intervention's possible fit or function as a cognitive-behavioral therapy intervention.

### **Distraction and Attentional Deployment**

Depression is a condition that causes severe symptoms that affect how a person feels, thinks, and handles daily activities. It is characterized by a persistent state of sadness or an empty mood which may be associated with a host of negative feelings, cognitive impairments, and physical ailments. It stands to reason that distracting oneself from this overarching state is beneficial. Over an 18-month period of time, non-depressed individuals who report using a ruminative response style are more likely to experience an episode of depression compared to non-depressed individuals who report distracting themselves from symptoms.

(Just & Alloy, 1997). In this framework, rumination is considered a maladaptive emotion regulation strategy that can worsen the depressed condition (Nolen-Hoeksema, 2000).

Rumination can bring about debilitating patterns of thinking focused on adverse past events, current events, negative emotions, or one's own negative thoughts by means of metacognition (Papageorgiou & Wells, 2001). This plague of thought can impair neural activation during

conflict monitoring (Alderman et al., 2015), and this hampered neural activation may disrupt an individual's ability to concentrate, learn, and employ healthy decision-making processes.

A progressive resistance training program may help decrease depressive symptoms by functioning as an effective distraction that reduces rumination. It has been suggested that one acute bout of exercise can decrease rumination in populations with mental disorders (Brand et al., 2018). This effect may be due to an increased demand for working memory and cognitive-emotional processes during exercise. Progressive resistance training may not be unique in this regard. However, a reappraisal of progressive training as both a mind and body intervention reveals some interesting connections and a possible route for enhancing the rumination-reducing aspects of progressive resistance through regulating attentional deployment. There may ultimately be untapped mental benefits to approaching progressive resistance training mindfully.

Seminal work has already been conducted along this axis. Mental and physical training (MAP) is a novel intervention for treating depression that exercises the mind and body. It consists of a twice-per-week practice of 30 minutes of moderate-intensity aerobic exercise followed by 30 minutes of focused attention meditation (Alderman et al., 2016). Practicing these treatments in a single session is more effective at reducing depression and ruminative thought patterns than if they were practiced separately. The simplified neuroscientific explanation for this phenomenon is that there is synergistic potential for these activities to increase neurogenesis and amygdala functioning. This is evidenced by measured increases in synchronized neural activity, increased cognitive control, and ultimately decreased ruminative thought patterns (Alderman et al., 2016).

Progressive resistance training inherently entails elements of mindfulness that could be emphasized to produce greater reductions in depression and rumination. By cultivating a greater

awareness of attentional processes during progressive resistance training, more effective emotion regulation processes and greater neural synchronicity may ensue. Emotions can be effectively regulated through attentional deployment, and this ability can be successfully trained. Those who cultivate this skill may be able to experience more positive emotions through better recognition of negative attentional biases (Wadlinger and Isaacowitz, 2011).

When engaged in sports and exercise, attentional focus refers to cues, stimuli, or states that an individual pays mind to during physical activity (Neumann, 2019). These mental processes can be engaged in either an internal or an external direction, and performance during exercise is influenced by the type of attentional focus that is adopted. An internal mode of attention may be used to increase muscle hypertrophy, as evidenced by increased EMG activity of target muscles. When given proprioceptive cues to “feel” a muscle during a barbell biceps curl, EMG activation is greater than if a trainee is told to focus on external cues like the movement of the bar through space (Vance et al., 2004). A simple example of this phenomenon can be illustrated through the bicep curl. In the curl, the job of the bicep is the supination of the wrist and flexion of the elbow. Cues to actively drive the pinky up and keep the elbow “glued” to one’s side during the exercise could be used to help develop a better mind-to-muscle connection and influence muscle hypertrophy. Conversely, an external mode of attention may be used to increase the power output and performance of an exercise. When told to place attention on an external object such as the exercise apparatus, more automatic processes are engaged and performance is improved (Grgic et al., 2021).

In the context of mindfulness training, better external attentional awareness during progressive resistance training may lead to greater control and understanding of the exercise and decrease the occurrence of ruminative thoughts and depressive symptoms. This is an untested

method of approach, but the ability to actively monitor and train these attentional modes for the purpose of emotion regulation is an idea that may be supported by the neuroscience of combinative physical and mental training. Exercising with attention fully placed outside of oneself may be an important avenue of emphasis in future research.

### **Emotion Regulation and Behavior Activation**

At its core, depression is a condition that impairs a person's ability to effectively regulate negative emotions (Joormann & Gotlib, 2010). The monoamine hypothesis is one of the most widely accepted neurophysiological explanations for why depression is so difficult to control. Decreased quantities of monoamine neurotransmitters such as dopamine, serotonin, and norepinephrine have all been observed in individuals suffering from depression (Delgado, 2000). Among many other functions, these neurotransmitters are involved in goal-oriented behavior (Montague et al., 2004), regulating mood (Hariri & Brown, 2006), and working memory (Berridge & Spencer, 2012). A lack of these neurotransmitters can reduce emotional control, which may be responsible for keeping someone in this extended state of negative emotion (Jiang et al., 2022). This is the cyclical nature of depression. Negative emotions compile and are difficult to effectively regulate because of the non-resourceful neurophysiological state of the brain. For this reason, medication is often used to manipulate monoamine levels in an attempt to treat depression and get the brain's cogs spinning in the right direction.

Medication isn't the only way to elicit this change. Monoamine quantity and the structure of the brain systems that regulate these neurotransmitters can be altered for the better through consistent exercise (Lin & Kuo, 2013). Dopamine, serotonin, and norepinephrine, the exact neurotransmitters that are typically low in individuals with depression, can be naturally increased through consistent exercise. These increases, among other pharmacological effects of exercise,

are so strong that exercise may be considered a drug that may benefit from dosage regulation and prescription (Vina et al., 2012). Much more research is required on this topic, as the majority of trials directly measuring changes in monoamine systems have been conducted in mice. In particular, comparisons between different types of exercise, their durations, intensities, frequencies, and the neurochemical changes these variables incur in humans are still needed.

Other than possible long-term benefits in emotion regulation from changes in monoamine levels, exercise also provides a more immediate impact on mood and a person's sense of well-being from elevated levels of beta-endorphins. Beta-endorphins can induce mood state changes and are responsible for the state of "exercise-induced euphoria" (Harber & Sutton, 1984). This phenomenon is well-known in aerobic training, and the commonly used term "runners high" refers to the feeling one gets from the beta-endorphin release during sustained periods of exercise. Progressive resistance training also has the ability to bring about beta-endorphin release when the parameters are properly configured. To optimize beta-endorphin release during progressive resistance training, approximately 10 repetitions of an exercise should be performed close to an individual's physical capabilities with under a minute rest in between sets (Kraemer et al., 1993).

The intervention length, duration of exercise sessions, frequency, and intensity of exercise interventions all play roles in its drug-like effects. When it comes to implementing an active exercise practice, the malleable nature of a progressive resistance training program makes it a viable option to induce these emotion regulation benefits through changes in neurochemicals and beta-endorphins. The tools to effectively regulate these variables can all be managed through the creation of an individualized program. Research on the optimization of progressive resistance training parameters suggests that the maximally-effective dose for treating depression may be

approximately four sessions per week lasting at least 45 minutes per session (Carneiro et al., 2020). These variables are likely individual-specific because the most effective form of exercise is ultimately going to be the one that someone will be able to adhere to. Forty-five minutes per session at four sessions a week may be too much or too little for different people. This needs to be taken into account when individualized treatment plans are being constructed.

Although there is a parallel between exercise and medication in terms of emotion and mood regulation, the actions required to achieve the outcome are drastically different. Medication is an effective treatment option and between 40 and 60 out of every 100 individuals who take medication notice improvement in 6-8 weeks (Institute for Quality and Efficiency in Health Care, 2020). Some individuals may be so deeply entrenched in their depression that the mere thought of taking action and exercising is overwhelming and anxiety-inducing. In these cases, medication should be considered a first-line option. However, in more moderate cases, behavioral activation of a progressive resistance training program may be used to garner emotion regulation changes.

Individuals experiencing depression are typically emotionally disengaged from the environment. Through the use of scheduled practices and operant conditioning principles, behavioral activation can help someone with depression form positive connections with the activity (Ekers et al., 2014). The aforementioned neurophysiological responses and emotion regulation benefits from progressive resistance training may function as a positive reward for the activity. One of the basic tenets of behavioral activation is a depressed person cannot wait for motivation to strike in order to take action because it likely will not come. Rather, the principles of behavioral activation state that the benefits of taking action in lieu of direct motivation can

still lead to positive changes. Exercise is no exception here. By prescribing direct exercise, emotion regulation benefits may ensue.

### **Physical Self-efficacy and Mastery Experiences**

Self-efficacy is a person's belief that they can successfully accomplish a task and effectively cope with problems or hurdles that may arise (Bandura, 1997). It is an important component of effectively navigating life and is related to emotion. Measures of self-efficacy in young adults can predict levels of overall life satisfaction (Savi Çakar, 2012). Self-efficacy also predicts greater happiness among college-age students (van Zyl & Dhurup, 2018). Self-efficacy is a psychological construct composed of multiple subdivisions. These divisions include but are not limited to, physical self-efficacy, academic self-efficacy, emotional self-efficacy, and social self-efficacy. A person's belief in their ability to overcome challenges and achieve goals in these different areas feeds into their total self-efficacy. For the purpose of this paper, physical self-efficacy and its interactions with other aspects of the self will be explored and analyzed.

Physical self-efficacy is an individual's belief in their ability to perform physical skills and tasks. Low physical self-efficacy may leach into other areas of an individual's psychological state, as it is negatively correlated with feelings of depression, anxiety, increased worry, and social avoidance (Tahmassian & Moghadam, 2011). This association suggests that increases in physical self-efficacy may have implications for one's overall feelings of self-worth. Furthermore, physical self-efficacy acts as an initial determinant of exercise behavior and a perception that increases through participation in exercise (McAuley & Blissmer, 2000), suggesting that physical self-efficacy can be built up if exercise behavior is successfully activated.

The benefits of increasing physical self-efficacy do not appear to be self-contained. The EXSEM model provides a framework for the pathway through which exercise acts en route to increasing positive views of the self. The model asserts that participation in exercise behaviors increases physical self-efficacy. This increase in physical self-efficacy can improve an individual's views of their sport competence, physical strength, physical condition, and body attractiveness. These changes may increase feelings of physical self-worth and collaborate with physical acceptance to increase global self-worth (Collins et al., 2019). A meta-analysis of four studies and seven data sets assessing the effects of progressive resistance training on these measures in youth found that resistance training significantly increases resistance training efficacy, physical strength, physical self-worth, and global self-worth. There were also small effects on body attractiveness, although they were not statistically significant in this particular study (Collins et al., 2019). It is important to note that the studies used in this meta-analysis did not include individuals with depression as their sample and clinically depressed individuals garner greater benefits from exercise (Craft & Perna, 2004).

The most effective method of increasing self-efficacy is through mastery experiences, which are personal experiences of success (Bandura, 1977). Through these mastery experiences, a person gets positive feedback on their ability to accomplish goals and information to assess the feasibility of future challenges. As these mastery experiences compile, self-efficacy increases. Progressive resistance training may bring about positive effects on physical self-efficacy and perceptions of the self because it provides a tangible series of these mastery experiences to progress through.

Progressive resistance training contains these mastery experiences in the form of learning new exercises, perfecting exercise techniques, and achieving personal records and goals. Specific



examples of these mastery experiences could be learning and improving upon movement patterns like the squat, deadlift, or bench press, or achieving the first pull-up. As these mastery experiences are accomplished, the avenues for more challenging mastery experiences then open up. These principles are employed by effective personal trainers working with novice trainees. Exercise may start relatively simple, but as early mastery experiences are achieved and physical adaptations from exercise occur, the options for more challenges in line with these improved capabilities and physical self-efficacy arise (Jackson, 2010).

It is out of a personal trainer's scope of practice to offer exercise as a direct method of treating depression. This approach is also theoretical, and more research needs to be conducted before determining the overall effectiveness of targeting the physical self-efficacy pathway for improving depressive symptoms. Future research in this area could include information on who might benefit the most from this style of intervention, and the development and testing of supervised progressive resistance training programs or other alternative exercise programs that emphasize self-efficacy-increasing principles.

### **Flow State and Goals**

The flow state refers to a frame of mind a person enters when they are deeply involved in an activity, and nothing else seems to matter in the present moment except the activity. Flow is so enjoyable that people will continue to do it even at great cost, purely for the purpose of doing it (Csikszentmihalyi, 1990). It can be accessed through a number of pursuits including work (Csikszentmihalyi & LeFevre, 1989), leisure (Bonaiuto et al., 1991), and athletics (Jackson & Marsh, 1996), among others. In this state, individuals tend to perform their best and find the most enjoyment out of activities. A theorized mechanism behind this phenomenon is that being in a flow state frees up computational space in executive function processes in the brain (Gold &

Ciorciari, 2020). This may be in line with prior work done on the neural basis of distraction and ruminative processes, although the exact nature of the relationship is unclear. With the need to consciously monitor an experience at bay, a person in a state of flow will be fully present in the activity and can garner a number of rewards that are open-ended and inexhaustible (Csikszentmihalyi, 1999).

The flow state has its roots in positive psychology, which differs from traditional psychology in the sense that it focuses more on the cultivation of strengths than the correction of weaknesses. It does not shy away from the weaknesses, but it claims that what is good about life should be weighted as heavily if not more so than what is bad when it comes to research attention (Peterson, 2006). One sub-division of positive psychology is positive subjective experiences, within which the study of flow is categorized. Flow activities are subjective experiences that do not follow a one-size-fits-all approach. In this regard, they are autotelic, or pursued because they have intrinsic value to an individual. Accessing the flow state ultimately requires a level of person-activity fit.

Conceptualizations of flow may vary, but a common method of interpretation is that there are three conditions and six characteristics. The conditions or prerequisites for flow include clear and proximal goals, immediate feedback about progress, and a balance between perceived challenge and skill required for the activity. If these conditions can be met during an activity, the six characteristics may emerge during its execution. These include an intense focus and concentration on the present moment, merging of action and awareness, loss of reflective self-consciousness, a strong sense of control, distortion of time, and a feeling of intrinsic reward (Nakamura & Csikszentmihalyi, 2014).

Progressive resistance training is an activity that not only has the capacity for flow but has the conditions built into its framework. Clarity of goals, immediate feedback, and balance of challenge and skills are salient at any level of progressive resistance training. Clarity of goals is a fundamental aspect of progressive resistance training. There is a strong individualization component to the goal-setting process, which may affect the results a trainee will see. It is not just the pure undertaking of resistance training that ensures progress. Ultimately, it is the combination of structured stimulus and individual effort toward a particular goal that determines the outcome of progressive resistance training (Kraemer & Ratamess, 2004). The goals of a progressive resistance training program are easily trackable because progressive resistance training revolves around quantitative progress. Progress in resistance training is maximized through the use of strategic goal-setting principles such as long-term and short-term goals, specificity, time limits, and so forth. (Tod & McGuigan, 2001). The feedback from working towards and achieving these goals is immediate. Either a trainee accomplishes the particular exercises prescribed in a training program and achieves progress towards their goals, or they do not.

In terms of the challenge and skill balance, the level of individualization and specificity required to gain physical results in resistance training is proportional to a trainee's level of experience. The general-to-specific model of resistance training progression illustrates the balance between challenge and skill, which can be found at any level of experience (Kraemer & Ratamess, 2004). Meaning, those who are just beginning a progressive resistance training program generally do not have a need for overly specific exercise parameters because of the body's early sensitivity to the stimulus. Increases in muscular size and strength are pronounced in novice trainees and typically evident after only 8-12 weeks of training (Hakkinen et al., 1998 ;

Housh et al., 1992). However, as an individual progresses in training, more specific approaches are needed to make progress due to diminishing returns. Novice lifters only need a few days of resistance training a week and loads corresponding to an 8-12 repetition maximum to see optimal physical results. Intermediate and advanced lifters require a wider loading range from a 1-12 repetition maximum, and a greater emphasis on exercise variation, load periodization, and longer rest to progress (American College of Sports Medicine, 2009). This suggests that there is a clear tightrope of challenge and skill that is walked during progressive resistance training. Progressive resistance training can be started at virtually any level of fitness and meet an individual with an adequate challenge at their current skill level. As the skill increases, the challenge requirements to continue making progress climb at a steady rate.

Activation of the other components of the flow state may be heavily reliant on the level of enjoyment a person derives from the activity. If they become fully invested in the exercise and love the feeling they get from working towards and achieving new physical challenges, more open-ended and inexhaustible rewards may be found in the activity. With this person-activity fit in mind, the flow state accessed through progressive resistance training may be possible if self-efficacy benefits are pronounced, and an individual feels confident in the activity. It may serve as an explanation for why certain individuals acquire a passion for progressive resistance training and highlight the important goal-setting and achieving principles present in this style of exercise. The flow components of progressive resistance training may enable it to eventually develop into an intrinsically rewarding activity that provides an infinite number of goals to achieve and a steady process of physically bettering oneself along a constantly shifting axis of challenge and skill.

## **Relevance of Cognitive-Behavioral Therapy**

Cognitive-behavioral therapy is a style of psychological treatment focused on the interconnected nature of thoughts and behaviors. Its central goals include recognizing faulty or unhelpful ways of thinking that affect behavior and identifying learned patterns of unhelpful behavior. This is done to help people suffering from a number of problems learn better ways of coping in order to gain better control over their lives and promote human growth (Terjesen et al., 2019).

Martin Seligman's original learned helplessness theory of depression and current neuroscientific research can be used to understand how depression may function in a cognitive-behavioral sense. The original learned helplessness model posits that depression can emerge as a consequence of uncontrollable trauma (Seligman, 1972). The explanation for this is that if a person is continuously met with negative events or circumstances that are beyond their perceived control, they may become passive in the face of future challenges. This may occur through negative reinforcement as these events or circumstances compile and a person is unable to do anything about them. In this original framework, maladaptive cognitions about one's ability to handle life's adversities may be learned, and a person may then overgeneralize their inability to help themselves and become passive in situations that are actually under their control.

As the mysteries of the human brain have started to unravel through the study of neuroscience, researchers now believe that overarching cognitions about a person's level of control may not be the appropriate explanation for this passivity response. Current literature suggests that helplessness may not be an effect of learning; rather, it may arise from the non-responsive activity of various brain structures and neurons due to prolonged aversive stimulation (Maier & Seligman, 2016). This means depression may not come about as a function of learned

cognition. Instead, it may arise due to the brain's inability to learn appropriate responses to aversive stimuli, which then may be cognitively overgeneralized in the context of other activities.

How does this ultimately fit within the context of a progressive resistance training program? Progressive resistance training is dichotomous with helplessness, as it requires a person to be active and exert control in the face of physical challenges. Through the provision of an achievable behavior-oriented program that has biological and psychological benefits, better cognitions regarding a person's ability to overcome future adversities may develop, and depressive symptoms may diminish. This may occur because progressive resistance training is an activity that can present a high level of distractibility, which may decrease the ruminative thought patterns associated with depression. As the program progresses, mood and emotion regulation benefits may ensue as a result of changes in neurotransmitter and endorphin function that supports the activation of the brain structures impacted by depression. Through continued practice, increases in self-efficacy may occur and counteract the helplessness cognitions that are commonly associated with depression. If the person-activity fit of this style of exercise is right, it could lead to a fulfilling flow activity with the ability to produce great intrinsic rewards.

This line of thinking is theoretical, and much more research has to be done in order to determine whether this is the pathway through which a progressive resistance training program functions to alleviate symptoms of depression. It is known that the health of the body is deeply intertwined with the health of the mind (Renoir et al., 2013), but the cognitive mileage of an exercise intervention likely varies based on a number of individual factors.

Operationalization of exercise behavior in terms of a complex mental illness is a challenging task. The activation of exercise behavior itself comprises many biopsychosocial

variables that vary at the individual level. Exercise behavior is influenced by individual episodes of exercise comprising thoughts, emotions, feelings, and sensations related to exercise. These individual episodes combine with previous exercise episodes, media messages, recommendations from healthcare professionals, and societal attitudes to generate a person's interpretation of exercise. However, through increased awareness of this information, the addition of new information, and new individual episodes of exercise, a person's general interpretation of exercise may change (Herning et al., 2005).

If implemented, a progressive resistance training program may not be the optimal form of treatment for everyone, as the best treatment is one that a person can adhere to and believes will help them. However, progressive resistance training is more accessible than most may think, as the aim of this style of exercise is to meet an individual at their current level of fitness and build upon it. By crafting a program that is achievable and aligns with the antidepressant properties of exercise, more positive individual episodes of exercise may compile, and the biological and psychological benefits may be more readily accessible.

It is unknown how exercise interventions will fit into the healthcare continuum if adopted for the treatment of depression. Very little direct research has been conducted on the implications of a combinative CBT and exercise intervention approach. However, an adjunctive approach to including exercise in CBT has been explored. Exercise completed prior to CBT as a priming method before treatment may be a plausible way to enhance CBT mechanisms and overall outcomes (Meyers, 2022). It has been suggested that individually-tailored exercise programs may be efficacious at further improving outcomes, but direct research has yet to be conducted on this topic (Heinzel et al., 2022). Does progressive resistance training stand on its own as an effective treatment option, or should there be greater emphasis placed on it in a psychological

context to improve accessibility, adherence, and depression-related outcomes? More research is required to answer these questions, but a progressive resistance training program is an intriguing tool that may be used to dig deeper and find some answers.

### **Conclusions and Future Research**

Progressive resistance training is a known antidepressant. This benefit has been demonstrated in numerous studies, yet it has not been adopted as a primary treatment option. The reasons for this are complex and biopsychosocial because the effects and initiation of exercise are complex and biopsychosocial. Through more direct research exploring the antidepressant mechanisms of various forms of exercise, a greater understanding of the whys and psychology behind this property may start to emerge.

Progressive resistance training is well suited to this type of research as it is already a highly operationalized form of exercise. Individualized progressive resistance training programs may act as an exercise intervention that can effectively treat depression. They may be used as a form of distraction to quell the ruminative thoughts that are often associated with depression and as attentional-deployment training to help with emotion regulation. The neuroscience of combining mindfulness and exercise seems to suggest that this could be an effective treatment route. However, this has not yet been tested and explored in the context of progressive resistance training.

The biochemical and neurological effects of exercise are strong, and it may have the potential to function much like a drug. In the context of progressive resistance training, the ideal duration, frequency, and intensity of the exercise for producing antidepressant effects are known, but context and more trials within different demographics could be helpful. Comparisons



between these biochemical and neurological effects in varying forms of exercises need to be conducted.

The effects of increasing physical self-efficacy in relation to depression also are not very well-understood. The effects may vary greatly depending on a person's fit with a given exercise. Future research on the self-efficacy pathway should consider the creation of individualized progressive resistance training routines that actively aim to steadily build a trainee's physical capabilities.

The links between flow and progressive resistance training bring up some fascinating comparisons and may hold some of the keys to making progressive resistance training a more enjoyable experience. Through setting and achieving goals in line with an individual's challenge and skill, there may be greater adherence and eventual autotelic experience. This needs to be explored further as well.

In terms of cognitive behavioral therapy, the overall conclusion is still up in the air. It is unclear where this type of intervention will best fit in the healthcare continuum. Through practicing the activity and putting in the effort to see progress, there may be changes in cognition, but this cannot be generalized. Furthermore, through the mechanisms outlined in this paper, there may be a possible progression for alleviating depression. However, more empirical research needs to be conducted in order to draw conclusions.

An individualized progressive resistance training program that aligns with the psychological and biological components of depression may serve to make this type of intervention more accessible and effective. Further study and application of progressive resistance training's antidepressant effects could enable the development of alternative and efficacious treatment plans.

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