A REVIEW OF HUMAN REACTIONS TO ENVIRONMENTAL SOUNDS

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ABSTRACT

Soundscape is defined as the entire acoustic environment and the human responses to it. This review summarizes different human reactions to sound exposure, their development, prevalence, symptoms, comorbidities, methods for their assessment, and possible origins.

The interpretation of sounds from the environment depends, not only on the characteristics of the sound itself, but also on the characteristics of the listener, their judgments, preferences, motivations, and emotional reactions to the sound or its source. Typical sound-related reactions are presented from two standpoints: population reactions, from the community perspective, and individual reactions, from the clinical perspective. Noise annoyance is a specific, unique, and typical psychological and physiological reaction to noise, which is assessed from the community perspective. Noise sensitivity, a stable personality trait, is at the basis of noise annoyance. Both noise annoyance and noise sensitivity play important roles in the development of other noise-related health disturbances.

From the clinical perspective, hyperacusis and misophonia are the most distinctive individual responses to specific sounds. They may become so pronounced that they disturb one's physical and mental health, behavior, and functioning.

Human reactions to sounds in the environment are widespread and well-investigated. This review goes beyond merely defining terminology in the domain of psychoacoustics; it may help health professionals understand human reactions to sound better. Further studies need to be directed towards developing methods for alleviating or treating the described reactions, but also towards creating a more pleasant acoustic environment for the purpose of protecting public health.

Key words: sound, noise, psychoacoustics, annoyance, hyperacusis

SAŽETAK

Celokupno zvučno okruženje označava se pojmom „zvučni pejzaž“ (engl. soundscape). Ovaj rad opisuje različite reakcije ljudi na zvuke u njihovoj okolini i prezentuje razvoj karakteristika tih reakcija, njihovu zastupljenost, simptome, komorbiditete, metode za procenu i moguće uzroke. Interpretacija zvukova iz okoline zavisi, ne samo od karakteristika samog zvuka, već i od osobina slušalaca, njihovog odnosa prema zvuku i izvoru zvuka, njihove motivacije, psiholoških i emocionalnih reakcija. Tipične reakcije na zvuk predstavljene su iz dva ugla: populacione reakcije, iz uglava istraživanja u zajednici, i pojedinačne reakcije, iz uglava klinički značajnih prezentacija. Uznemirenje bukom je specifična, tipična i jedinstvena psihozvukoloska reakcija na buku u životnoj sredini koja se procjenjuje na nivou populacije. U osnovi uznemirenja bukom leži, između ostalog, i osetljivost na buku kao stabilna psihološka osobina. I uznemirenje bukom i osetljivost na buku igraju značajnu ulogu u razvoju drugih poremećaja zdravlja vezanih za izlaganje buci. U kliničkoj praksi pojavljuju se hiperakuzis i misofonija kao najizraženiji načini reagovanja pojedinca na specifične zvuke u okolini. Oni mogu postati toliko izraženi da narušavaju fizičko i mentalno zdravlje individua i njeno ponašanje i funkcionalnost. Različite reakcije ljudi na zvuke u njihovoj okolini su široko rasprostranjene i dobro proučene. Ovaj pregled literature nije samo puko definisanje pojmov u domenu psihoakustike, već može pomoći lekarima i psiholozima da ih bolje razumiju. Buduća istraživanja treba usmeriti ka razvoju metoda za ublažavanje ili lečenje opisanih reakcija, kao i to stvaranju prijatnije akustičke sredine u cilju očuvanja javnog zdravlja.

Ključne reči: zvuk, buka, psihoakustika, uznemirenje, hiperakuzis

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UVOD

Ljudi su izloženi različitim zvučnim podsticajima iz okruženja, koji se kreću od zvukova iz prirode (zvuči koje proizvode biljke, životinje, vetar, grom, kiša) do zvukova koje proizvode drugi ljudi i društvo uopšte, u šta spadaju: muzika, mašine i električni aparati, saobraćaj, industrija, gradilišta, i drugo. Zvučni pejzaž (engl. soundscape) jeste pojam koji obuhvata celokupno zvučno okruženje, kao i reakcije ljudi na njega [1,2]. Sam engleski termin soundscape nastao je od reči zvuk (sound) i sufksa -scape, koji znači „vidik”, odnosno „pogled na nešto”, čime se ovaj termin odnosi na celokupno viđenje ili percepciju zvukova u okruženju. Psihoakustika proučava izvore, kvalitet i karakteristike zvukova iz okruženja u odnosu na ljudske reakcije, preference, stavove i očekivanja [3].

Kvalitet zvučnog pejzaža zavisi od karakteristika zvukova koji se emituju u okviru samog okruženja, nihovog broja i frekvencije, njihove konsonance ili dissonance (u zavisnosti kako ih doživljava slušač), osećanja i kognitivnog suda koje zvuk evocira kod slušaoca, kao i od promenljivosti odnosno monotonosti zvučnog zvuka. Balance između prirodnih zvukova i saobraćajne buke mogla bi se uzeti kao indikator kvaliteta zvuka. Ravnateža između prirodnih zvukova i saobraćajne buke može biti integrirana u dugoročno planiranje saobraćajne infrastrukture [5]. Percepcija zvuka preko vazduha, gasova, tečnosti i čvrste materije, izuzimajući vakuum [5]. Percepcija zvuka prekida se na elemenatima koji se izražavaju u paskalima – Pa, intenzitet zvuka (izražava se u decibelima – dB), frekvenciju (izraženu u hercima – Hz), i frekventni spektar. Ove osobine koreliraju sa psihoakustičkim karakteristikama zvuka. Na primer, percepcija glasnosti zvuka zavisi od njegovog intenziteta; oštrina zvuka je povezana sa frekvencijom; kvalitet zvuka (boja) vezana je za kompleksnost tog zvuka, itd. Stoga, iz akustičke perspektive, ljudi doživljavaju zvukove kao glasne ili tihe, oštre ili duboke, harmonične ili disharmonične [6]. Iz psihološke perspektive, međutim, ljudi tumače zvuk kao prijatan

INTRODUCTION

Humans are exposed to various auditory stimuli from the environment, ranging from the sounds of nature (sounds made by plants, animals, wind, thunder, rain) to sounds made by other humans and society in general, which include music, mechanical and electrical equipment, traffic, industry, construction, etc. The entire acoustic environment and human responses to it are defined by the concept of soundscape [1,2]. The term soundscape is coined from the word sound and the suffix -scape, meaning “a view of something”, thus referring to the overall view or the perception of sound in the environment. Psychoacoustics examines the sources, quality, and characteristics of environmental sounds in relation to human reactions, preferences, opinions, and expectations [3].

The quality of the soundscape depends on the characteristics of the sounds emitted in the environment, their number and frequencies, their consonance or dissonance (as perceived by the listener), the emotions and cognitive judgment evoked in the listener, as well as on the changeability vs. monotony of the soundscape [1]. Balance between natural sounds and traffic noise could be used as an indicator of the quality of soundscape to highlight the discrepancy between those sound sources that are perceived as favorable, positive, and restorative vs. those that are viewed as unfavorable, negative, and damaging to the soundscape [4]. This encourages architects and urban planners to create more pleasant and healthier soundscapes by eliminating unwanted sounds (i.e. reducing traffic and installing noise barriers), by masking unwanted sounds with more pleasant ones (e.g. birdsong or music), and by introducing pleasant acoustic and visual stimuli into the soundscape (e.g. water fountains). The search is still ongoing for the most sustainable and pragmatic soundscape design intervention that can be integrated into the long-term planning of urban areas [2,4].

Sound is a mechanical oscillating wave travelling from the sound source through air, gas, liquid and solid matter, with the exception of vacuum [5]. The perception of sound primarily depends on its physical characteristics, which include: sound pressure (expressed in pascals - Pa), sound intensity (expressed in decibels - dB), frequency (expressed in hertz - Hz), and the spectrum of frequencies. These qualities correlate with the psychoacoustic properties of sound. For example, the perception of sound loudness depends on sound intensity; sound sharpness is related to its frequency; the quality of the sound (timbre) is related to its complexity, etc. Therefore, from the acoustic point of view, humans perceive sounds as loud or quiet, sharp or deep, harmonious or disharmonious [6]. From the psychological perspective, however,
ili neprijat, poželjan ili nepoželjan, pozitivan ili negati
van, emotivno neutralan ili emotivno provokativan, znač
jačan ili beznačajan. Sveukupna percepcija zvukova iz
okruženja zavisi ne samo od osobina samih zvukova,
već i od njihovog afektivnog značenja [6], kao i od su
dova, preferenci i poriva slušaoca [7]. Gore navedene ve
ze između zvuka, slušaoca i zvučnog okruženja pre
dstavljaju predmet izučavanja naučne discipline pod na
zivom psihoaustikstika [8].

Kako bi se pomoglo slušaocu da razume zvučni pej-
zaž u kontekstu svakodnevnog života, ovaj rad sažeto
prikazuje različite ljudske reakcije na zvuk, njihov ra
zvoj, zastupljenost, simptome, komorbiditete, i njihovu
procenu. Negativne reakcije na zvuk su stoga prikazane iz
dve perspektive: iz ugla istraživanja u zajednici, gde se
uzimaju u obzir populacione reakcije na nepoželjne
zvuke; i, iz ugla klinički značajnih prezentacija, gde je
fokus na pojedinačnim reakcijama, koje mogu narušiti
fizičko ili mentalno zdravlje pojedinca. Ovaj pregled li
terature može koristiti svim zdravstvenim stručnjacima
kao sveobuhvatni vodič za različite prakse i naučna is-

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nekog zvuka kao buke zavisi, ne od samog zvuka,
već od slušaoca. Uznemireni bukom je tipična psihološka i fiziolo-
ška reakcija na buku. Obično se opisuje kao osećanje
nezadovoljstva, razdražljivosti, anksioznosti, frustracije,
iljutine, izazvanog zvukovima iz okruženja [9]. Među svim žetnim faktorima iz okruženja, buka je jedini
faktor koji izaziva uznemireni. Opšte je poznato da
uznemireni bukom zavisi od: vrste izvora buke, karakteristi
tika zvuka kojeg emituje izvor (intenzitet, frekven-
cija, boja, broj zvučnih događaja) [9,10] i od prostiranja
zvuka (što zavisi od građevinskog materijala, prisustva
zelena, zvučne izolacije, itd.) [9,10,11,12]. Uznemireni
bukom proizilazi pre svega iz osobina ličnosti, osetljivosti
na buku i stavova prema konkretnim izvorima buke
[9,11]. Uz to, uznemireni bukom povezano je i sa kon
tekstom u kojem je neko izložen buci, uključujući tu i:

humans interpret sound as pleasant or unpleasant, want-
ed or unwanted, positive or negative, emotionally neu-
tral or emotionally provocative, meaningful or meaning-
less. The overall perception of the surrounding sounds
depends, not only on their characteristics, but also on
their affective meaning [6], as well as on the judgments,
preferences, and the motivations of the listener [7]. The
above-mentioned associations between the sound, the
listener, and the acoustic environment present the focus
of the scientific discipline called psychoacoustics [8].

In order to help readers understand soundscape
in everyday life, this paper summarizes several human
reactions related to sound exposure, their develop-
ment, prevalence, symptoms, comorbidities, and their
assessment. The adverse reactions to sound are thus
presented from two standpoints: from the community
perspective, which takes into account the population
reactions to unwanted sounds; and from the clinical
perspective, which deals with individual responses that
can disturb a person’s physical or mental health. This
review may benefit all health professionals, as a com-
prehensive guide to practices and research in this field,
and may help in the development of models for indi-
vidual treatment and community intervention.

The sound environment of a community consists
predominantly of the sounds emitted by road traffic,
construction work, industrial facilities, entertainment
venues, humans, and animals. Given the negative per-
ception of such a soundscape, these sounds are gen-
erally defined as noise, i.e. unwanted sound [5]. This
definition is far more complex than it seems because
it relies only on negative affective perception of the
sound. This further implies that the designation of a
particular sound as noise depends on the listener, not
on the sound itself.

Noise annoyance is a typical psychological and phys-
iological reaction to noise. It is usually described as a feel-
ing of displeasure, irritation, anxiety, frustration, or anger
caused by environmental sounds [9]. Among all the haz-
ardous environmental factors, noise is the only one that
provokes annoyance. It is well-established that noise
annoyance depends on the type of noise source, on the
characteristics of the sound emitted by the source (in-
tensity, frequency, timbre, the number of noise events)
[9,10], and on the propagation of the sound (which de-
pends on construction material, presence of greenery,
isolation barriers, etc.) [9,10,11,12]. Noise annoyance
arises primarily from personality traits, noise sensitivity,
and the attitudes toward particular noise sources [9,11].
In addition, it is related to the context of noise exposure,
mesto gde se buka javlja (kod kuće, na poslu, u školi, itd.), uslove stanovanja (orijentacija dnevne ili spavače sobe, spratnost, broj članova domaćinstva), vreme izloženosti buci (dnevni naspram noćnog perioda), dugotrajno izlaganje buci (kratkotrajno naspram dugotrajnog; kontinuirano naspram isprekidanog), kao i mere zaštite (zvučna izolacija zgrada, vrata i prozora) [9,12].

Mechanizmi koji povezuju buku iz okruženja i pojavu uznemirenja dobro su utvrđeni. Buka izaziva uznemire

nje time što maskira druge zvuke, remeti pažnju i koncentraciju slušaoca, povećava stepen fiziološke pobune

nosti, ili izaziva strah, a samim tim i „borki-ili-beži” reakcije [13,14]. Nevezano od toga koji je proces uključen u njih, ovi mehanizmi leže u osnovi i kratkotrajnih i

reakcija [13,14]. Nadalje, uznemireni bukom, igra ulogu u razvoju drugih zdravstvenih ishoda povezanih sa stresom, uključujući i poremećaje sna, povećani krvni pritisak, glavobolje, i narušenost mentalnog zdravlja i kvaliteta života [9,13,15].

Srbija je, pre deset godina, usvojila niz zakona i amandmana o zaštiti od buke u životnoj sredini, koji su obavezali vlasti da mjere stepen izloženosti buci, kreiraju mape buke, te da procenjuju zastupljenost uznemirenja bukom i druge negativne efekte prisutne u populaciji izloženim buci [16]. U pilot studiji, koju je sprovedla opština Stari grad u Beogradu, više od trćine svih odraslih ispitanika izazvala je visok stepen uznemirenja saobraćajnom bukom [17]. Iznenađujuće je to što je procenat ljudi koji su pokazali visoki stepen uznemirenja bukom, a koji je zabeležen u ovom terenskom istraživanju, previšao teoriji procene za 10 do 20%, za sve nivo buke [17].

Znak je poznat kao tolerantna na nivou zajednice, i on opisuje raskorak između epidemioloških i teorijskih procena uznemirenja bukom u populaciji [18]. Tolerancija na nivou zajednice prepoznaje uticaj gore navedenih neakustičkih faktora koji izazivaju uznemirenje bukom iz različitih izvora i kod različitih populacija [18].

Evropska agencija za životnu sredinu je nedavno procenila da 22 miliona ljudi širom Evrope pati od hroničnog visokog uznemirenja usled dugotrajne zvukove [19]. Najnovije meta-analize takođe potvrđuju vezu: izloženost – reakcija, između buke iz različitih saobraćajnih izvora i procenta ljudi sa visokim stepenom uznemirenja bukom, što je utvrđeno u više različitih studija [20]. Imajući u vidu šetne efekte buke, Svetska zdravstvena organizacija rangirala je saobraćajnu buku kao drugi po redu faktor rizika po ljudsko zdravlje u Zapadnoj Evropi, izazvanog uznemirenja vezduha [19].

Uznemirenje bukom može se lako proceniti primenom dva standardizovana upitnika sa standardizovanim skalama odgovora (tzw. verbalne i numerike skale), koje preporučuje Međunarodna komisija o biološkim efektima buke (engl. International Commission on Biological

including the place of exposure (home, work, school, etc.), housing conditions (orientation of the living room or bedroom, floor level, crowding), the time of exposure (daytime vs. nighttime), the duration of exposure (short-term vs. long-term; continuous vs. intermittent), and protective measures (insulation of the buildings, doors, and windows) [9,12].

The mechanisms linking environmental noise and the occurrence of annoyance are well known. Noise causes annoyance by masking other sounds, interrupting the attention and focus of the listener, increasing the level of physiological arousal, or by provoking fear and consequent fight-or-flight reactions [13,14]. Regardless of the process involved, these mechanisms account for both the short-term and the long-term effects of noise [14]. Furthermore, noise annoyance plays a role in the development of other stress-related health outcomes, including sleep disturbances, increased blood pressure, headaches, and impaired mental health and quality of life [9,13,15].

A decade ago, Serbia adopted a set of laws and amendments on the protection from environmental noise, which required authorities to measure noise exposure, create noise maps, and assess the prevalence of noise annoyance and other adverse effects in the exposed populations [16]. In a pilot study carried out in the municipality of Stari Grad, in Belgrade, more than a third of all adult responders were highly annoyed by road traffic noise [17]. Surprisingly, the proportion of highly annoyed persons reported in this field research exceeded theoretical estimations by 10 - 20%, for all noise levels [17]. This phenomenon is known as the community tolerance level, depicting the discrepancy between the epidemiological and the theoretical assessments of noise annoyance in the community [18]. The community tolerance level recognizes the impact of the above-mentioned non-acoustic factors that cause noise annoyance from different sources and in different populations [18].

The European Environment Agency recently estimated that 22 million people across Europe suffer from chronic high annoyance due to prolonged noise exposure [19]. The latest meta-analyses also confirm the exposure - response association between noise from different traffic sources and the proportion of highly annoyed persons, across studies [20]. Bearing in mind all the harmful effects of noise, the World Health Organization ranked traffic noise as the second risk factor for human health in Western Europe, after outdoor air pollution [19].

Noise annoyance can easily be assessed using two standardized questionnaires with standardized response scales (so-called verbal and numerical scales), as recommended by the International Commission on
Effects of Noise – ICBEN) [21], and those which have been adopted by the International Standardization Organization (ISO/Ts 15666) [22]. The respondents are asked to report the extent to which they have been annoyed (disturbed, bothered) by noise from a specific source in their home, in the previous 12 months. Both scales were successfully applied in field studies conducted in Belgrade [11,12].

However, human reactions to environmental noise often go further than mere annoyance. Rather than “suffering in silence” or seeking quieter acoustical surroundings, some persons expressed their attitudes toward noise in the form of anger, aggression, verbal complaints, and even physical conflict. Public complaints of noise are taken seriously in many countries and are included in noise legislation, so that the local authorities can apply adequate measures to resolve the noise problem. A survey of noise complaints reported on online social networks indicates that residents most often protest against neighborhood noise, traffic noise in the streets, noise from entertainment venues, and noise from construction sites [23]. It seems reasonable to conclude that the residents who complain are more annoyed than the non-complainers, but the link between individual complaints and the community annoyance level deserves to be explored further [24].

As explained above, noise annoyance arises from acoustic and non-acoustic factors. One of the latter is the individual’s sensitivity to noise. Noise sensitivity can be understood as a cluster of physiological, psychological, or lifestyle-related personality traits, which portray one’s general attitudes toward noise in everyday situations [25,26]. Noise sensitivity plays an important role in the occurrence of noise annoyance [12,27]. Furthermore, high noise sensitivity is associated with cardiovascular diseases [28], poor physical and mental health [29], and high perceived anxiety and depression [30].

The neurological, anatomical, and physiological basis of noise sensitivity is currently under investigation; the findings should not merely help researchers better understand it, but also suggest the possibilities for objective measurement of this personality trait [31]. Currently, subjective noise sensitivity is assessed with Weinstein’s Noise Sensitivity Scale [32]. This is the oldest (developed in 1978), the longest and the most complex scale in this discipline, consisting of 21 items. Each item requires the respondents to report their attitudes toward noise in various situations, and to understand their emotional reactions to a variety of sounds [32]. In spite of the attempts to reduce this scale, to make it less time-consuming for the participants and simpler to process for the researchers, it is still widely used, including the studies performed in Belgrade [11,12,30].
NEGATIVNE REAKCIJE NA ZVUK UZ UGLA KLINIČKIH ZNAČAJNIH PREZENTACIJA

Negativna reakcija na zvuk iz okruženja se generalno definiše kao smanjena tolerancija na zvuk, odnosno negativna reakcija na zvučne podsticaje koji ne bi izazvali istu reakciju kod prosećnog slušaoca [33]. Najčešća vrsta smanjene tolerancije na zvuk u kliničkom okruženju jest hiperakuzis. Hiperakuzis (engl. hyperacusis) se odnosi na negativne reakcije na fizičke karakteristike zvuka, kao što su intenzitet (glasnost) ili frekvencija (oštrina) zvuka, nezavisno od izvora, konteksta, ili značenja zvučnog podsticaja [33]. Ovaj naziv potiče od prefiksa hiper-, što znači „previše”, i grčkog korena reči -akuzis, što znači „slušna sposobnost”, odnosno „čujenje”. Osoba sa hiperakuzisom je izložena glasnoj muzici i ljudskim glasovima (objekti za jamu), i ne oseća se prijatno u društvenim situacijama gde može lako da zanemari zvukove u svakodnevnim situacijama, i ne oseća se prijatno u društvenim situacijama gde je izložena glasnoj muzici i ljudskim glasovima (objekti za zabavu, društvena okupljanja, i sl.) [34].

Svi ovi emocionalni, kognitivni i bihejvioralni aspekti inkorporirani su u upitnik hiperakuzisu, koji je osmišljen 2002. godine [34]. Zastupljenost hiperakuzisa kreće se u opsegu od 8% do 17% u različitim populacijama, u zavisnosti od uzrasta i kriterijuma koji se koriste u kliničkim kriterijumima [35]. Etiologija hiperakuzisa je i dalje nepoznata. Ipak, se pojavljuju simptomi hiperakuzisa od 8% do 17% u različitim populacijama, u zavisnosti od uzrasta i kriterijuma koji se koriste u kliničkim kriterijumima [34]. Zastupljenost hiperakuzisa kreće se u opsegu od 8% do 17% u različitim populacijama, u zavisnosti od uzrasta i kriterijuma koji se koriste u kliničkim kriterijumima [35].

A REvIEw OF humAN REACTIONs TO ENvIRONmENTAl sOuNds

A negative reaction to environmental sounds is generally defined as decreased sound tolerance, i.e. an adverse reaction to auditory stimuli that would not evoke the same response in an average listener [33]. The most common type of decreased sound tolerance in a clinical setting is hyperacusis. Hyperacusis refers to negative reactions to the physical characteristics of sound, such as intensity (loudness) or sound frequency (sharpness), independently of the source, the context, or the meaning of the stimulus [33]. The term comes from the prefix hyper-, meaning “excessive”, and the Greek root acusis, meaning “ability to hear”. Typically, a person with hyperacusis has trouble performing mental activities (reading, concentrating) in loud environments, cannot easily ignore sounds in everyday situations, and does not feel at ease in social situations where he or she is exposed to loud music and voices (entertainment venues, social receptions, etc.) [34].

All these emotional, cognitive and behavioral aspects are incorporated into a hyperacusis questionnaire constructed in 2002 [34]. The prevalence of hyperacusis ranges from 8% to 17% in different populations, depending on the age of the participants and the criteria applied [35]. The etiology of hyperacusis remains unknown. Yet, it can be associated with several diseases, including tinnitus, headache, head injury, autism, myasthenia gravis, Lyme disease, Addison’s disease, etc. [36]. It is also known that persons with hyperacusis may exhibit higher levels of neuroticism, depression, anxiety, impulsiveness, aggression, and other personality traits [35].

Another psychological phenomenon observed in clinical practice is misophonia, defined as an abnormally strong emotional and behavioral reaction to very specific sounds, independent of their physical characteristics [33]. Misophonia comes from the prefix miso-, meaning “to hate”, and the word phonia, meaning “sound”. It is, therefore, correctly translated as the “hated of sound”. Typically, a person with misophonia expresses strong distress, irritation or anger when exposed to triggering sounds, such as the sounds of breathing, chewing, swallowing, lip smacking, throat clearing, spitting, etc. [37]. These provoking sounds must come from other humans (not from the suffering persons themselves), must cause excessive discomfort and distress, must cause an aggressive reaction by the suffering person, must cause them to verbally or physically protest against the source of the sounds, or force them to withdraw from the social situation [33,37,38].

Misophonia symptoms are assessed using the Amsterdam Misophonia Scale (A-MISO-S), developed in 2013 [38]. This questionnaire requires an interview...
A REVIEW OF HUMAN REACTIONS TO ENVIRONMENTAL SOUNDS

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Negativne reakcije na zvuk, međutim, možda predstavljaju samo vrh ledenog brega u ovoj naučnoj oblasti. Negativne reakcije na svakodnevne faktore iz životne sredine sežu šire od osetljivosti na zvuk, uključujući i osjetljivost na taktline podsticaje, hemikalije sa snažnim mirisom, kao i osećaj na elektromagnetna polja [39]. Nevezano od vrste osećajnosti, osoba koja pati od datog poremećaja doživljava čitav niz nespecifičnih simptoma koji nemaju medicinsku podlogu [40]. Imajući u vidu sličnosti među simptomima i njihovu psihofiziološku podlogu, predloženi zajednički termin za sve ove osjetljivosti jeste idiopatska netolerancija na okruženje [39,40]. Buduća istraživanja trebalo bi da se usredsrede na dijagnostičke kriterijume i alate za procenu različitih tipova netolerancija na okruženje, kao i na izučavanje njihove etiologije, posledica, i mogućnosti lečenja. Ovo bi trebalo da dovede do kreiranja posebnoj životnih sredina, kao i do unapređenja javnog zdravlja uopšte.

ZAKLJUČAK

Ovaj pregled opisuje karakteristike nekoliko reakcija vezanih za izlaganje zvuку. One uključuju uznemireњe zvukom, kao najizraženiji reakцијu iz ugaла istražивања. Ovaj pregled opisuje karakteristike nekoliko reakција посветних за излагање звуку. One uključuju uznемирење звуком, као најизразенију реакцију, из угла истраживања.

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VIŠE OD TERMINOLOGIJE

Ukratko, razlikujemo nekoliko negativnih reakcija na zvuke iz okoline. Međutim, opisi nekih od ovih reakcija se međusobno preklapaju i mogu navoditi na pogaђaњe различитих феномена у наклонностима, као и у вези са звуковима. One uključuju uznемирење звуком, као најизразенију реакцију, из угла истраживања. Овациој pregled описује карактеристике неколико реакција посвећених за излагање звуку. Оне uključuju uznемireње звуком, као најизразенију реакцију, из угла истраживања.

BEYOND THE TERMINOLOGY

To summarize, several adverse reactions to environmental sounds can be distinguished. However, the descriptions of some of these reactions overlap and are possibly misleading in everyday communication, not only among laypersons, but among health professionals as well. For example, there is a wide discussion on the terminology used to describe hyperacusis, phonoaphobia, misophonia, and noise annoyance [36]. Researchers have commented on the fact that the same terms tend to be used to describe different sensations, and that different terms are often used to describe similar sensations. Thus, it is necessary to look beyond the vocabulary in this discipline, and to provide simple, unambiguous and comprehensive definitions of all sound-related health outcomes, which can be understood, interpreted and appreciated by both professionals and the general public [36].

Adverse reactions to sound, however, may only represent the tip of the iceberg in this scientific area. Adverse reactions to everyday environmental factors go beyond sensitivity to sounds, and include sensitivity to tactile stimuli, odorant chemicals, and electromagnetic fields [39]. Regardless of the type of sensitivity, the suffering person presents with a series of non-specific symptoms, without medical justification [40]. Given the similarities in the symptoms and their psychophysiological background, the proposed common term for all these sensitivities is idiopathic environmental intolerance [39,40]. Future research should focus on the diagnostic criteria and the assessment tools for various types of environmental intolerances, and the exploration of their etiology, consequences, and treatment possibilities. This should lead to the development of more positive and friendly environments, and to the improvement of public health in general.

CONCLUSION

This review elaborates the characteristics of several reactions related to sound exposure. They include noise annoyance, as the most prominent reaction from the
community perspective, and hyperacusis and misophonia, as unique phenomena, from the clinical perspective. These reactions are presented and discussed together with noise sensitivity – a cornerstone personality trait for annoyance reactions. Health professionals should focus on the development of treatment options for persons suffering from these sound-related reactions. Everyone in the public health domain faces the challenging task of introducing permanent community measures that will promote and guarantee high-quality sound environments.

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KAKO ĆOVJEK REAGIJUJE NA ZVUK U ŽIVOTNOJ SREDINI

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