

Subliminal Audio Stimulation: A Theoretical Overview of Effects and Mechanisms Influencing Perception

Peter Vaško,¹ Patrik Jurčičin², Adriana Rusková³, Jakub Berčík⁴

Abstract: Subliminal audio stimulation: A theoretical overview of effects and mechanisms influencing perception. Subliminal audio stimulation, which uses sounds at a level of consciousness unobserved, has the potential to influence perception, behavior and emotional response in individuals. This article offers a theoretical summary of the mechanisms, effects, and applications of subliminal audio stimuli. The review covers the historical development, basic principles, and neuropsychological mechanisms through which these stimuli can influence brain activity and decision-making. The article also examines various experimental studies and applications of subliminal stimulation in areas such as marketing, therapy, and cognitive performance, focusing on the ethical aspects and possible implications of this technique. The results of these investigations may contribute to a better understanding of the abilities of sound stimuli to improve human perception and decision-making processes.

Objective: The aim of the article is to examine the theoretical mechanisms and applications of subliminal sound stimuli in various fields, with an emphasis on their influence on behavior, emotional reactions and decision-making.

Methods: This review is based on an analysis of current research and experimental studies investigating subliminal sound cues in a variety of contexts, including marketing and psychology.

Results: Research suggests that subliminal sounds can improve attention, emotional response, and decision-making, and may have significant applications in marketing and therapy. However, the ethical and moral issues surrounding their use require further attention.

Keywords: Subliminal audio stimulation, subliminal stimuli, cognition, perception, decision making

JEL Classification: M31, I18, D12, C91

1 Introduction

Subliminality is a complex and often debated phenomenon that refers to the perception of stimuli without conscious awareness, which can still influence a person's psychology and behavior. Research on subliminal stimuli is grounded in the basic premises of psychology and neuroscience, exploring mechanisms that enable unconscious perception. These stimuli, whether visual or auditory, lie below the threshold of conscious perception, meaning they are not intense enough to be registered by conscious awareness, yet they can initiate specific brain responses that affect our decision-making, emotions, and even memories (Karremans, Stroebe, & Claus, (2006).

In the field of sound stimulation, the subliminal is of particular interest because the human sensory system can process sound stimuli even at an unconscious level. This approach finds application not only in psychology, but also in marketing and therapeutic practice.

Elgendi et al. (2018) argue that subliminal sound stimulation can lead to significant changes in consumer behavior, using specially designed sound cues to influence mood, increase attention, or create an emotional bond with a product.

¹ Slovak University of Agriculture in Nitra/Institute of Marketing, Trade and Social Studies, Faculty of Economics and Management, Tr.A.Hlinku 2, 949 76 Nitra, Slovak Republic, xvaskop@uniag.sk

² Slovak University of Agriculture in Nitra/Institute of Marketing, Trade and Social Studies, Faculty of Economics and Management, Tr.A.Hlinku 2, 949 76 Nitra, Slovak Republic, xjurcisin@uniag.sk

³ Slovak University of Agriculture in Nitra/Institute of Marketing, Trade and Social Studies, Faculty of Economics and Management, Tr.A.Hlinku 2, 949 76 Nitra, Slovak Republic, xruskovaa@uniag.sk

⁴ Slovak University of Agriculture in Nitra/Institute of Marketing, Trade and Social Studies, Faculty of Economics and Management, Tr.A.Hlinku 2, 949 76 Nitra, Slovak Republic, jakub.bercik@uniag.sk

These techniques are based on the knowledge of psychology and neuroscience and offer more sophisticated and effective ways of communicating with customers than traditional methods.

Subliminal stimuli are also used in therapy to promote relaxation, reduce stress or solve problems related to anxiety and depression. (Karremans, Stroebe, & Claus, 2006) suggest that specific sound frequencies can stimulate brain activity and create favorable conditions for psychological well-being and mental health. These applications of sound stimulation often focus on long-term benefits, such as improving sleep quality, promoting creativity, or increasing cognitive performance in areas such as concentration and memory.

In recent decades, interest in subliminal stimuli has grown significantly, mainly due to technological advances allowing more precise measurement and analysis of their effects on brain activity. Kihlstrom, J.F. (2004) focuses on investigating the interaction of subliminal stimuli with brain structures and their influence on conscious behavior. This research provides new insights into how unconscious processes influence everyday decision-making and responses in a variety of contexts—from shopping behavior to emotional regulation and therapeutic interventions.

Despite growing interest and positive findings, subliminal stimuli also raise many ethical and moral questions. While some experts, such as Elgendi et al. (2018), see these techniques as valuable tools for improving mental well-being and enhancing the effectiveness of marketing strategies, others caution against the risks associated with influencing thoughts and behaviors without an individual's awareness. The misuse of subliminal stimuli can compromise individuals' autonomy and personal integrity, raising questions about responsibility and regulation in their use.

This article, therefore, seeks to provide a comprehensive overview of experimental studies and practical applications of subliminal stimuli, focusing on their potential uses in marketing, therapy, and cognitive performance enhancement. It also closely examines the ethical and moral aspects that are integral to this issue and analyzes the possible implications of subliminal stimuli for individuals and society. Thus, the question of using subliminal stimuli becomes not only a technological challenge but also a matter of ethical principles that should guide their application in the modern world.

2 Methods

This theoretical article relies on the methods of literature review and systematic examination of available research focusing on subliminal auditory stimuli and their use in cognitive and relaxation techniques. The literature collection process began with identifying key studies that explore the mechanisms, effects, and applications of these stimuli. Reputable academic databases, such as PubMed, PsycINFO, and Google Scholar, were utilized, with keywords including "subliminal messaging," "auditory stimulation," "cognitive performance," "relaxation techniques," and "binaural beats." This approach enabled the collection of relevant studies reflecting the latest knowledge in the field.

The literature was carefully reviewed based on criteria such as the quality of theoretical works, methodological accuracy, and contributions to the understanding of subliminal stimuli. Studies directly related to topics like the impact of sound stimuli on brain function and emotional responses were subjected to detailed analysis. The review focused on various types of audio stimulation, such as binaural beats, isochronic tones, and subliminal audio messages, considering differences in their mechanisms of action.

Furthermore, the topic of the effectiveness of subliminal stimuli is frequently discussed in the context of cognitive tests, subjective questionnaires, and biological measurements, such as heart rate and heart rate variability. This comprehensive approach provides insight into how subliminal stimuli may influence different aspects of cognitive performance and relaxation in various contexts.

The ethical aspects of this topic were also a focus of the review, emphasizing theoretical works that discuss issues related to manipulation, informed consent, and the responsible use of audio stimulation in therapeutic and commercial applications.

3 Research results

Subliminal sound stimulation focuses on the influence of sound stimuli that are too weak or have such a frequency that they are not consciously perceived by the listener. Although these sounds do not evoke direct conscious perception, they can influence cognitive and emotional processes. Subliminal stimulation is used in a variety of fields, including psychology, marketing, and therapeutic techniques. This review focuses on the theoretical mechanisms and effects of subliminal sound stimuli that influence the perception and behavior of individuals.

Mechanisms of effect of subliminal sound stimuli

• Limbic system and emotional reactions

Modern studies show that subliminal stimuli affect the limbic system, which is involved in the processing of emotions such as fear, stress or well-being. Research by Williams et al. (2006) shows that these stimuli can trigger emotional responses that influence behavior without conscious awareness.

Another author whose study we examined as it related to the limbic system and emotional responses was Nierhaus et al. (2015). His research focuses on the identification and manipulation of perceptual thresholds, which has direct implications for the way subthreshold stimuli are processed at the behavioral and neural levels.

Driver & Noesselt (2007) explore how different sensory modalities (eg sight, hearing, touch) interact and influence each other. In doing so, they question the traditional view that the processing of sensory information takes place in isolation in brain areas specific to individual modalities.

The differences between the studies are in the type of stimuli examined. Williams et al (2006) examines emotional stimuli, particularly fearful faces, and their effect on the limbic system (amygdala), while Nierhaus et al. (2015) on somatosensory stimuli and perceptual thresholds. Driver & Noesselt (2007) focus on multisensory integration, where different sensory modalities (sight, hearing, touch) interact with each other.

The authors agree that subliminal stimuli can influence behavior, even without the subject's conscious awareness. Overall, the works complement each other by examining subliminal stimuli and their impact on brain processing and behavior.

• Impact on cognitive decision-making

More recent research suggests that subliminal stimuli can influence cognitive decision-making, especially in quick intuitive decisions. The following authors contributed significantly to the understanding of the influence of subliminal stimuli on cognitive decision-making:

Bargh & Morsella (2008) examined how unconscious behavioral influences, including associations between subconscious cues and everyday decisions, influence behavior. Their research highlights the automaticity of behavior that can be controlled by subconscious processes.

Research by Bault & Rusconi (2020) analyzed the connection between neuroscience and consumer decisions. The authors investigated how neural processes influence individual choices, especially in the context of marketing strategies, using neuroimaging methods to investigate these processes.

Sofi, Mir & Baba. (2020) investigated the interaction between cognitive and affective factors. Their research provides deeper insight into how emotional and psychological factors influence consumer decision making.

The differences in the mentioned works are that Bargh & Morsella (2008) focused on how subliminal stimuli influence behavior through unconscious associations, without conscious control. Bault & Rusconi (2020) focused on the connection between neural processes and consumer decisions, with an emphasis on marketing strategies and their influence on decision-making. And Sofi, Mir & Baba (2020) in turn investigated how emotional and cognitive factors interact and shape consumer decision making.

The studies of the mentioned authors have in common that they examine the processes affecting the decision-making of individuals, in different contexts: in everyday life (Bargh & Morsella), in the consumer context (Bault & Rusconi) or at the psychological level (Sofi, Mir & Baba) and focus on the factors influencing the choices. This means that studies

combine different dimensions of decision-making – from unconscious cues and emotions to cognitive and affective factors.

All studies focus on factors that influence choices and together provide different perspectives on decision-making processes.

Ethical and moral issues of subliminal sound stimuli

The Audiovisual Media Services Directive (AVMSD) prohibits the use of subliminal techniques in audiovisual commercial communications.

In addition, Regulation (EU) 2024/1689, known as the Artificial Intelligence Act (AI Act), contains provisions aimed at regulating artificial intelligence systems that use subliminal techniques.

The regulation states that AI systems that use subliminal components, such as audio, visual or video stimuli that cannot be perceived by persons, or other manipulative or deceptive techniques that interfere with or weaken the autonomy, decision-making or free choice of persons in a way that persons not aware should be banned.

This legislation reflects the EU's commitment to protect citizens from unethical practices linked to subliminal incentives and to ensure that technologies, including artificial intelligence, are developed and used in a way that respects human autonomy and decision-making.

Analysis from the point of view of theoretical research:

Interdisciplinary methods such as neuroimaging (EEG, fMRI), behavioral experiments and cognitive analysis are used in the theoretical investigation of subliminal sound stimuli. These methods make it possible to investigate the processing mechanisms of subliminal stimuli and their influence on the limbic system and decision-making.

Our theoretical stance integrates knowledge from neuroscience, psychology, and law, while emphasizing the ethical issues associated with manipulating subliminal techniques. This approach enables a comprehensive understanding of the influence of these stimuli on behavior and autonomous decision-making.

4 Conclusion

Critical summary and theoretical approaches

Research on subliminal sound stimuli in recent years reveals diverse theories and approaches that suggest that their use in marketing and therapy can significantly influence individual behavior. However, the most discussed aspect is the ethical side of using these techniques, especially in commercial applications where they can influence decision-making without conscious consent.

The following table provides an overview of the authors who investigated the individual mechanisms of the effect of subliminal sound stimuli.

Table 1. Overview of mechanisms of the effect of subliminal sound stimuli:

Mechanism	Description	Key studies
Mechanisms of effect of subliminal sound stimuli		
Emotional re- actions	Subliminal stimuli affect the limbic system, which controls emotional reactions and behavior.	Williams et al. 2006; Nierhaus et al. (2015); Driver & Noesselt (2007)
Influence on cognitive decision making	They influence consumers' intuitive decision-making and preferences without their awareness.	Bargh & Morsella (2008); Bault & Rusconi (2020); Sofi, Mir & Baba. (2020)

Source: Own creation, 2024

Theoretical investigations of subliminal sound stimuli demonstrate their ability to influence emotional responses and cognitive decision-making without conscious awareness. Interdisciplinary approaches that include neuroscientific, psychological, and ethical perspectives provide a deeper understanding of their mechanisms and impacts.

Regulations such as the AVMSD Directive (2018) and the AI Act (2024) emphasize the importance of protecting individual autonomy from manipulative practices. These legislative frameworks reflect a commitment to ensure the ethical use of technology, emphasizing the need for transparency and informed consent. Current knowledge also suggests that further research is needed to better understand the long-term effects and to establish clear ethical boundaries for their practical use.

References

- Bault, N. a Rusconi, E. (2020). The Art of Influencing Consumer Choices: A Reflection on Recent Advances in Decision Neuroscience. *Frontiers in Psychology*. doi: 10.3389/fpsyg.2019.03009.
- Bargh, J. A. & Morsella, E. (2008). The Unconscious Mind. *Perspectives on Psychological Science*, 3(1). doi: 10.1111/j.1745-6916.2008.00064.x.
- Driver, J. & Noesselt, T. (2007). Multisensory interplay reveals crossmodal influences on 'sensory-specific' brain regions, neural responses, and judgments. *Neuron*. 57(1). doi: 10.1016/j.neuron.2007.12.013.
- Elgendi, M. a kol. (2018). Subliminal Priming—State of the Art and Future Perspectives Behavioral Sciences. Behavioral Sciences. Basel : Multidisciplinary Digital Publishing Institute (MDPI). doi: 10.3390/bs8060054.
- EUR-LEX. (2024). Nariadenie Európskeho parlamentu a Rady (EÚ) 2024/1689. [online]. Retrieved from https://eur-lex.europa.eu/legal-content/SK/TXT/?uri=OJ:L_2024:1689.
- EUR-LEX. (2018). Smernica Európskeho parlamentu a Rady (EÚ) 2018/1808. [online]. Retrieved from: <https://eur-lex.europa.eu/eli/dir/2018/1808/oj?locale=sk>.
- Karremans, J. C., Stroebe, W., & Claus, J. (2006). Beyond Vicary's fantasies: The impact of subliminal priming and brand choice. *Journal of Experimental Social Psychology*, 42(6), 792–798.
- Kihlstrom, J. F. (2004). Cognition, unconscious processes. *Encyclopedia of Neuroscience*. [online]. Retrieved from: <https://www.ocf.berkeley.edu/~jfkihlstrom/PDFs/2000s/2004/EncNeuro072Cognitionuncons.pdf>.
- Nierhaus, T. et al. (2015). Differential Cerebral Response to Somatosensory Stimulation of an Acupuncture Point vs. Two Non-Acupuncture Points Measured with EEG and fMRI. *Frontiers in Human Neuroscience*. doi: 10.3389/fnhum.2015.00074.
- Sofi, S. A, Mir, F. A & Baba, M. M. (2020). Cognition and affect in consumer decision making: conceptualization and validation of added constructs in modified instrument. *Future Business Journal*.
- Williams, L., M., et al. (2006). Amygdala–Prefrontal Dissociation of Subliminal and Supraliminal Fear. *Human Brain Mapping*. doi: 10.1002/hbm.2020.