Psychophysiological Synergistic Mechanisms in Music Performance: An Interdisciplinary Model of Personality Traits, Stage Anxiety, and Occupational Injury

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ABSTRACT

Today's music education focuses heavily on competition and technique. This focus has led to more mental health problems and physical injuries among piano performers. This study draws on music psychology, physiology, and personality typology. It examines how different personality traits shape stage anxiety and physical injury in music students. Traits include extraversion, neuroticism, and emotional stability. The findings show that highly neurotic and sensitive students feel more exhausted by "studio perfectionism". Effective memory strategies can reduce stage anxiety. These strategies connect meaning with movement. The study proposes a three-part teaching approach. It includes physical monitoring, mental support, and personality-based training. This approach aims to reduce the physical and mental costs of performer training.

Keywords: *Music performance anxiety, Personality traits, performance-related musculoskeletal disorders, Mind-body connection, Interdisciplinary model.*

1. INTRODUCTION

A common pattern appears repeatedly in music conservatories. Students who practice smoothly in the practice room often find their hearts racing, hands trembling, and minds going blank on stage. Others develop physical problems over months or years—wrist pain, stiff shoulders, tight forearms, aching backs—some forced to abandon performing altogether [4].

These two problems are growing more common, yet traditional teaching treats them separately—blaming stage anxiety on "weak mentality" and physical injury on "wrong practice methods." But stage anxiety is not just mental: the body reacts with faster heartbeat, quicker breathing, and tightened muscles, and repeated tension can cause real damage over time [2]. Nor is physical injury merely physical: chronic pain creates mental stress, worries about ability, and anxiety about the future, which in turn worsens stage anxiety. The two feed into each other in a cycle that remains underexplored [3].

This tendency to separate them stems from the old idea that mind and body are distinct—technique belongs to the fingers, expression to the mind, and the body's sensations are not seen as something worth teaching. Stage anxiety falls into a gray area because it involves both, while physical injury is seen as purely technical, and this thinking hides the real connection. New research has started to change this view: studies show that personality traits affect stress reactions [1], with easily stressed or perfectionistic individuals feeling more anxious [6], and that mental distress is closely linked to physical problems in musicians [2]. This study brings these lines together, examining stage anxiety and physical injury from the perspectives of music psychology, physiology, and personality types, aiming to show how stage anxiety connects personality traits to physical injury—an understanding that may help us teach better and support performers' health more effectively.

2. HOW PERSONALITY SHAPES DIFFERENT RESPONSES TO STAGE ANXIETY

Music Performance Anxiety (MPA) involves too much tension and fear in public performance. Serious cases lead performers to avoid performance chances. Some give up their stage careers[7]. Different performers react very differently to the same stage pressure. Some panic before walking on stage. Others become more focused and energetic. The answer lies largely in personality[1].

A Russian music teacher named Rybina studied stage fright in pianists. She identified five common response patterns. The tense type feels restless but stays in control. The fearful type freezes or feels numb. They cannot think clearly. The inhibited type slows down a lot. They move as if through water. The aggressive type loses emotional control. They sometimes hit the instrument. The positive-stress type does better under pressure. They become more focused and energetic. This last type is the most desirable. These performers are usually outgoing. They do not fear the stage. They feel good about themselves in performances. The other types become passive and drained. This shows that stress responses follow patterns. These patterns come from personality traits[6].

Modern personality psychology offers a useful framework. The five-factor model helps us understand these differences. Many studies show that neuroticism is the strongest predictor of MPA[1]. People with high neuroticism are more sensitive to threats. They see unclear situations as dangerous. They react with stronger anxiety. For these performers, the audience itself becomes a source of stress. Their minds fill with catastrophic thoughts. They think, "What if I make a mistake?" They think, "What if they notice my hands shaking?" These thoughts distract attention. They interfere with smooth playing[5].

The link between conscientiousness and MPA is more complicated. Being conscientious means preparing well. This can reduce anxiety. Extreme conscientiousness can become perfectionism. Perfectionism is a known risk factor for MPA[6]. Performers with high perfectionism set impossibly high standards. Even a small mistake feels like complete failure. They are very sensitive to others' judgments.

One group deserves special attention. These students are highly neurotic and highly sensitive to beauty. I call them the "emotional type." They face the demand for "studio perfectionism." This means every performance should be as flawless as a recording. These students feel much more worn out. Each performance feels like a final judgment on their abilities. It is not a chance to share music. A single wrong note is not a small slip. It feels like proof of failure. This thinking makes their anxiety much worse. It makes them avoid performing. It makes them avoid challenges. In the worst cases, they avoid music altogether. This avoidance makes the anxiety continue and grow[1].

Being outgoing works as a protection. Outgoing performers often become more energetic under pressure. They find the challenge stimulating. Studies show that performers with less MPA score lower on neuroticism. They also use more active coping strategies[5]. Professional orchestra musicians score higher on outgoingness and carefulness than non-professionals. Personality affects how much anxiety a person feels. It also affects how they interpret it. Do they see it as a threat or a challenge?

3. THE PHYSICAL EFFECTS OF STAGE ANXIETY AND HOW THEY BUILD UP

Stage anxiety works on three levels at once. It affects thinking, behavior, and the body. At the thinking level, anxious performers worry too much about negative judgments. They judge their own playing too harshly. At the behavior level, anxiety shows up as stiffness and shaking. Performers tend to play safe. At the physical level, anxiety sets off a chain of reactions. The heart beats faster. Breathing quickens. Blood pressure rises. Palms sweat. Muscles tighten. Muscle tension is the most damaging physical response. It is also the most easily ignored[2].

Human movement depends on muscle balance. When one muscle tightens, the opposite muscle relaxes. Anxiety disrupts this balance. Novokreshchinova studied the physical and mental basis of performance technique. She notes that the mind overreacts in difficult situations. It makes muscles tighter than needed. The mind follows a simple rule. Better to be too tight than too loose. Performers make many unnecessary movements on stage. They do not relax muscles that should relax. They use muscles that have no useful role. This extra tension may last only minutes during one concert. But frequent performances add up these small tensions. The body cannot repair itself fast enough over time[9].

Anxiety does more than create short-term tightness. Long-term high anxiety affects the body's hormone system. It reduces the body's ability to repair tissue. This speeds the process from tension to tissue damage. One study looked at students with playing-related physical problems. Researchers found a clear pattern. More pain interference meant more mental distress. It also meant more anxiety, poor health ratings, and fatigue[2]. Mental stress ends up as physical damage. This process is hard to notice. Performers may blame their discomfort on practicing too much. They may blame it on bad posture. They may not realize anxiety plays a big role.

The effects of anxiety also take time to show up. This makes them hard to catch early. Tension from one performance may fade away. Muscles relax. Discomfort goes away. But performances often come one after another. Exams, competitions, and concerts fill the schedule. Muscles do not get enough recovery time. They stay in a state of constant low-level tightness. The feeling changes over time. Tightness becomes soreness. Soreness becomes tendinitis. Hildebrandt and colleagues studied music students. They found much more fatigue, depression, and stage fright after the first year[4]. The demands of conservatory life affect both mind and body.

The famous Russian pianist and teacher Neigauz made an important point. Even when a lack of confidence looks physical, it is mental at its root. It comes from the music itself or from personality. People with these deep problems cannot learn to play well just by fixing technique[8]. Teachers must work on both the body and the mind together. Research on musician health supports this view. Physical injury has a strong mental impact on musicians. The performing body is central to what they do. The reverse is also true. Mental stress is written into the body. Anxiety-driven tension is how this writing happens[2].

4. MENTAL RISK FACTORS FOR PHYSICAL HEALTH PROBLEMS IN PERFORMERS

PRMDs are the most common health problem among musicians. PRMD stands for performance-related musculoskeletal disorders. People explained these problems as purely physical for a long time. They blamed bad posture. They blamed practicing too hard. They blamed poor ergonomics. These factors do matter. Newer research found something more surprising. Mental distress links strongly to PRMDs. Physical factors like posture have not shown the same clear connection[2]. One study looked at students with PRMDs. More pain interference meant more mental distress. It also meant more anxiety, poor health ratings, and fatigue. This raises an important possibility. The real question may not be about posture. It may be about mental state while playing.

Anxious performers may develop injuries even with good posture. They may practice only moderately. Mentally steady performers may handle big physical demands without getting hurt. Mental factors affect whether PRMDs happen. They also affect how bad PRMDs get.

More people are paying attention to musicians' mental health. Fedorova and colleagues studied musicians. Musicians are more sensitive to everyday stress than non-musicians. They are also affected by stress for longer. Many music students in their study reported stress from traumatic events. Some had lost loved ones. Some had conflicts with their teachers. A number of students had thought about leaving the profession. Others had simply lost their motivation. Musicians scored higher on all mental health measures than non-music students. The impact of traumatic events was stronger[3].

Conflicts between teachers and students deserve special attention. Music students usually work with one teacher for many years. This relationship shapes their development. When it goes wrong, it can cause real harm. Some participants in Fedorova's study called teacher-student conflict traumatic. Some had tried to change teachers. A few developed physical symptoms like hand tightness. A few lost their voices[3]. Rybina made a similar observation. Learning goes smoothly when teachers and students get along well. Students feel less anxious. Strained relationships make anxiety worse. They also increase injury risk.

How people cope with stress also matters. Emotional release links clearly to stress coping. Performers who release emotions in healthy ways use constructive strategies. Those who cannot release emotions tend to avoid problems. Avoidance keeps MPA going. Avoiding the stage gives less chance to build confidence. Less confidence means stronger anxiety next time. This explains why some people cope well under stress. Others fall into a downward spiral[7].

5. A MODEL THAT CONNECTS PERSONALITY, ANXIETY, AND INJURY

The previous sections looked at two things separately. They looked at the physical effects of stage anxiety. They looked at the mental factors behind physical injury. Looking at each alone is not enough. We still need to answer one question. Some performers only feel "nervous" under stage pressure. Others become "nervous enough to get hurt." Why? The answer may lie in personality[1].

I propose a model that connects personality, anxiety, and injury. This is a first attempt to understand how these three relate. The logic is simple. Personality traits are stable parts of who we are. They come before anxiety and injury. People with high neuroticism are more sensitive to threats. They see unclear situations as dangerous. This makes them more prone to anxiety. People with perfectionist tendencies set very high standards. They cannot tolerate mistakes. This attitude makes anxiety stronger on stage[6]. These traits create a mind that is ready to feel anxious. Stage anxiety works as a transformer. It turns mental pressure into physical tension. Tension builds into tissue damage over time. It becomes PRMDs. The path looks like this: personality traits → anxiety → muscle tension → tissue damage[2].

The model also feeds back on itself. Personality sets the starting point for anxiety. Anxiety increases tension. Tension leads to injury. Injury creates worry about ability. This worry feeds back into anxiety. The negative parts of personality get stronger over time. Neuroticism and perfectionism do not weaken. They grow. Once this cycle starts, it keeps going on its own.

Semantic-motor encoding is a promising strategy. It connects musical information to meaningful ideas. It links these ideas to muscle memory. This strategy helps reduce stage anxiety. It helps the "emotional type" students most. These students feel intense anxiety partly because they see each performance as high-risk. Every note feels like a possible disaster. Encoding music as meaningful phrases makes the performance more secure. It no longer depends on rote memory. This creates a buffer between personality and anxiety. Even highly sensitive performers can reduce anxiety with this strategy. In Russian piano teaching, this is called the "support point method." Students analyze the piece phrase by phrase. They create stable memory points[8]. This is a good example of how teaching can break the chain.

I suggest a three-part teaching approach. I call it the "physiological–psychological–artistic" pathway. The physiological part trains students to notice body signals. They learn to feel tension before it builds up[9]. The psychological part teaches anxiety management. It targets high-risk students. It helps them stop the move from anxiety to muscle tension. The artistic part means teaching each student differently. The "emotional type" needs focus on semantic-motor encoding. The perfectionist needs to rethink what "perfection" means. These three parts work together. They help performers express themselves artistically without damaging their health[10].

6. WHAT THIS MODEL MEANS FOR TEACHING

This model is not just theory. It has real implications for music teaching and performer health.

We could include personality tests in health checks for new students. This is the screening level. Students with high neuroticism or perfectionist tendencies would get extra support. This does not mean labeling them. It means preventing problems early. Teachers could adjust their approaches. Instead of saying "this student is timid," they could say "this student shows the fearful type pattern." They could teach in ways that work better for that type[6]. Fedorova's call for mental health support systems is based on this kind of evidence[3].

Anxiety management training works for highly neurotic students. This is the intervention level. Simple techniques can be taught directly. Breathing exercises calm the body. Positive self-suggestion changes the inner voice. Self-instruction gives clear steps to follow. Self-encouragement builds confidence. These techniques stop anxiety before it triggers muscle tension. The focus is on building constructive coping strategies. These can be taught and practiced. We can also reframe anxiety. Students learn to see it as a resource. It is not an enemy. This mental shift changes the relationship between anxiety and the body[7].

Health education should be part of regular teaching. This is prevention. Neigauz's insight is still true today. Confidence cannot be built on technique alone. We must work with the whole person. Teachers should teach how to feel. They should teach how to notice the body. They should

teach how to relax. Muscle relaxation is not extra. It is central to playing well over a long career[10].

The relationship between teacher and student matters greatly. Supportive, non-judgmental environments are not a luxury. They are a health measure. Many musicians describe teacher-student conflict as traumatic. Teaching is not neutral. It can reduce or increase risk. The relational side deserves as much attention as the technical side[3].

7. CONCLUSION

This study examined stage anxiety and physical injury through the lens of music psychology, physiology, and personality typology. The findings suggest that stage anxiety mediates the link between personality traits and physical injury [1]. Highly neurotic and aesthetically sensitive students report greater exhaustion under "studio perfectionism" [6], while semantic-motor encoding may reduce anxiety. Based on these findings, the study proposes a three-part teaching approach: physical monitoring, mental support, and personality-based training [10]. This framework challenges the traditional mind-body divide, reframing stage anxiety as a phenomenon with clear physiological effects [2], not merely a problem of willpower. It also offers a practical perspective: stage fright and physical strain are not separate issues but points on the same causal chain, where intervening at the level of personality and anxiety may prevent injury. The model remains theoretical and requires empirical validation [4]. Nevertheless, recognizing the role of personality in stage anxiety [5], the physical expression of anxiety, and the psychological contributors to injury may help break down the barriers between body and mind in music performance, supporting performers to play more fully and sustainably over their careers.

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