

The Neuropsychological Effects of Posture: An Analysis of the Influence on Human Biochemistry in the Context of Sports Psychology

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Introduction

An upright posture is not only considered a sign of self-confidence and strength but also profoundly affects the brain and psychological well-being. This observation leads directly to a question of increasing importance both in everyday life and in scientific research: To what extent do physical postures control the complex biochemical processes in the brain, and what are the resulting psychological consequences? This article takes an in-depth look at the neuropsychological significance of body language. In particular, it focuses on the question of how a straight posture influences the biochemistry of the brain and what effects this has on the human psyche.

This article aims to analyze the connection between upright posture and the biochemical processes in the brain and shed light on the resulting psychological consequences for performance in a sports psychology context. It also aims to investigate the extent to which the physical alignment of the body influences the mental state and the ability to perform in sport. The biochemical principles and the associated emotional and cognitive processes will be examined.

The approach of this article focuses on a comprehensive literature analysis. The findings from various studies and publications are analyzed and correlated to create a differentiated picture of the current state of research. Both physiological and psychological aspects are considered and an attempt is made to synthesize the various research findings. The analysis methodology includes critical evaluations of the study results, reflection processes on the significance of the results in the context of sport psychology and a comparative analysis of studies that deal with similar issues.

The current state of research shows that the direct effects of posture on physiological processes and its influence on mental states have been investigated in detail. The article will be based on several studies that deal with the biochemical and psychological dimensions of posture. These range from studies on the effect of posture on cerebral hemodynamics and the

influence of intracranial pressure to psychological studies on the effect of posture on mood and fatigue.

Neuropsychological Basics of Body Language

This chapter sheds light on the neuropsychological foundations of body language and its significance in a psychological context, particularly in sports psychology. The focus is on analyzing how an upright posture influences the biochemistry in the human brain and what psychological consequences this has for the performance of athletes. The aim is to create a comprehensive understanding of the reciprocal relationships between body language, biochemistry, and psychological processes in order to discuss their relevance for sporting success.

The Importance of Body Language In A Psychological Context
Body language is integral to human communication and can often reveal more about a person's inner state than verbal expressions. This non-verbal form of communication is particularly important in sports psychology, as it influences interpersonal relationships, self-esteem, and emotion regulation. Studies indicate that positive non-verbal signals such as an upright posture can significantly increase team dynamics and the intrinsic motivation of athletes (psychology (Singer et al., 2001)). Body language functions here as a mirror that reflects an individual's emotionality and mental state and, at the same time, can shape the social fabric within a team.

Upright posture as an indicator of positive emotional feelings and a strengthened self-perception can be seen as a key component in sports psychology (Singer et al., 2001). It is not only an expression of self-confidence but can also serve as a tool to influence one's well-being. A straight body alignment promotes social interactions and forms a basis for confidence in oneself and other team members. This leads to the assumption that through targeted training in non-verbal communication, coaches and support staff can positively influence the self-perception and emotional experience of their athletes and thus optimize their performance. (Singer et al., 2001).).

However, the importance of body language goes beyond the social aspects and is also used in emotional work. The conscious control and adjustment of body posture can have an impact on the affective state of sports practitioners. This is supported by the findings of Wilkes et al. (2017), who found a significant improvement in mood and a reduction in fatigue in people with an upright posture. This opens up the possibility that posture could be used as a low-threshold tool to regulate mood and promote mental health in high-performance sport.

Another important point is the influence of posture on psychological and somatic processes. The work of Bijak (2003) emphasizes that correct posture plays an important role in the practice of Qigong. Here, specific acupuncture points are stimulated by certain postures, which in turn have effects on soma and psyche. These findings suggest that a transfer of similar principles to the field of sport could contribute to an optimization of biochemical processes and thus to improved somatopsychic health. This approach offers new perspectives for sports psychology and requires a deeper investigation of the mechanisms of action of postures concerning the physical and mental health of athletes (Bijak, 2003).

Finally, the relevance of body language in sports psychology should not be underestimated. It contributes significantly to the athletes' sense of self-efficacy and willingness to perform. An optimistic, confident body posture can help athletes feel up to their challenges and improve their performance under competitive conditions. This emphasizes the importance of non-verbal communication between coaches and athletes and highlights the need for sports psychology professionals to be trained in the use of body language to enhance athletes' performance and well-being (The influence of non-verbal body language on sports performance in ..., n.d.).

Neuropsychological Mechanisms of Posture

In the context of sports psychology, the neuropsychological control of posture is of central importance. As part of the cerebral cortex, the vestibular cortex plays a decisive role here, as it processes information from the vestibular system of the inner ear. Karnath et al. (2000) describe how a lesion of this area of the cortex can lead to impaired perception of the visual vertical, which in turn impairs posture. This is particularly relevant for athletes, as the correct perception and processing of vestibular information enables correct spatial orientation and balance posture during physical activities.

Investigating the interaction between visual and vestibular information reveals that the perception of gravity and balance is achieved through the interplay of these data. The posterolateral thalamus plays an essential role in this interaction. It plays a key role in integrating sensory information relevant to balance. Karnath et al. (2000) emphasize that the thalamus is involved in networks related to the processing of gravitative data and thus controls the alignment and stabilization of the body. These findings are of great importance for sports psychology practice, as targeted promotion of sensory processing through training could significantly improve postural control in athletes.

In addition, a study from the field of sports psychology research shows no direct correlation between expertise in a sport and postural skills (Paillard, 2019). The skills in both areas develop and influence each other. This implies that specific training that takes into account both motor expertise and postural control is necessary to achieve optimal performance. The study also highlights the need for personalised training methods that incorporate specific movement environments and ecological conditions of the athletes to enable an effective transfer of postural skills to motor expertise.

It becomes apparent that the neuropsychological regulation of posture is a multidimensional component that is not limited to the physiological level, but also significantly influences athletic performance, balance and postural control. These findings lead to the conclusion that a detailed analysis and specific training of the neuropsychological and motor components are essential for optimising athletic performance.

Biochemical Processes and Posture

This chapter is dedicated to analysing the biochemical processes that are influenced by an upright posture. The focus is on cerebral haemodynamics and intracranial oxygen supply, which are essential for cognitive and physical performance. Analysing these processes provides insights into the interactions between physical postures and biological mechanisms and clarifies their significance in a sporting context.

Influence of Upright Posture on Cerebral Haemodynamics

The influence of posture on cerebral haemodynamics represents a central aspect of this paper and reflects the interdependence of physical and biochemical processes. An upright posture has far-reaching effects on cerebral oxygenation and thus represents a fundamental element for the promotion of cognitive functions and physical performance.

The importance of adequate oxygenation for cognitive function and mental performance is well documented in the literature. Ng et al (2004) provide important findings in this regard by showing that an upright posture significantly improves brain oxygenation compared to a supine position. The increase in blood flow velocity and oxygen pressure in the brain can directly influence neuronal activity and is therefore of crucial importance for performance in a sports psychology context. The findings illustrate the direct link between an upright posture and potentially enhanced cognitive and physical performance.

In addition, the reduction of intracranial pressure through an upright posture is another relevant aspect that can reduce the risk of pathological consequences of increased pressure. Ng et al. (2004) observed a significant reduction in pressure at an inclination of 30°. This implies that the upright posture should be considered not only in everyday life but also during sporting activities as a preventive measure against diseases caused by intracranial pressure.

The discussion about cerebral blood flow becomes even more complex when one considers the study by Ouchi et al.

(2001), who found a reduction in regional cerebral blood flow during an upright posture. These results seem to contradict the findings of Ng et al. (2004) and raise questions about the specificity of body position and its effects. This calls for a more nuanced consideration of posture and its effect on cerebral haemodynamics, particularly in the development of training methods designed to exploit the benefits of optimal posture for athletic performance.

The consistency of systemic factors during the experiments of Ng et al. (2004) emphasises the importance of controlling variables for the validity of the research results. The invariability of factors such as sedation, CPP (cerebral perfusion pressure), PaCO₂ and PaO₂, haemoglobin content and body temperature shows that the specific effects of an upright posture on cerebral haemodynamics are not caused by changes in these systemic conditions. These findings support the hypothesis that changes in posture can have a direct influence on biochemical processes in the brain.

Taken together, the results presented provide evidence that an upright body position has specific and direct effects on cerebral haemodynamics. These findings are highly relevant for sports psychology practice, as an optimised posture in training and competition can help to promote the performance and well-being of athletes.

Effects on Intracranial Pressure and Oxygen Supply

The optimisation of intracranial pressure ratios through upright posture is a remarkable mechanism that reflects the physiological response of the human body to gravity. Ng et al (2004) found a significant reduction in intracranial pressure at an inclination of 30° compared to the supine position, a finding of considerable relevance for physical integrity during sporting activities. The reduction in pressure can be interpreted as an indicator of improved venous drainage of the brain, which in turn is favoured by the use of gravity. The question arises as to the extent to which these findings can be transferred to disciplines that require a variation in head and upper body position and whether a targeted improvement in posture could reduce the risk of pressure-induced damage to the brain. This could also imply that postural training could be an important preventive approach in disciplines with an increased risk of intracranial hypertension.

Upright posture has also been shown to have a positive effect on cerebral oxygenation, as illustrated by the increase in oxygen pressure and blood flow velocity (Ng et al., 2004). This improvement could lead to an increase in cognitive functions such as attention and reaction speed, which would have a direct effect on athletic performance. An upright posture could therefore be used as a strategy to support phases of intense concentration. In the context of high-performance sport, this could play a role particularly in decision-making processes and during long periods of sustained exertion. Furthermore, it is of utmost importance that the oxygen supply is optimised, especially for endurance athletes in extreme environments.

The constancy of systemic factors during postural variations emphasises that specific physiological responses to postural changes are not caused by changes in these conditions (Ng et al., 2004). This highlights the need to train haptic skills in order to optimise cerebral haemodynamics. This raises the question of the potential role of proprioceptive and vestibular training to better control the body's responses to different postures and the associated biochemical changes.

The reduction in regional cerebral blood flow in certain areas of the brain during upright posture found by Ouchi et al. (2001) contrasts with the aforementioned effects and emphasises the complexity of the body's physiological responses to postural changes. These findings suggest that individual differences in the anatomy and physiology of athletes vary the response to body positions. Training strategies should therefore be individualised to optimise cerebral blood flow and not reduce rCBF in critical areas. Training regimes could be adapted and the effects on cerebral haemodynamics continuously evaluated to ensure the balance between optimal posture and maximum blood flow supply.

In conclusion, it is clear that posture has a significant influence on intracranial haemodynamics and cerebral oxygenation, which has far-reaching implications for athletic performance. A differentiated analysis of the effects of posture on biochemical processes in the brain can help to develop more precise training methods and improve the health and performance of athletes.

Psychological Consequences of Posture

This chapter analyses the psychological effects of an upright posture and examines how this influences the performance and stress management of athletes. The effects on cardiovascular and cognitive performance are examined, as well as the role of posture in optimising mental and emotional resilience. This section places the previously discussed neuropsychological and biochemical principles in a practical sports psychology context and highlights their importance for sports practice and performance enhancement.

Posture and Its Effects on Performance

A person's physical presence, in particular their posture, plays a decisive role when it comes to athletic performance. Based on the study by Ashe et al., (2003) it can be concluded that an upright posture in untrained cyclists has measurable positive effects on physical performance parameters such as oxygen uptake (VO₂), ventilation, heart rate and maximum work output. These results suggest that posture could play an important role in optimising athletic abilities and thus goes beyond mere physical expression.

The observed increase in oxygen uptake and ventilation in an upright position is of particular interest for endurance sports. Increased VO₂ means more efficient oxygen utilisation by the organism, which is crucial for longer performance phases. Better ventilation in turn supports oxygen supply and carbon dioxide removal, which contributes to an overall improvement in aerobic performance. The link between an upright posture

and these improved respiratory parameters suggests that postural training could help to improve athletic performance.

An upright posture also leads to an increase in heart rate, which serves as an indicator of the intensity of cardiovascular stress. In this context, an increased heart rate can be an expression of a better adaptability of the cardiovascular system. In the long term, these adaptation processes could lead to increased cardiovascular efficiency and thus to higher performance. However, it should be noted that heart rate alone is not a comprehensive indicator of cardiovascular performance, but should be considered in conjunction with other physiological parameters.

Maximum work output, which is also increased in an upright position, is of the utmost importance for athletes. This increased performance capacity enables them to tolerate more intensive loads over a longer period of time and could therefore also indicate increased competition performance. Here, however, it is essential to develop specific training methods that are specifically aimed at improving posture and thus support the transfer of maximum work performance into practice.

The psychophysiological states investigated by Wilkes et al. (2017) show that an upright posture can affect not only the physical but also the emotional component of human health. The research findings suggest that a straight posture can improve mood and reduce fatigue. This implies that, in addition to the physical effect, an upright posture could also support mental and emotional resilience in stressful situations, as is often the case in sport.

Finally, research by Smith (1990) points to immediate haemodynamic responses triggered by the upright posture, such as increased heart rate and vascular resistance. These responses could promote performance under endurance exercise by ensuring efficient blood circulation and oxygenation during exercise. However, further research is needed to understand how these adaptations can be best utilised in the context of different sports and performance levels.

The study by Singer et al (2001) illustrates that body position can modulate the Valsalva trial, which plays an important role in the regulation of the cardiovascular system. Especially in sports that require high blood pressure for short periods of time, such as weightlifting, the upright posture could therefore help to optimize performance. However, it should be noted that the transfer of these results to training and competition requires detailed consideration of the individual physical requirements and the specific sporting context.

In summary, it becomes clear that posture plays a multifactorial role in athletic performance. Both the physical and psychological effects of an upright posture offer valuable approaches for sports practice in order to promote and further research the potential of athletes in the best possible way.

Posture and Stress Management In A Sporting Context

Positive posture as a non-verbal stress management tool plays a significant role in the sporting context, as studies show the link between upright posture and increased team dynamics and motivation (Martínez-Gallego & Carrillo Molina, 2019). It is plausible that such a posture strengthens self-confidence and enables athletes to perform better in competition and training situations. Establishing an upright posture could, therefore, serve as a simple but effective means of positively modulating the experience of stress.

The upright posture as a moderator between physiological stress and cognitive performance emphasizes the importance of body position for cognitive performance. Significant in this context is the finding that non-verbal cues such as upright posture not only shape external appearance but can also modulate internal psychophysiological stress responses, ultimately leading to improved concentration and performance (Martínez-Gallego & Carrillo Molina, 2019). This understanding could help to develop targeted programs that support athletes in using posture as a resource to manage stress.

The detailed consideration of upright posture to promote internal self-control reveals interesting aspects regarding the interplay between posture and breathing techniques. An upright posture can increase the efficiency of breathing techniques and thus reduce stress and promote a relaxed focus during competition preparation. This underpins the relevance of an integrated approach to body and mind in sports psychology practice.

The effects of posture on group dynamics in a team context should also not be underestimated. A shared positive posture can improve affective coordination between team members and strengthen their collective stress resilience (Martínez-Gallego & Carrillo Molina, 2019). These findings should be incorporated into the development of team training programs in order to exploit the synergies of a collectively positive attitude.

Biochemical correlates of upright posture and its role in stress regulation show that body positions have a direct influence on physiological processes. The study, published on NCBI, highlights that upright posture in untrained cyclists increased oxygen uptake and heart rate, which in turn can improve performance (Ashe et al., 2003). These findings are important for understanding how physiological benefits can assist in coping with exercise stress.

The influence of an optimized body position on glycolysis and energy supply in muscle tissue cannot be overlooked. An ergonomic posture can optimize the efficiency of energy conversion processes during training and competition (Ashe et al., 2003). These factors are essential for endurance performance, and an upright posture could contribute to improved energy utilization.

There is a link between posture and the regulation of stress hormones such as cortisol. An upright posture could potentially reduce cortisol production and thus have a stress-reducing effect. This suggests that postural interventions could be beneficial as part of stress management programs for athletes.

In conclusion, research shows that posture influences the emotional resilience of athletes. Wilkes et al (2017) found that an upright posture can improve mood and reduce fatigue in individuals with mild to moderate depressive symptoms. This implies that athletes could improve their mental resilience and stress management by consciously adopting an upright posture.

Overall, it can be concluded that an upright posture can contribute to stress management in sport in many ways, from the immediate physiological response to long-term emotional resilience. Future research should further investigate these relationships and develop precise interventions for the stress management of athletes based on these findings.

Sports Psychology and Posture

This chapter examines the importance of upright posture for athletes in the context of sports psychology and how this can be optimised through targeted training. The focus is on the effects on team dynamics, self-perception and the athletes' performance. Methods and strategies for improving attitude and integrating them into sports training and coaching will also be discussed. The aim is to demonstrate practical approaches that sustainably promote the well-being and sporting performance of athletes.

Importance of an Upright posture for Athletes

Non-verbal communication plays an important role in the interaction between coaches and athletes. Research emphasizes that positive non-verbal cues such as upright posture can increase athlete engagement and motivation, positively influencing team dynamics and strengthening the bond between coaches and athletes (Martínez-Gallego & Carrillo Molina, 2019).). This leads to the consideration that the conscious application and training of non-verbal communication not only enables better performance promotion, but can also be a supporting pillar for the social fabric within a team.

Building on this, it seems necessary for coaches to be specifically trained in non-verbal communication. Such training could help to improve the understanding and application of effective non-verbal methods, ultimately leading to more effective training design and delivery (Martínez-Gallego & Carrillo Molina, 2019). The ability to adequately send and receive non-verbal messages is critical to successful coach-athlete interaction and leads to an atmosphere of trust and mutual respect.

Another important component appears to be the transfer of nonverbal communication, especially upright posture, to team values. By internalizing an upright posture during training, ethical and social values such as respect, cohesion, and discipline can be integrated into the team spirit. This raises the question of how much such values can be promoted and anchored within the team through physical expression.

A direct influence of an upright posture on the self-confidence and self-image of athletes is documented by Wilkes et al. (2017). They found that an upright posture leads to an improvement in mood and a reduction in fatigue. This suggests that the perception of oneself is positively influenced by an upright posture, which in turn can contribute to a more self-confident appearance and an increase in performance potential. It therefore opens up discussions about the extent to which posture can be integrated into the mental training of athletes and used to improve performance.

The improvement in cardiopulmonary parameters through an upright posture, as found in the study of untrained cyclists, could also be transferable to other sports and points to the need for ergonomic training approaches (Ashe et al., 2003.). These findings provide an important foundation for the development of training programs aimed at an optimizing posture to maximize physical performance and minimize the risk of injury.

Finally, the role of upright posture in promoting mental resilience in athletes and preparing them to cope with pressure and defeat cannot be overstated (Martínez-Gallego & Carrillo Molina, 2019.; Wilkes et al., 2017). This underscores the importance of posture in stress management and competition performance and the need for coaching strategies that help athletes strengthen their self-awareness and stress management through postural exercises. By understanding the role of posture in mental resilience, athletes can feel more prepared and resilient in the face of challenges.

Training and Optimizing Posture In Sport

The optimization of posture plays a central role in the context of sports training in order to increase postural control and, thus, the performance of athletes. The targeted strengthening of postural control requires closely examining exercises to improve balance and proprioceptive abilities. Here it is necessary to integrate balance and equilibrium training into sport-specific training programs, whereby the consideration of motor learning and neuromuscular adaptation is of great importance. The interaction between motor skills and postural control is particularly interesting in sports environments such as gymnastics. Studies show that ecological conditions significantly influence motor expertise and that qualitatively analyzing these relationships can contribute to a deeper understanding of the mechanical and neurophysiological aspects (Paillard, 2019).

The upright posture is also particularly important regarding biochemical processes in untrained athletes. Training-induced changes can certainly influence the physiological state of the organism in posture. For example, the upright position could increase oxygen uptake, heart rate, and maximum work output (Ashe et al., 2003). These factors are particularly relevant regarding neurotransmitter release and hormonal response, as they may be associated with increased performance. In addition, Qigong emphasizes the importance of posture in stimulating specific acupuncture points, which stimulate the body's self-regulation and thus contribute to improving psychophysical

condition (Bijak, 2003). This perspective on acupuncture and posture can be groundbreaking for developing new training methods beyond traditional approaches.

Another starting point is the promotion of team dynamics and motivation through conscious posture training, which can be achieved by improving non-verbal communication within the team. An upright posture as a non-verbal signal can increase the commitment and motivation of the athletes and thus positively influence the team dynamic (Martínez-Gallego & Carrillo Molina, 2019). The effective transmission of non-verbal messages is particularly important for coaches who want to create a cooperative and performance-enhancing environment.

Finally, integrating an upright posture into the mental training of athletes is an important field. Mental training that includes exercises to promote an upright posture can positively affect stress resistance and self-confidence (Ashe et al., 2003). Consciously controlling and correcting posture in stressful situations can improve athletes' mental state and performance. Developing interventions that target posture as a stress management tool is a promising approach in the context of sports psychology practice.

Overall, posture training and optimization open up various perspectives for sports practice. It also emphasizes the importance of an interdisciplinary approach that harmonizes neuromuscular, biomechanical, and psychophysiological aspects to provide athletes with the best possible support and promote their performance.

Embodiment as A Bridge Between Body and Psyche

Embodiment concepts have become increasingly important in sports psychology, as they influence athletes' physical and cognitive and emotional processes. Hawighorst (2023) explains that an upright posture can help to increase attention span and improve decision-making ability. These aspects are essential in competitive situations, as they directly influence the ability to react and the quality of performance. However, further studies are needed to identify specific cognitive processes that posture can influence and understand the underlying mechanisms in more detail.

The emotional response of athletes to their posture is another field that is being considered in sports psychology research. A straight posture can boost self-confidence and contribute to a more positive mood, as Hawighorst (2023) states. This has potentially positive effects on stress resilience and performance. However, the extent to which such emotional effects are culture- and context-dependent and the role played by individual differences between athletes must be questioned.

Consciously adopting a stronger posture can also promote a feeling of self-efficacy. Hawighorst (2023) argues that this can lead to improved performance. Self-efficacy is a central component of competitive sport; however, a differentiated approach is required to decipher the interactions between posture, feelings of self-efficacy and actual performance improvement.

The work of Karnath et al. (2000) illuminates the neurophysiological foundation of embodiment in sport. They show that the vestibular cortex and the posterolateral thalamus are essential for maintaining body position and balance. These findings emphasize the need for further research into training these brain regions to develop targeted interventions for athletes that could improve their performance.

Paillard (2019) emphasizes that balance and spatial orientation have neurophysiological underpinnings essential for athletes to train. However, how this knowledge can be integrated into sport-specific programs to achieve maximum effect remains unclear.

Karnath et al. (2000) state that the posterolateral thalamus is central in integrating sensory information to optimize posture. Further research could help shed light on this area's specific functions in athletic performance and training.

Implementing embodiment techniques in everyday training can strengthen athletes' mental health and stress management. Hawighorst (2023) recommends using these techniques to prevent burnout and overtraining. Although this approach is promising, it may pose challenges in practice, especially regarding acceptance and feasibility in everyday training.

As Hawighorst (2023) notes, mindfulness-based techniques can also promote embodied self-experience. These techniques could improve athletes' psychological resilience and coping strategies. However, discussing how they can best be combined with existing training methods to achieve synergetic effects is important.

Finally, Bijak (2003) emphasizes the relevance of posture in Qigong practices. It should be investigated to what extent traditional posture exercises can serve as a source for developing new training methods. Research should also include other types of sport and critically examine the transferability of the effects known from Qigong.

The aspects discussed show that embodiment offers numerous starting points for positively influencing athletes' mental and physical processes. However, further development of these theoretical concepts and integration into practical sports work remains necessary to realize their full effect.

Conclusion

This article examines the neuropsychological effects of posture, how an upright posture influences the biochemical processes in the human brain, and what psychological consequences this has for performance in a sports psychology context. The thesis aimed to analyze the reciprocal relationships between body language, biochemistry, and psychological processes and to discuss their relevance for sporting success. This objective was achieved through a comprehensive investigation of the neuropsychological, biochemical, and psychological mechanisms of an upright posture.

The main part of the thesis initially deals with the neuropsychological foundations of body language and its significance in a psychological context. It was shown that body language is an integral part of human communication and that an upright posture positively affects self-esteem, emotion regulation, and team dynamics. This was confirmed by both theoretical models and empirical studies, which underpin the importance of non-verbal communication in sports psychology.

The neuropsychological mechanisms of posture were then analyzed. Particular attention was paid to the vestibular cortex and the posterolateral thalamus, which play a central role in the perception and processing of balanced information. These findings illustrate that an upright posture improves physical stability and cognitive performance by optimizing sensory integration.

Another central chapter of the thesis is dedicated to the biochemical processes influenced by upright posture. In particular, the effects on cerebral haemodynamics and intracranial pressure were investigated. It was shown that upright posture improves the supply of oxygen to the brain and reduces intracranial pressure, positively affecting cognitive and physical performance parameters. These biochemical changes provide important insights into the physiological basis of performance enhancement through postural training.

The psychological consequences of upright posture were also analyzed in detail. It was found that upright posture increases performance and has a positive effect on stress management. These effects can be attributed to cardiovascular and cognitive improvements, as well as increased emotional resilience. The work shows that conscious posture control is an effective means of optimizing the mental and emotional resources of athletes.

Finally, the relevance of upright posture for sports psychology practice was discussed. It was emphasized that targeted posture training could strengthen not only individual performance but also team dynamics and athletes' self-confidence. Practical approaches were outlined as to how an upright posture can be integrated into training in order to achieve sustainable improvements in athletic performance.

The results of this paper are relevant both to existing research and to future studies. The findings presented confirm and expand our understanding of the interactions between posture, biochemistry, and psychological processes. They provide a solid basis for further research and the development of new, effective training methods.

However, methodological limitations must also be pointed out. Many of the underlying studies are based on specific experimental designs that are not always transferable to all sports disciplines or different performance levels. Future research should address these limitations and pursue interdisciplinary approaches to further integrate neuropsychological and biochemical perspectives.

To summarize, this article makes an important contribution to the understanding of the neuropsychological effects of posture. It shows how an upright posture influences the biochemical processes in the brain and what positive psychological and physiological consequences this has for athletic performance. The insights gained offer valuable approaches for practical application in sports psychology training and open up perspectives for future research projects that could further promote the well-being and performance of athletes.

References

1. Ashe, M. C., Scroop, G. C., Frisken, P. I., Amery, C. A., Wilkins, M. A., & Khan, K. M. (2003). Body position affects performance in untrained cyclists. *British journal of sports medicine*, 37(5), 441–444. <https://doi.org/10.1136/bjism.37.5.441>
2. Bijak, M. (2003). Einfluss der Haltung auf Soma und Psyche — Der Zusammenhang von Akupunkturpunkten und Körperhaltung im Qigong. *Deutsche Zeitschrift für Akupunktur*, 46, 26-28.
3. Hargens, A. R., & Meyer, J. U. (1990). Upright posture and cranial hemodynamics in humans and other “tall” animals. *Behavioural and Brain Sciences*, 13(2), 359-360.
4. Hawighorst, S. (2023). Understanding the interaction between body and psyche-Embodiment. *ergopraxis*, 16(11/12), 42-45.
5. Karnath, H. O., Ferber, S., & Dichgans, J. (2000). The neural representation of postural control in humans. *Proceedings of the National Academy of Sciences*, 97(25), 13931-13936. <https://doi.org/10.1073/pnas.240279997>
6. Martínez-Gallego, R., & Carrillo Molina, D. (2019). The influence of non-verbal body language on sport performance in professional tennis. *ITF Coaching & Sport Science Review*. DOI:10.52383/itfcoaching.v27i79.83
7. Ng, I., Lim, J., & Wong, H. B. (2004). Effects of head posture on cerebral hemodynamics: Its influences on intracranial pressure, cerebral perfusion pressure, and cerebral oxygenation. *Neurosurgery*, 54(3), 593-598.
8. Ouchi, Y., Okada, H., Yoshikawa, E., Nobezawa, S., & Futatsubashi, M. (2001). Brain activation during maintenance of standing postures in humans. *Brain: a journal of neurology*, 122(Pt 2), 329–338. <https://doi.org/10.1093/brain/122.2.329>
9. Paillard, T., (2019). Relationship Between Sport Expertise and Postural Skills. *Frontiers in Psychology*. DOI=10.3389/fpsyg.2019.01428
10. Singer, W., OpferGkehrking, T. L., McPhee, B. R., Hilz, M. J., & Low, P. A. (2001). Influence of posture on the Valsalva manoeuvre. *Clinical science*, 100(4), 433–440.
11. Smith, J. J. (1990). Circulatory response to the upright posture. CRC Press.
12. Wilkes, C., Kydd, R., Sagar, M., & Broadbent, E. (2017). Upright posture improves affect and fatigue in people with depressive symptoms. *Journal of behavior therapy and experimental psychiatry*, 54, 143–149. <https://doi.org/10.1016/j.jbtep.2016.07.015>