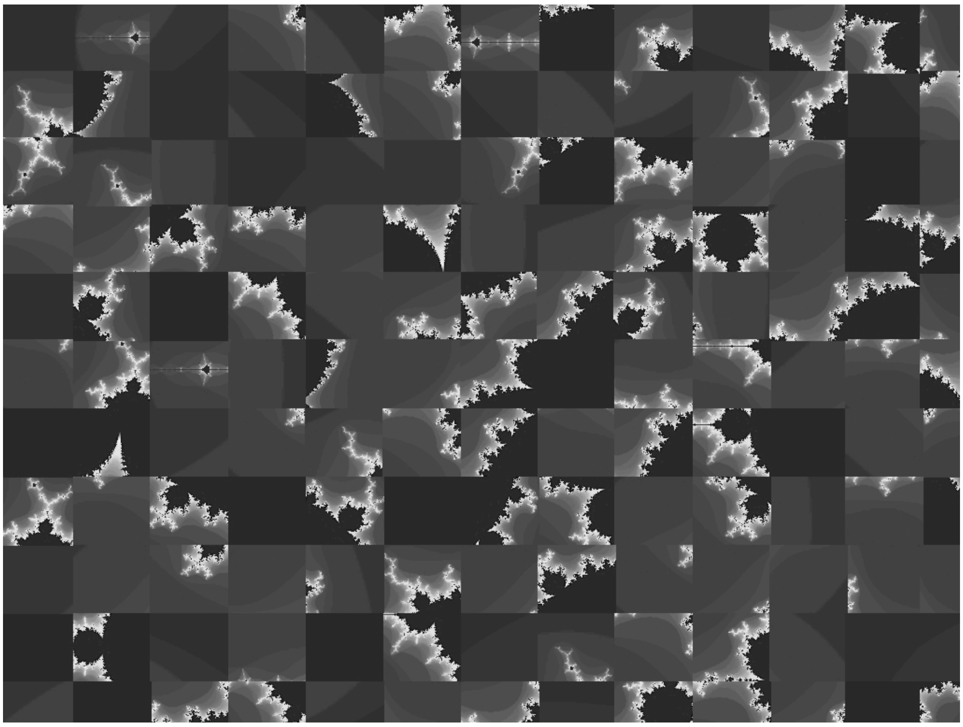

The dependence of restorative qualities in simulated environments as function of audio-visual load variations

Master's Thesis in the Master's programme in Sound and Vibration

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Abstract

This thesis explores the restorative potential in locally, common outdoor sounds combined with abstract visions; after playing a stressful computer game. The experiment is divided into four equal sessions which test the possibilities of positively and negatively ranked sounds combined with structured and non-structured images. Only self-reports are analyzed, targeted for large effect sizes. As for the investigations of the 25 male participants, the similar 'how stressed do you feel right now'-questions submitted just after the stressed induced computer game and in and after the appraisal tests yield some contradictory results concerning the level of perceived stress. The order of the presented stimuli (positive sound, structured image; positive sound, non-structured image, negative sound, structured image and negative sound, non-structured image) and its components (positive sound, negative sound, structured image and non-structured image) are analyzed as well. The outcomes indicate that the sequence matters; negatively ranked sounds alone and combined with the non-structured image provide the strongest results. Further analyses indicate that noise-sensitive persons are more affected by the negative sounds and non-structured image - compared to the noise-insensitive group.

Keywords: Auditory Stimuli, Visual Stimuli, Effect Size (η_p^2), Noise Sensitivity (Weinstein)

Contents

Acknowledgements

Welcome. And congratulations. I am very happy that you made it. It was not easy, I know. In fact, I think it was harder than you expected. To start with, for you to be here, trillions of atoms must somehow be united in a directed and peculiarly helpful way in order to create you. This is an arrangement which is so specialized and special that it has never been tested before and will only be performed this very time. During the next years (many, we hope!), these minor particles will - without any complain - spend time on the billions of fast cooperation strains which is essential for keeping you alive and permitting you to perceive the extraordinary pleasant but commonly underestimated condition we usually call existence... [Bry 03]

First of all, I would like to thank my supervisor Penny Bergman for all her support and patience with me and all my questions since I had a tendency of first knocking on her door, then entering and simply start talking...! Then I would like to send my gratitude to my examiner Mendel Kleiner for his comments on my writing progress. Also a great thanks to all other staff at the Division of Applied Acoustics, Chalmers for all your help and understanding (you know who you are!). Last but not least, I would like to send my sincere appreciation to the 25 participants who spent more than 2 h inside the test location. Thank you all for making this master thesis possible!

1. Introduction

The growing interest in environmental stress was accompanied by a rapid accumulation of evidence indicating that environmental factors could obtain substantial effects in people. Previous stress research has for instance, mostly focused on situations which threaten well-being and accordingly evoke stress. A different, though complementary, perspective on environments and stress is evident in the question of whether different environments could be designed in order to foster or hampering recovery from stress; people evaluate and react to the same environment differently. This thesis investigates the restorative potential for locally common outdoor sounds combined with structured and non-structured visions, after a demanding computer game was played. *Chapter 2. Background* provides a description of how auditory, visual as well as combined auditory and visual stimuli affects human beings. *Chapter 3. Theory* displays opinions in the field of human perception when it comes to cognition, physiological measures of emotions and subjective measures. *Chapter 4. Evaluation* presents the hypothesis and some common principles of the performed data treatment when analyzing the subjective measures. *Chapter 5. Modelling of Stimuli* supplies the auditory and visual stimuli. *Chapter 6. Test Procedure* submits a description of the procedure in the experiment. The outcomes of the experiments can be found in *Chapter 7. Results*. An account of the findings is presented in *Chapter 8. Discussion*. The most important discoveries in the investigation and some suggestions for additional work are finally shown in, *Chapter 9. Conclusion & Future Work*.

2. Background

2.1. Auditory Stimuli

Sound is one of the essential ways for humans to notice and communicate with the world. [Gid 07] Schafer has defined sounds as keynotes, signals/foreground sounds and soundmarks. Keynotes are in analogy to music where a key identifies the fundamental tonality of a composition around which the music modulates. Signals, also called foreground sounds, are intended to attract attention. Sounds which are particularly regarded by a community and its visitors are called soundmarks[1] (in analogy to landmarks). [Yan 05] The concept of soundscape[2] refers to sound variations in space and time caused by the topography of natural environment, buildings and different sound sources. [Gid 07]

Additionally, variations in the content of the sound were found to cause changes in meaning; the relationship between meaning, form and content could be described by the so called semiotic triangle. How the interpreter perceive the sound and how the person reacts depend on the level of experience and the mood of the person. Basically all measures that quantify sound in numbers describe the form of the sound; the form is in other words important for describing the sounds which the interpreter hear. The content of the sound is the information the interpreter could gain from the actual sound which on the contrary is hard (if not impossible) to quantify in numbers. [Gen 08] Due to preference, people evaluate and react to the same environment differently. Variations in sound liking could be divided into three levels; basic, macro and micro preference. In basic preference, people generally share a common opinion of enjoying nature- and culture-related sounds rather than artificial sounds. However, cultural background and long-term environmental experience play an important part in peoples' judgement of sound taste. People from different backgrounds show rather different tendencies in terms of sound liking, according to macro preference. Although, in micro preference,

[1]Soundmarks could be classified as passive or active. Passive soundmarks are intentionally designed functional and/or aesthetic elements with pleasant sounds (such as fountains), whereas active soundmarks are sounds generated by interesting activities (for instance, skateboarding). [Yan 05]

[2]Soundscape was denoted an emotive and not an intellectual environment. The assessment of soundscape is part of sensory aesthetics research which involve the arts of discrimination and making judgements and is concerned with the pleasurableness of the sensations people receive from the environment. [Yan 05]

personal differences occur within the same cultural background and long-term environmental experience. [Yan 05]

Physiological and psychological factors are present when humans listen. Individual noise sensitivity could be characterized as a stable personality trait that captures attitudes towards a wide range of environmental sounds. For instance, individual annoyance reactions to noise were found to depend on physical attributes of the noise, attitudes towards the noise source and the personal characteristics of receiving. Small but systematic differences were also found in peoples' verbal loudness estimates and in ratings of the unpleasantness of natural sounds. This suggest that what is psychophysically tractable in the concept of noise sensitivity might primarily reflect attitudinal/evaluative rather than sensory components. [Yan 05]

2.2. Visual Stimuli

Since eyes submit unfiltered information of data to the brains, the visual intelligence must (thereafter) be separated in details belonging to figure and ground which is sorted into meaningful knowledge during the process. The first and most important question is in other words what should be perceived as the object and what should be recognized as the shapeless ground? There are no right and wrong answers; sometimes, different interpretations provide different solutions. When people look around, attention is first payed to lines and contours; crossings and borders. [Sto 07] It is well-known that disparities in lines and shapes in the environment draw attention as the human visual processing system is specialized to detect contrasts. [Ped 08] For adults, the complexity of patterns is affected by the number of elements, turns and amount of contour; in randomly generated patterns, complexity varies systematically with pattern quality but is reduced by the introduction of organization. The importance of contours is viewed in a simple line which immediately could be associated to a certain object for instance, a logotype. The perception of contours is so obvious that the brains sometimes fill in the outlines even when not present. Indeed, contour could be described as the fundamental underlying variable in perceived complexity, setting an upper bound value of complexity which is then reduced by the detection of organization. Nevertheless, structured patterns were found to be judged as less complex compared to unstructured pattern of approximately equal contour. [Chi 75]

Vision is also able to work simultaneously; targets could be interpreted for the contents but new sights could appear when replacing the objects since new understandings could be gained due to the extraordinary ability to abstract in the brains. As long as the outer well known shape of an item is identifiable, the real contents of the exterior parts seem to be of no importance. Nevertheless, it is possible to govern the vision; if persons start looking at the overall image and then the parts, or the other way around, is controlled by location and dimension of the different fragments in the picture. Moreover, images could live double lives, the first impression could supply one explanation which is altered as soon as the additional information is perceived. This extra knowledge provides a complete reinterpretation of the overall impression; the new information is now stored and it is no longer possible to return to the first impression. [Sto 07]

However, vision's largest drawback is that humans must move constantly and orientate in a 3D world but are only able to see in 2D, augmented by stereoscopic processing. The reproduction that are projected on the lens towards the retina on the back of the eye is as flat as a photo; there are no information concerning the spatial depth. Depth is constructed by (not without trouble) secondary facts such as lights, shads and storing but also with help of empiricism; previous experiences. It is particularly easy to mislead the observer on this weak point; a well-made 2D production could be really hard to separate from the real (3D) world. Another way to attract the beholder to see more than needed is to use a clever and precise stage where the camera decides the eye view. This provides the spectator with no other option than to create a meaningful connection between the fore- and background which cancels out the spacial difference. [Sto 07]

Furthermore, different views of objects such as contours, shapes and sizes are stored in the apperception system. The feature-integration theory proposes that characteristics such as colour and shape are registered automatically and in parallel in the visual field. To bind factors together within an object (such as a red apple), the viewer must focus attention towards the object. Due to capacity limits, attention could only be focused on one spatial region at a time. When people detect a target in a rapid stream of visual stimuli, subsequent targets tend to be missed in the next 400 to 600 ms interval. This phenomenon is known as the attentional blink. Emotionally arousing (compared to neutral) stimuli was found to be more resistant to the attentional blink. When searching for two features that co-occur within the same visual object, people typically need to look at each item one at a time. In contrast, when the task is to find any target that contains one of the two features, increasing the number of articles do not slow down peoples' search much (Treisman et al.). This suggests that humans do not have to look at each object in order to detect individual characteristics.[3] [Mat 07]

[3] To remember an event accurately, the various elements must be bound together and maintained in the configurations in the memory [Mat 07]

2.3. Auditory & Visual Stimuli

Preference is also influenced by coherence between sound and image. In general, projects in environmental preference and attitude confront the difficulties human face when expressing feelings, emotions or ideas which is found to be exacerbated in the case of sound. When auditory signals and visual stimuli are presented simultaneously, people were found to generally respond to the visual input (and are sometimes not aware of the auditory contribution). [Car 99]

Although, two main functions of sound in the landscape were found regarding the provision of information which complements the visual data. The first function is related to the interpretation of the identified sound(s) and the second to the abstract structure of the sound information. As for the first role, the interpretation, natural sounds are mostly rated positively and increase the appreciation of natural and artificial settings.[4] Many natural sounds (especially the sound of water[5]) help to enhance the images of natural environments and urban spaces by projecting a meaning other than that derived from the actual picture. The findings on natural soundscape are consistent with the visual landscape; it was found that natural landscapes are particularly sensitive to the presence of human sounds. However, any incongruence between sound and vision in a landscape quite clearly diminishes the values assigned to it, leading to confusion and indicates the need to conserve singular soundscapes.[6] As for the second function, the abstract structure, the information content of sounds are found to be closely associated with its physical structure in terms of the ability to produce alarms or alerts. This could be regarded as the most primitive function of the auditory perception, considering how the information is processed (in the brains). [Car 99]

Nevertheless, the influence of auditory and visual stimuli on environmental perception remains an unsolved question since images could modify the effects of sounds and also determine the environmental quality[7] [Gif 82]. Seeing a noise source was additionally found to increase the noise annoyance in some experiments (Bangjun et al.) [Ped 08].

[4]Natural sounds are normally related to gentle variations in volume and tone, natural landscapes are associated with an abundance of vegetation [Car 99]

[5]which was found to provide greater ability (compared to human sounds) to induce states of relaxation (Bjork) [Car 99]

[6]In such situations, sounds are often perceived as noise [Car 99]

[7]Examples of definitions of environmental quality; 'an environment of high quality conveys a sense of well-being and satisfaction to its population through characteristics that may be physical, social or symbolic' (Lansing et. al.). Environmental quality could be defined as an essential fraction of the broader concept of 'quality of life'; the basic qualities health and safety in combination with aspects such as cosiness and attractiveness (RIVM). [Kam 03]

3. Theory

3.1. Cognition

Humans are often said to be the most emotional animal. [Kap 08] Emotional arousal increases the likelihood that items will be remembered but arousal sometimes enhances and sometimes impairs memory binding.[1] According to the cue-utilization hypothesis, emotional arousal leads to narrowing of the attention that benefits central information at the expense of peripheral information. [Mat 07] Furthermore, arousal theories imply that recuperation from excessive arousal (or stress) occurs more rapidly in settings that have low levels of arousal increasing properties such as complexity, intensity and movement. Consistent with the arousal perspective, studies (Berlyne & Lewis and O'Leary) using abstract (non-environmental) visual displays have found that preferred level of complexity declined when individuals were stressed or anxious. Since natural settings tend to have lower levels of complexity and other arousing properties compared to urban environments, arousal theories also suggest that nature should have (comparatively) restorative influences on stress. [Ulr 91]

An alternative theory[2] concerning restorative environments emphasizes the physiological and emotional changes that could occur while viewing a scene after a situation involving challenge or threat. The theory proposes that perceiving particular qualities and contents in a landscape could support psychophysiological stress recovery. Moderate depth and complexity, the presence of a focal point, gross structural qualities as well as natural contents (such as vegetation and water) could evoke positive emotions, sustain non-vigilant attention, restrict negative thoughts and aid the return of autonomic arousal to more moderate levels. In this context, humans are thought to be biologically prepared to respond positively to environmental features which signal possibilities for survival (which assumes an evolutionary basis for aesthetic and restorative responses to some natural scenes). [Har 03]

Furthermore, evolutionary perspectives state that because humans have evolved over

[1] Arousal-induced enhancement is found to rely on amygdala; activation of the amygdala by emotionally arousing stimuli enhances memory for central information even when the actual information is not arousing [Mat 07]

[2] Ulrich seems to call the theory a psychoevolutionary theory [Ulr 91]

a long period of time in natural environments, people are to some extent physically and (perhaps) psychologically adapted to natural, as opposed to urban, physical settings. In this context, humans have an unlearned predisposition to pay attention and respond positively to natural content (for instance, vegetation and water) and other characterizing configurations of settings which are favorable for survival or ongoing well-being. [Ulr 91] Studies have shown that contact with natural (compared to urban field) settings has the ability to significantly affect physiological systems (reduced blood pressure), cognitive abilities (improved performance on attentional test) and emotional states (increased feelings of happiness and declined feelings of anger/aggression) (WHO and Őhrstrőm et al.). [Gid 07] Nevertheless, in some experiments, urban scenes have received higher mean ratings of perceived restoration potential compared to natural scenes (Herzog et al.). [Har 02] Although, the existing knowledge base indicates that supportive environments speak to the human desire to explore, understand, enhance competence, be a part of the solution and to participate with others towards meaningful goals. [Kap 08]

If natural environment reduces emotional and physiological arousal and makes the subjects less spatially selective, it could be expected that humans would perform better on tasks requiring a broad attentional focus (Easterbrook). This could involve processing of multiple stimuli (or cues), rather than a simple task. On a simple job (involving few stimuli), it could be expected that subjects who are more aroused will perform better. [Lau 03] Overload perspectives provide a rather different explanation of why recovery following a stressor could be more rapid when external stimulation is comparatively low; high complexity and other stimulating and demanding processes are slowing down or hindering improvement from the stressful situation. [Ulr 91] It was noted that conditions of extreme demand accompanied by strong negative emotions resulted in a deterioration of performance (when predictions of achievements under fearful situations were evaluated) (Lazarus, Deese & Osler). At the same time, stressful situations were found to occur when the motivated behavior was prevented by circumstances (Lazarus & Folkman). Conditions of high motivation complemented by frustration, failure or extreme danger were seen as stressful and accompanied by negative emotional states. Meanwhile, conditions favoring motivated behavior and successful achievement of goals were regarded as non-stressful and conductive to positive emotions. Loss of control over the environment became a critical determinant of psychological stress reactions (Averill). [Cac 00] Nevertheless, the arousal, evolutionary and overload perspectives converge in implying that everyday threatening natural environments, compared to most urban settings, tend to foster greater stress recovery.

A central tenet of appraisal theories is the claim that emotions are elicited and differentiated on the basis of a person's subjective evaluation or appraisal of the significance of a situation, object or event on a number of dimensions or criteria. According to the theory, stress and emotions are obtained by a two-stage process of appraisal; primary and secondary appraisal (Lazarus). Primary appraisal is characterized as the significance of an event for personal well-being and secondary appraisal could be described as the ability to cope with the consequences of the event.[3] In addition, the dynamic nature of appraisal was acknowledged by specifically allowing for re-appraisals of objects or events based on new information or re-evaluation. Appraisal theories neither claim to be able to explain all types of affective phenomena (for instance, reflexive reactions, preferences or moods) nor pretend that the occurrence of the altered stages could not be explained by mechanisms other than appraisal (such as memories, proprioceptive feedback or induction by drugs). Furthermore, appraisal theories do not claim to provide comprehensive models of emotion. It was suggested that appraisal theories have largely neglected the restoration needs and social context in which emotions are obtained; possibly requiring appraisal criteria relevant to relationships and interaction strategies. [Sch 99] (and [Har 06])

3.2. Physiological Measures of Emotions

Physiological measures involve registering changes in biological systems, caused by emotional processes (which include facial expression or other muscle activity, patterns of gaze, voice, autonomic nervous system and endocrine activity) - which could be so small that the differences are not noted in the behavioral level. However, most of the measures could be performed by means of simple, non-invasive techniques including video recordings of facial expressions and facial electromyography (EMG), measuring hand tension, recording of vocal expression... etc. [Taj 08] Physiological stress could also be measured by comparing cortisol (hormone) levels in saliva samples, collected pre- and post-exposure. [Lju 07]

Cortisol hormone has two purposes; serving normal metabolic and diurnal functions and coming into play in times of stress.[4] The diurnal cycle of cortisol is tied to the

[3]A perceived event is evaluated for its threat value which depends on how much it interferes with the person's commitment to a course of actions or beliefs about how the environment is structured. When an event was judged to be a threat to well-being, the individual undertakes a second-stage appraisal to consider courses of action as well as coping resources which could result in diminished or enhanced judgements of global threat - according to the known or perceived effectiveness of the coping resources at hand. In other words, the model includes processes that occurs both in and out of awareness - based on the individual's history of conditioning. [Cac 00]

[4]In conditions of stress; heart beat increases, blood vessels contracts under rising blood pressure, bronchus broadens and tension in muscles as well as alertness increase. Meanwhile, saliva production and activity of intestine decrease. [Nationalencyklopedin]

sleep-wake cycle rather than the light-dark cycle (Van Cauter et al.) (with a peak beginning just prior to awakening, a nadir in the late evening and early morning and additional rises during the day related to meal times). [Cac 00] During stress, high levels of cortisol are produced to apply regulatory control over stress related processes which would otherwise prove injurious since prolonged high levels of cortisol could damage hippocampus (resulting in cell loss and decrements in memory). Concentration levels of cortisol were found to be sensitive to acute stressors in daily activities for instance, when people work under high effort with a demanding task during noise exposure but lack of effort could decrease reaction times (Tafalla & Evans). [Lju 07]

Different effects on natural and urban environments could appear quickly in physiology (within four minutes) and emotional states (within 10 - 15 minutes). In contrast, environmental effects on performance have not consistently emerged after 15 - 20 minutes but appeared after longer periods. Over an extended period, some of the initial effects could dissipate. [Har 03] As for participants' endogenous arousal level, it is usually measured by sampling amounts of stress hormones which rise and fall relatively slowly. [Mat 07] Heightened emotional arousal (such as induced by a stressor) has both immediate and longer lasting effects.[5] Any study that tests memory immediately after an arousing session is affected by the increased levels of stress hormones which could reduce recovery with potentially greater information impairments for emotional, compared to neutral, items (Roozendaal and Kuhlmann). [Mat 07] Stressor onset will activate a cortisol response in 10 - 15 minutes for a potent stressor (for example, a mild electric shock), moderate mental stressors could take 20 - 30 minutes. Owing to the slow response of the hypothalamic-pituitary-adrenocortical (HPAC) axis, stressors of longer duration (more than 15 minutes) are more likely to result in a reliable cortisol response than brief ones. After a stressful experience, peaks in cortisol level typically occur 20 - 30 minutes later. Increased cortisol levels were found up to one hour after the experiment. [Cac 00]

[5] Within seconds, stress activates the sympathetic nervous system which triggers secretion off catecholamines such as epinephrine (adrenaline) and norepinephrine. Within minutes, stress activates the hypothalamic-pituitary-adrenal (HPA) axis. The axis begins in the brains with the release of hormones at the hypothalamus, stimulating pituitary generation of adrenocorticotropic hormone into the bloodstream. When the hormone reaches the adrenal gland, it initiates the release of glucocorticoids (or cortisol in humans) which serve as a negative feedback regulatory function to help terminating HPA responses to stress. [Mat 07] In other words, cortisol's secretion is regulated by three primary structures; the pituitary gland, the hypothalamus and the hippocampus. (Cortisol is the primary hormone secreted by the adrenal cortex). [Cac 00]

3.3. Subjective Measures

Subjective measures assess the consciously felt emotional experience; the personal representation of emotions or the emotional feelings which rely on the individual's capacity to be aware of and to be able to express felt emotions. [Taj 08] The Symptoms of Illness Checklist (SIC) was developed to study psychological influences on physical symptoms of illness. SIC has also proved to be significantly associated with other health matters for instance, to correlate with diverse measures of stress as well as hassles and negative life events but not uplifts or positive life events. Nevertheless, SIC is sensitive to individual change in physical symptoms over a two-week period (Olsen and Bloch & Bloch). In comparison to the individual SIC components, the correlation of the total SIC score with stress measures was found to be almost always the highest possible. [Sto 09] Stress reactivity (and cortisol production) could also be influenced by age, sleeping cycle and sleeping stage structure, increased with increasing body weight or by smoking, be responsive for an increased hypertension risk and altered by psychological factors such as suppressed in post-traumatic stress disorder and elevated in depression (for instance, Brandtstadter et al.). [Cac 00] Normally, the number of physical symptoms increase with age. The actual instructions for completing health questionnaires could also increase the correlation between health and stress. For instance, because there is a reciprocal relation between stress and illness, the instructions for stress questionnaires (or the stress item itself when asked about illness symptoms) could also influence the correlation. [Sto 09]

Considerable effort was invested in attempts to identify personal characteristics underlying sensitivity to noise. Community noise surveys generally find no relationship between annoyance and sex, age, education, income or occupational status (Langdon). Some early works (Bennett) within the field observed that neurotic patients were more disturbed by noise compared to normally healthy persons but additional work (Broadbent) finds little evidence that noise sensitivity is related to neurotic tendencies in normal populations. Nevertheless, correlations with the noise-sensitivity scale and academic test data as well as personality inventories suggest that noise-sensitive students are lower in scholastic and intellectual ability and have fewer social skills (for instance, appearing less comfortable and effective in social situations as well as lower in dominance and capacity for status) and therefore have a greater desire for privacy, compared to less noise-sensitive students. Additional findings indicate that noise-sensitive persons tend to be critical towards the surroundings and express annoyance about situations generally recognized as irritating. [Wei 78] However, variations in sound sensitivity do not seem to be associated with differences in influence ratios. [Gif 82]

Further work suggest that introvert (persons) have chronically higher levels of central nervous system arousal than extraverts and that while introverts become excessively aroused by noise, noise causes extraverts to reach a more optimal level of arousal (Eysenck). There is considerable evidence that introverts and extraverts perform differently in the presence of noise although, when appearing, the divergences are not always found nor present in a consistent, interpretable pattern (Hockey). Furthermore, studies have found that introverts will spend more effort avoiding noise during task performance and that extraverts more often request short periods of noise during the performance of a boring (observing) task (Davies et al.). A modest link was also found between introversion and noise sensitivity but it could not be clarified whether it was determined by the direct, arousing effects of noise on the central nervous system (physical stimuli) or the fact that noise frequently has interpersonal significance and is seen as intrusion by persons who are ill at ease in social settings and therefore values privacy higher (psychosocial stimuli). [Wei 78]

Furthermore, environments were suggested to be located in a circumplicial space[6] with two primarily dimensions; pleasure and arousal (Russell et al.). Environments (and other stimuli) evoke emotional states which could be located anywhere in the 2D space described by the pleasure and arousal dimensions which are presumed to be orthogonal. [Gif 82] Kaplans' Attention Restoration Theory (ART) provides four factors; being away, fascination, extent and compatibility which are expected to hold at high levels in natural environment. According to ART, restoration from directed attention fatigue occurs with psychological distance from routine mental contents (being away) in conjunction with effortless, interest-driven attention (fascination), sustained in coherence ordered environments of substantial scope (extent) when personal inclinations match the demands imposed by the environment as well as the environmental supports for intended activities (compatibility). [Har 06][7] The key concept of ART is directed attention; an attentional mechanism that is largely under intentional control and seen as a precious and fragile component, preservation requires it not to be used unnecessarily since its recovery is aided by spending time in environments where competence is not dependent on its use. [Kap 01] However, ART says little about social aspects of the environment and restoration needs that might enable and enhance restoration. [Har 06]

As a consequence of the incompatibility between intended activities, environmental supports for the activities and demands imposed by the environment, individuals could suffer decrements in psychological resources such as the ability to direct attention. To regain full effectiveness in functioning, opportunities are needed in order to restore the resources which were reduced. [Har 96] Restoration is a process tied to

[6] in the affect-based Russell system [Gif 82]
[7] see also for instance, [Har 96] and [Har 03]

some preceding deficits and antecedent conditions from which recovery is made. The restorative potential seen in a place varies among individuals and over time. [Har 97] Environments which enable the opportunities to restore could be called restorative environments. Restorative environments help people review psychological resources, depleted in environments that do not fully support intended purposes, needed for effective functioning. [Har 96] The design of restorative environments could be aided and the understanding of the underlying theory improved with an instrument for measuring psychological factors thought to work in restorative experiences. [Har 96], [Har 97] The goal with the perceived restorativeness scale was to reach a valid and reliable instrument that could represent the constructs being away, fascination, extent and compatibility (from ART) as well as distinguish between environments with different restorative potentials.[8] [Har 96]

[8] In the restoration test, extent was replaced by coherence in order to not combine the legibility items (associated with extent) and the compatibility (or coherence) items [Har 97]

4. Evaluation

4.1. Hypothesis

Analysis of individual sound elements shows that acoustic comfort evaluation is greatly affected by the type of sound source. When a pleasant sound (for instance, music or water) dominates the soundscape of an urban open public space, the relationship between the acoustic comfort evaluation and the sound level is considerably weaker compared to other sound sources (such as traffic and demolition sounds). In other words, the introduction of a pleasant sound - especially as a masking sound, could considerably improve the acoustic comfort even when the sound level is rather high. [Yan 04] Natural sounds are mostly rated positively, compared to urban sounds. [Car 99] Some experiments regarding the influence from natural as well as urban environments on the psychological systems showed contradictory results considering restoration (Herzog). [Har 02] Additionally, it is possible that differences exist due to cultural or environmental context. For instance, for noise responses, studies have indicated that noise could be better tolerated in certain cities and countries (compared to corresponding sites) (Takano et al. and Wong). [Gid 07] A factor analysis has shown that acoustic environment is one of the main factors which influence the overall comfort in an urban open public space. It was also displayed that auditory and visual feelings always appear in the same factor which suggest interaction between the two aspects of audio and vision (which is important in design considerations). [Yan 04]

According to Ulrich's (psychoevolutionary) theory; perceiving moderate depth and complexity, the presence of a focal point, gross structural qualities and natural contents (such as vegetation and water) in a scene could evoke positive emotions, sustain non-vigilant attention, restrict negative thoughts and aid the return of autonomic arousal to more moderate levels. [Har 03] In order to further test Ulrich's theory, abstract pictures will be used to eliminate the somewhat contradictory results from the natural contents and instead focus on the other parameters; depth, complexity, focal point and structural qualities which would be easier to alter and test by using abstract scenes. Furthermore, consistent with the arousal perspective; studies using abstract (non-environmental) visual displays have found that preferred levels of complexity declined when individuals were stressed or anxious. [Ulr 91]

Therefore, the hypothesis is that creating a non-natural scenery consisting of a moderate depth and complexity together with a focal point in combination of gross structural qualities which is displayed together with preferred sound combinations (sounds used as a background sound to mask additional (characteristic) sounds) - should provide a decrease in the arousal level from a stressed condition.

4.2. Data Treatment

When designing an experiment, a researcher usually has a specific set of hypotheses to test. The first step in evaluating a scientific hypothesis is to express the theory in the form of a statistical hypothesis. A statistical hypothesis is a statement about one or more parameters of a population or the functional form of a population - for instance, that the population is greater than a certain value. Another statistical hypothesis could, for instance, be formulated that the mean is equal to or smaller than a certain value. These hypotheses are mutually exclusive and exhaustive; if one is true the other must be false. Furthermore, the hypotheses are examples of the null hypothesis and the alternative hypothesis where the null hypothesis is the one which tenability is actually tested.[1] [Kir 95]A level of significance is the probability (p) of committing an error in rejecting the null hypothesis. An approach of assessing practical significance of research results is based on differences among means. If the difference (which is wanted to be detect) is divided by the population's standard deviation (SD), the quotient is similar to a standard score and the (relative) measure is known as the effect size (η_p^2: partial eta squared); it expresses the magnitude of the difference in SD units of the within-group population SD. [Hop 00]

SD around each group's mean value indicates the spread of the measurements in the group and is therefore useful for describing the distance between the mean values. If the variances in the groups are homogenous, SD of either group could be used in calculating the effect size. If there is an experimental group, i. e. a group in which a treatment is being tested, and a control group - SD of the control group should be used. If the sample size of the control group is large, SD will be an unbiased estimate of the population. [Hop 00] When the sample size is small or when there is no control group, the pooled SD which is the average of the root-mean-square (RMS) value of the SDs, should be used.[2] [Pea 08]

[1] If, on the basis of the test, the null hypothesis is rejected - only the alternative hypothesis remains true [Kir 95]

[2] In general, differences larger than three SD from the mean score could be disregarded. Anything less than 0.2 SD is not worth worrying about. [Hop 00]

The effect size between two independent groups is calculated as: [Pea 08]

$$Effect\ size = \frac{(Mean_2 - Mean_1)}{SD} \tag{4.1}$$

Effect size refers to the idea that one variable has an effect on another variable. [Hop 00] A small effect size is known as 0.2, 0.5 is considered to be a medium effect size and 0.8 is treated as large. When there are three or more means, 0.10 is regarded to be a small effect size, 0.25 is estimated as medium and 0.40 or larger is recognized as a large effect size.[3] [Kir 95] When dealing with a spread of numbers, the numbers could be thought of as representing values of some characteristic for different subjects. Nevertheless, the integers could also display a repeatedly measured single subject. In order to separate the events, between-subject variation and within-subject variation is used to distinguish between the types of spread where within-subject variation is used for presenting useful measures of reliability. [Hop 00]

Furthermore, conclusions about differences could be wrong in two ways. First, one might wrongly decide that differences are present when in fact absent (Type I error) - which is feared by engineers. Second, one might suppose that differences are non-existing when the opposite is truth (Type II error). [Lev 86] In many research situations, the cost of committing Type I error could be large compared to Type II error. It is apparent that costs associated with making the errors must be known before a rational choice could be made. Unfortunately, researchers in the behavioral sciences are generally unable to specify the costs related to the two errors. The problem could be resolved by using the conventional but arbitrary 0.05 (or 0.01) level of significance. [Kir 95] Furthermore, a 0.05 level of significance often produce a higher risk of Type II error, compared to Type I error. [Lev 86] Nevertheless, the only time to really worry about getting the Type I error rate is when examining effects in the provided data. The more effects that are scrutinized, the more likely that exaggerated effects will be displayed. The simplest adjustment for the bias effect is called Bonferroni; [Hop 00] the most powerful tool to control Type I error testing hypotheses for a priori nonorthogonal contrasts among means is known as the Holm-Bonferroni procedure which could be used with F statistics. F statistics which is used to test the null hypothesis when analyzing variance, could be described as the ratio of error and treatment effects. According to the ratio - the smaller the sum of the squared effects, the larger the F statistics and the greater the probability of rejecting a false null hypothesis. [Kir 95]

Covariance (similar to variance) is the mean value of all pairs of differences from the

[3] When results of significance tests are reported, a measure of the accounted variance (which is the mean value of all differences from the squared mean) or the relative size of the treatment effects should always be included [Kir 95]

mean for an event multiplied by the differences from the mean for that event. If the two events are not closely related to each other, the covariance is small and the correlation is small. If, on the other hand, the events are closely linked, the correlation is almost one. [Hop 00] A covariance matrix is defined by assuming that all population variances on the main diagonal and all population covariances off the main diagonal are equal; such a matrix is said to have compound symmetry (and is called a Type S matrix). Compound symmetry is a sufficient condition for randomized block statistics to be distributed as F when the null hypothesis is true; compound symmetry is not, however, a necessary condition. When the condition is satisfied, the matrix is said to be spherical.[4] On the other hand, when the sphericity condition is violated - the true F statistics could be approximated by an F statistics with reduced degrees of freedom (df). The term df refers to the number of scores whose values are free to vary. Epsilon (ϵ) is a number that depends on the degree of departure of the population covariance matrix from the required form. When the sphericity condition is satisfied, the value of ϵ is one, otherwise less than one. In any practical situation, the value of ϵ is unknown. However, a satisfactory estimate of ϵ could be obtained from the sample covariance matrix. The $\hat{\epsilon}$ is biased and the extent of the bias increases as ϵ approaches one. The use of $\hat{\epsilon}$ is recommended but the computation of $\hat{\epsilon}$ is tedious. Nevertheless, the need to compute $\hat{\epsilon}$ could be avoided by using Greenhouse-Geisser conservative F test. The conservative F test consists of investigating a treatment with $\hat{\epsilon}$ set equal to its lower bound. If the F test is significant, the adjusted F test will also be significant. A significant F statistics for treatment effects in a completely randomized design indicates that there is some association between the dependent and independent variables and that at least one treatment effect is not equal to zero. On the other hand, if the conservative F test is not significant - it is necessary to compute the adjusted F test. [Kir 95]

[4] A number of statistics were proposed for testing the hypothesis that satisfies the sphericity condition [Kir 95]

5. Modelling of Stimuli

5.1. Auditory Stimuli

Sound samples were collected in 2009 in common and popular places in and around Gőteborg (February - March).[1] The sound files were divided into three background sounds as well as four characteristic sounds and some additional mixing were performed in order to increase the wanted (and decrease the unwanted) snippets. Background sounds consisted of pouring water/waterfall sounds (from a small brook), an outdoor fan-motor for a ventilation system and different traffic sounds (trams, busses, trucks, cycles etc.). Characteristic sounds contained jogging persons (on moist sand/-grabble paths), bird song and the ticking sounds from traffic lights indicating when one is not allowed to cross the street by foot, as well as tram sounds (acceleration/deceleration and squeaking). When combining the samples, 12 sound files were created called A.mp3 to L.mp3 which were 15 minutes long - each consisting of a background and a characteristic sound. The sound files are described in Table 5.1. In the sound files, background sound is always present. After a minute, the characteristic sound is heard as well for 1.5 minute then ended. Only the background sound is thereafter displayed for the next minute before the characteristic sound could be heard again (in combination with the background sound) for another 1.5 minute before ending and so on... The sound files were looped without break. According to the hypothesis, natural (pleasant) sounds (like water) as well as urban (unpleasant) sounds (such as traffic and motor) are going to be presented as background sounds - the same mixture applies to the characteristic sounds.

5.2. Visual Stimuli

As for vision, photographs were accepted as valid representations of environments for research on environmental assessment. [Het 93], [Har 99] This suggests that an image could be projected on the screen and used as the visual stimuli, instead of displaying a real photo. Two (greyish) images were therefore created to be used during the test; one

[1] The intention was that the sounds should not be heard for the first time nor characteristic for particular locations (or events) within the city

Table 5.1.: Displayed sound files; description of auditory stimuli

Sound File (Name)	Background Sound	Characteristic Sound
A.mp3	Water	Tram
B.mp3	Fan	Tram
C.mp3	Traffic	Tram
D.mp3	Water	Jogging
E.mp3	Fan	Jogging
F.mp3	Traffic	Jogging
G.mp3	Water	Bird
H.mp3	Fan	Bird
I.mp3	Traffic	Bird
J.mp3	Water	'Mr Walker'
K.mp3	Fan	'Mr Walker'
L.mp3	Traffic	'Mr Walker'

showing the original Mandelbrot fractal (denoted structured) and the other displaying a rectangularly cut version of the previous image where the pieces were randomly distributed (denoted non-structured). As a comparison to the hypothesis, the first (structured) picture provides a scene with a moderate depth and complexity together with a focal point in combination with gross structural qualities. In the second image, these criterions are non-existing. Figure 5.1 and Figure 5.2 show the pictures in question. In order to exclude the influences of colour, the two images were designed to be greyish. It is uncommon for people to be totally colour-blind; instead, colour-blind persons see differences in brightness. The colours most people see when when an object is illuminated are the ones which are reflected back.[2] Normally, humans cannot see greyish colours; grey is actually a defect that becomes present during the observation. Grey is particularly perceived in cities and unusual in nature. [Ras 94]

[2] A surface that reflects all wavelengths appears to be white whereas the exterior that absorbs all wavelengths looks black [Ras 94]

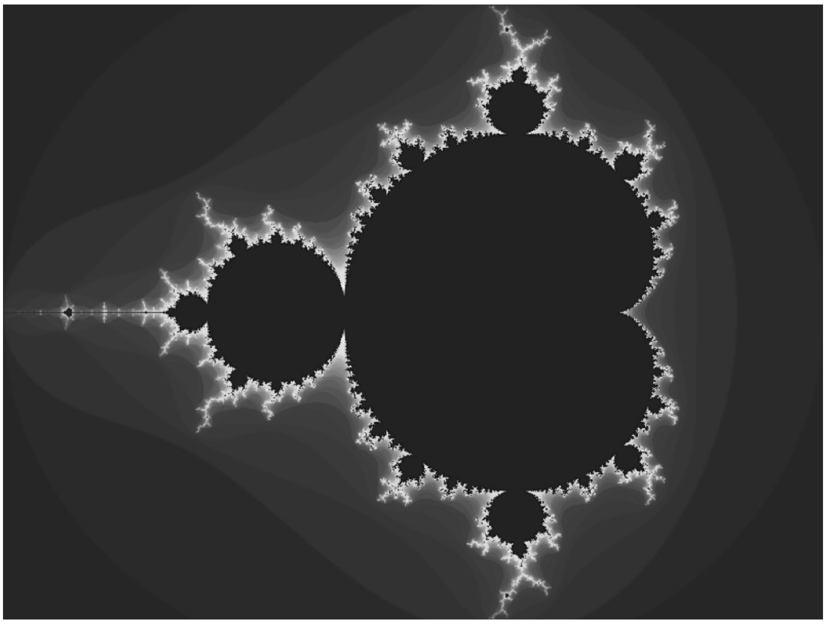

Figure 5.1.: Original Mandelbrot fractal (structured; S)

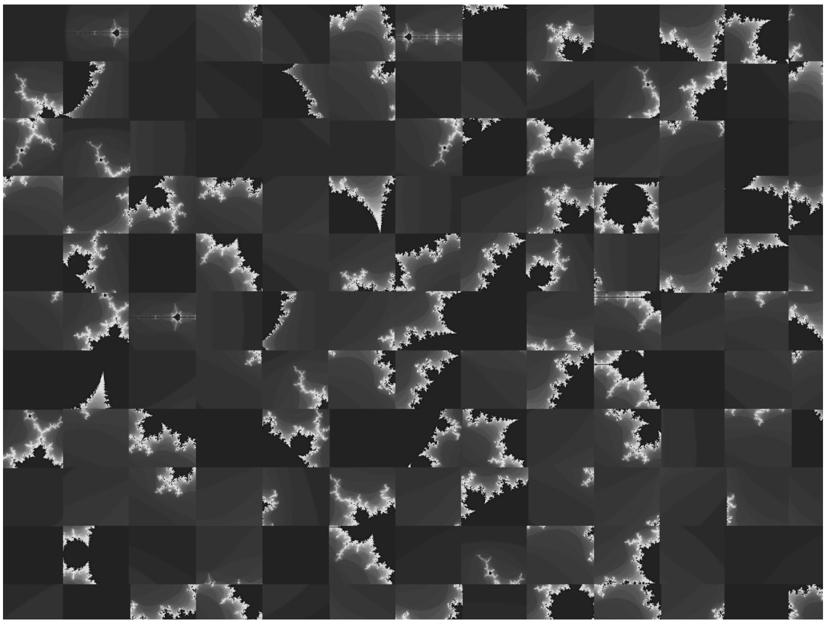

Figure 5.2.: Rectangularly cut and randomly distributed Mandelbrot fracal (non-structured; N)

6. Test Procedure

6.1. Compact Format

Table 6.1.: Procedure (checklist) for session 1; order 1 - 19 (for session 2 - 4; repeat paragraphs 12 - 19 for each part) - for participants 3 - 25 (participants 1 - 2 underwent a slightly changed procedure)

Order	Event
1	In kitchen area: gurgle
2	In test area (from now on): Introduction
3	Submit personal information
4	Practice VR-game
5	Question: How stressed do you feel right now?
6	First cortisol measurement (reference)
7	Rank sound files
8	Answer Weinstein test
9	Answer SIC tests (2 parts)
10	Question: How stressed do you feel right now?
11	Second cortisol measurement (about 10 minutes after first cortisol measurement)
12	Play VR-game (for less than 10 minutes)
13	Question: How stressed do you feel right now?
14	Third cortisol measurement (10 minutes after second cortisol measurement)
15	Answer Restoration test
16	Answer Visual test
17	Answer Appraisal test
18	Question: How stressed do you feel right now?
19	Fourth cortisol measurement (20 minutes after third cortisol measurement)

Copies of the 'how stressed do you feel right now'-question, Weinstein, SIC, restoration, visual and appraisal tests can be found in B. Questionnaires.

6.2. Extended Format (Description)

The teaching lab at the Division of Applied Acoustics, Chalmers was used as the test location.[1] The experiments were performed between June 30 and July 25, in 2009. Since saliva is a convenient and unobtrusive specimen source for cortisol measurement, and the menstruation cycle influences the cortisol levels, only male participants were asked to contribute in the test. Due to the work load, 25 men were advertised for in total to participate (mostly undergraduate students replied). Men (and especially younger men) are producing more cortisol across the diurnal cycle and are more stress-reactive compared to women. People were told not to rush to the session since an elevated heart rate could effect cortisol levels. Since cortisol has a pronounced diurnal pattern, subjects within a study should be tested at the same time each day. [Lju 07], [Cac 00] Therefore, the participants were asked to attend either before or after noon; at 10 am or 2 pm respectively, as equally distributed as possible. Participants were instructed not to eat, drink, smoke or brush their teeth for one hour before the experiment. [Lju 07] In this test, the participants were asked not to eat or drink anything one hour before the experiments started. In order not to have any left-overs in the mouth which could affect the saliva samples (and possibly also the sample quality), the participants were also asked to gargle their mouth with fresh tap water before the actual test started. Additionally (during the test), the doors will closed and no break will occur in order to avoid influences from the surrounding environment which could - for instance, affect the heart rate and the cortisol levels. [Lju 07] Due to the fact that the participants need to change seats a few times during the test, some minor physical activity will be performed. In fact, the participants were alone in the room as much as possible in order to not be influenced by the author as well. During the test, the author stayed in the control room which is located just outside the side door in the teaching lab. The participants were subjected to the test individually.

When the participant arrived at the test location, the lights were turned on and the screen was displaying a blank (ordinary white) image. See Figure 6.1. No sounds were presented. The participant was asked to sit down on the chair in front of the monitor (Monitor 1) and informed about the test in general and asked to fill in some personal information, if he approved on the conditions.[2] Thereafter, the participant was asked to get acquainted with the computer game; Pipe Dreams (MacPipes X) and complete a

[1] The stationary computer, belonging to the room which always needs to be turned on was moved out to the control room (still switched on) during the test in order to further eliminate unwanted sounds and possible distractions

[2] As for the information during the experiment, both written guidelines as well as oral information were provided by and from the author

practice (learning) round.[3] A question was then submitted to the participant concerning how stressed he felt and the first saliva sample was thereafter collected to be treated as a reference value and compared to the next measurements.[4] The reason for asking the participants the question in advance was to have no influence from the actual saliva taking process which perhaps could influence the answer. As for the saliva collection, the guidelines following the saliva toolkit were followed; the participants were asked to gently chew on the cotton stick for a minute.[5] [Sarstedt]

The next task consisted of listening through the 12 sound samples (called A.mp3 - L.mp3) for about 20 s (ten s with background sound only and ten s with both background and characteristic sounds present) and thereafter rank the files due to personal preference (putting the best liked first). The sound samples were provided through the same loudspeakers that were going to be used during the actual test. The sound level was set to match the one within the test; around 60 dB. It was suggested that when the sound level reaches a certain value, subjective evaluation varies significantly and becomes more unpredictable [Yan 05]. When the ranking was completed, no further sounds were presented. Thereafter, the participant was asked to answer the Weinstein and SIC tests. A new question was also provided about the stress levels and the second saliva sample was collected which completed the introductory part of session 1; steps 1 - 11 in Table 6.1. The length of this introductory part varied substantially for all participants, mostly due to how fast the participants were able to complete the parts.

Thereafter, the lights were turned off and remained so during the rest of the test in order to improve focus. The actual experiment, final part of session 1 as well as sessions 2 - 4, started when the participant was asked to start playing the VR-game. Pipe Dreams is thought to be neutral in gender (in this case; nonviolent, no car games etc.) and increase the arousal level of the participants. At the same time, when the participant was asked to start playing, one sound sample (A.mp3 - L.mp3, presented in Table 5.1) and one picture (either Figure 5.1 or Figure 5.2) were presented to be evaluated, put on and off more or less simultaneously from the computer (Computer 2) in the control room. Since attitude towards a noise source is known to influence the response to noise, [Ped 08] according to a preset key; the 2nd and the 11th ranked sound files were going to be used in the experiment and displayed at about the same level; roughly 60 dB.[6]

[3] As for the game, its built in sounds were turned off

[4] Since there are different ways of measuring the stress level, the question would be used as a comparison to the analyzed cortisol level

[5] Furthermore, it is recommended that the researcher collaborate with a proficient laboratory and follow the provided recommendations for sample handling and storage. It is also useful to incorporate all samples from a single subject in a single batch for processing and to use kits from the same manufacturer for the entire duration of the study. [Cac 00]

[6] Measured in the new position closer to the loudspeakers

Figure 6.1.: Photo of the teaching lab; as it looked like when participants entered; projector, screen, loudspeakers and monitor (Monitor 1) could be seen.

As for the actual sound files, each file was 15 minutes long and looped (without break) when played. The two selected sounds and the two images were going to be combined in four ways/sessions during the experiment.

The participant was sitting in darkness, playing the VR-game, watching the projected picture as a background image on the screen behind the computer monitor (Monitor 1) and hearing sounds from the loudspeakers hung on each side of the screen. After less than ten minutes, the participant was asked to end the computer game. A new 'how stressed do you feel right now'-question was then provided and the third saliva sample was thereafter completed. The participant was then asked to change seats and move to the chair in front of the screen. The image and sound were still turned on.[7] The participants were left for about ten minutes in the environment before the restoration, visual and appraisal tests were supplied. After completion - the participants were told to remain seated, viewing the screen for another ten minutes (providing a total length of 20 minutes). Thereafter, the last 'how stressed do you feel right now'-question as well as the final, fourth, cortisol measurement were provided and the session accomplished;

[7] A small lamp was also provided and targeted away from the screen, the participants were asked to turn on the lamp if needed when answering the questionnaires and turn it off again when the tests were completed

the participants have now finished part 12 - 19 in Table 6.1.

Session 1 of the test lasted for about 50 minutes for the majority of the participants. Session 2 - 4 starts with playing the VR-game and ends after the final cortisol measurement was performed, each of the following sessions last for about 30 minutes. In total, the entire experiment takes around 140 minutes (50 + 3 x 30 minutes), or 2 h 20 minutes, to complete for the majority of the participants. In total, ten saliva samples were also provided by most of the participants (3 - 25) which were kept in the refrigerator after use - according to the provided recommendations [Sarstedt]. The reason for applying the small changes in procedure between participants 1 - 2 and participants 3 - 25 were in order to decrease the total test time. For the contribution, the participants were rewarded with three cinema tickets or 400 SEK on a gift voucher from Cremona, Chalmers' bookshop.

A description of the test location (teaching lab) as well as the used equipment can be found in A. Setup & Equipment. (Copies of the tests can be found in B. Questionnaires.)

7. Results

7.1. Before Analysis

The results from the provided personal information reveals that no participant has drunk or eaten anything during the last hour before the test started as well as no one uses cortisol-based skin products. As for the use of nicotine, four participants are a habitual smoker and/or are regularly using any other form of nicotine. Furthermore, two participants have 'to some extent' a hearing impairment; tinnitus. (The other participants do not have any hearing impairment.) As for the experience in playing VR-games, two participants have never tested, 15 participants have good (G) experience and eight participants have very good (VG) experience.[1]

Weinstein's test consists of 21 statements which were judge according to a 6-point scale, ranging from 'agree strongly' (1) to 'disagree strongly' (6); a total score was calculated according to Weinstein. [Wei 78] As for the Symptoms of Illness Checklist (SIC), a total score was computed by multiplying the severity ratings with the frequency ratings for each symptom value.[2] [Sto 09] The restoration test comprises of 26 items. [Har 97] In order to simplify the survey process, the original 7-scale was transformed into a 5-scale test, [Yan 05] ranging from 'totally agree' (1) to 'totally disagree' (5). The restoration test was analyzed according to Hartig where items were grouped as specified by the subscales; 'being away', 'fascination', 'coherence' and 'compatibility'. [Har 97] In the visual and appraisal tests, each statement was judged separately - providing a total of (7 + 23) 30 answers for each of the four sound and vision combinations (positive sound, structured image (PS); positive sound, non-structured image (PN); negative sound, structured image (NS) and negative sound, non-structured image (NN)) to be analyzed individually. Copies of the tests can be found in B. Questionnaires.

Unfortunately, in the end, the saliva cortisol samples were not analyzed in time for the writing of this report which draw away attention from the use of nicotine and the SIC test which were provided with respect to the analysis of the cortisol saliva levels.

[1]The sound preference ratings (positive and negative sound) will not be analyzed in this thesis since it is believed to be out of topic

[2]Symptoms that were marked as 'not present' where assigned zero and provided no contribution to the total score [Sto 09]

7.2. Analysis of Data

All gathered data was analyzed using the software SPSS (version 17.0, for mac computer). The valence and arousal answers (judged by the Self-Assessment Manikin (SAM) scales) from the first two rows in the appraisal test were treated in MATLAB (version R2009b, for mac computer) in order to provide a plot (Figure 7.1).

7.2.1. Absent Stimuli

As for the submitted personal information, the mean age of the participants was found to be 26.88 years with a standard deviation (SD) of 4.2. The mean Weinstein score was 75.84 with SD; 13.9. The mean SIC score was 40.33 with SD; 37.2. As a general rule, a result diverging with more than three SD units from its mean value could be disregarded. [Hop 00] This suggest that participants should be within the year span 14 - 40 (years) which is applied for all but one participant (45 years old). As for the Weinstein score, participants should reach between 34 - 119 which all participants managed to succeed. In the SIC test, participants should be within -71 (impossible here!) to 152 which all participants achieved as well.[3] The first 'how stressed do you feel right now'-question (asked directly after practicing the computer game; order 5 in Table 6.1), provided the mean score 3.54 with SD; 1.7. The second question (presented after the SIC tests; order 10 in Table 6.1), yielded the mean score 3.22 with SD; 2.0.

7.2.2. Present Stimuli

Furthermore, the stated 'how stressed do you feel right now'-questions are identical to the final question in the appraisal test, ('how stressed do you feel right now?'). Therefore, a comparison could be seen for the questions put forward when the stimuli (i. e. PS, PN, NS and NN) are presented with respect to mean value and SD in Table 7.1. The questions which this applies for are asked after the VR-game (order 13 in Table 6.1) and in and after the appraisal tests (order 17 and 18 in Table 6.1). Results from both separately displayed 'how stressed do you feel right now'-questions (presented after the VR-game and after the appraisal test), the restoration, visual and appraisal tests

[3] A SIC score value is missing for one participant but since the rest values reached 53, the participant is well within the limit. (Due to the missing value, the participant did not contribute to the calculations of the mean value and SD of the SIC score.)

were examined by within subject analysis for 2 x 2 repeated measures (positive/negative sound and structured/non-structured image) when the stimuli were presented. The main effects were studied using a Bonferroni confidence interval adjustment; degree of freedom (df), significance (p), Greenhouse-Geissers' corrected F-value (F) (used to correct for possible unequal variance - violation and sphericity) and effect size (η_p^2: partial eta squared) were investigated.[4] The results are displayed in Table 7.2.

Table 7.1.: Comparison between 'how stressed do you feel right now'-questions when stimuli are presented, concerning mean value and SD

Stimuli	Question Displayed	Mean Value	SD
PS	After VR-game	4.24	2.0
	In appraisal test	3.58	2.4
	After appraisal test	3.52	2.0
PN	After VR-game	4.92	2.3
	In appraisal test	4.00	2.2
	After appraisal test	3.76	2.2
NS	After VR-game	4.68	2.2
	In appraisal test	4.88	2.4
	After appraisal test	4.52	2.4
NN	After VR-game	4.52	2.9
	In appraisal test	4.52	2.6
	After appraisal test	4.79	2.5

As for the main four investigated parameters in Table 7.2 (df, p, F and η_p^2); degree of freedom is always one here since in the number of observations, only one value are free to vary. Significance describes the probability of committing an error in rejecting the null hypothesis; it says nothing about the importance or practical usefulness of the result. Corrected F-value is a function that uses both df and p (as well as some additional measures) as input parameters and it describes the assumptions (and consequences) of violating the experimental design model. Effect size, on the other hand, expresses the magnitude of difference in within-groups population SD (units) which could be used as an approach of assessing practical significance of research results which is based on differences among means. [Kir 95] Therefore, this thesis will focus on effect sizes.

As for effect sizes, when statistical analysis involved more than three means; 0.10 is regarded to be a small effect size, 0.25 is estimated as medium and 0.40 or larger is recognized as a large effect size [Kir 95]. According to the results in Table 7.2, the 'how stressed do you feel right now'-questions only achieved small effect sizes - if any

[4]The conditions are sometimes summarized as Bonferroni, Greenhouse-Geisser - particularly in tables

present (0.00 - 0.18). The restoration test provided small to medium outcomes, again; if present (0.00 - 0.31). The visual test shows a wider spread, ranging from small to large effect sizes (0.00 - 0.50) if present; in fact, the only large effect size was found for the *meaningful/meaningless* (0.50) parameter. The appraisal test consisted of effect sizes ranging from non existent to large (0.00 - 0.50), where large effect sizes were shown for questions concerning *be far away* ('to what extent would you like to be far away from the sound you just heard?') (0.50), *get away* ('to what extent would you like to get away from the sound environment?') (0.45), *sound change* (to what extent would you like to have changed the sound environment?') (0.44) and *pleasure perception* ('how pleasant or unpleasant did you perceive that the sound environment was?') (0.45).

As for the remaining two questions in the appraisal tests, judged by the SAM scales; valence and arousal, a circumplex plot was created for the mean values. SAM scales were used effectively to measure emotional responses in a variety of situations, for example including reactions to pictures and sounds. Previous results indicate that SAM is a successful method for measuring existing feeling states and relating the situations to other indices of emotional response and assessing changes due to for instance, reactions to contextual stimuli. SAM ratings could be used to plot directly any object or event into a 2D 'affective space'. [Bra 94] In the cicumplex plot, Figure 7.1, positive valence (x-axis) is associated with pleasantness, negative with unpleasantness. Positive arousal (y-axis) is connected to activation, negative to deactivation. Ratings of pleasure reflect the tendency of approaching a stimulus whereas displeasure reflect the likelihood to withdraw, escape or otherwise terminate the encounter; [Bra 94] valence is a basic dimension of all emotional responses. [Ber 08] Similarly, judgements of arousal index the amount of vigor associated with a given behavioral choice and increases with stimulus intensity. Furthermore, pleasure and arousal dimensions are typically accounting for most of the variance in emotional judgements. In order to simplify the plotting procedure, the scale (1 - 9) was transformed to -4 (lowest valence/arousal) to 4 (highest valence/arousal). [Bra 94] When displayed in coordinate form (valence, arousal), the mean values for the four conditions are PS = (0.35, -2.17), PN = (0.33, -1.79), NS = (-0.96, -1.20) and NN = (-1.24, -0.84). SD for valence are 2.6, 2.0, 1.8 and 1.6 in PS, PN, NS and NN. For arousal, SD are found to be 1.9, 2.3, 2.5 and finally 2.6 for PS, PN, NS and NN. As for the effect sizes, small to medium were found for valence (0.28 - 0.15) and only small are noted for arousal - if any present (0.00 - 0.15).

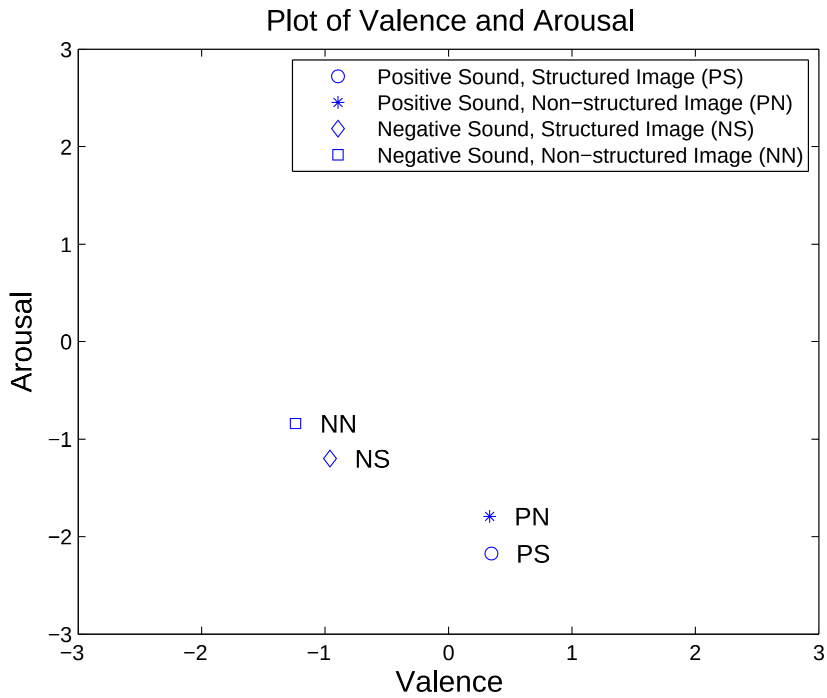

Figure 7.1.: Circumplex plot of valence and arousal, from SAM (Self-Assessment Manikin) scales

7.3. Order Analysis

Order analysis was performed as an in between-subject factor to be able to study the influence of the provided sequences in the four situations (PS, PN, NS and NN). The order was entered on a 4-step scale (1 - 4) where PS, PN, NS and NN were judged according to appearance, for instance if PS appeared as the third order when studied, three was assigned and entered as the in between-factor. Additionally, positive sound (P); negative sound (N (sound)); structured image (S) and non-structured image (N (image)) were also studied using the same procedure. The results were analyzed for the 'how stressed do you feel right now'-questions, the restoration, visual and appraisal tests - except for the first two ratings of valence and arousal. In order to narrow down the amount of data, only results yielding large effect sizes (i. e. ≥ 0.40) can be seen in C. Results: Order Analysis and Tables C.1, C.2, C.3, C.4, C.5, C.6, C.7 and C.8 (i.e. for PS, PN, NS, NN, P, N (sound), S and N (image)), together with the statistical measures; df, p and F (Bonferroni, Greenhouse-Geisser).

As for the results of the order analysis, in Table C.1 (PS), large effect sizes were found for *meaningful/meaningless* (0.54) in the visual test, in the appraisal test - *sound choice* ('how did the choice of sound environment affect you?') (0.46), *be far away* (0.48), *get away* (0.46), *sound change* (0.42) and *pleasure perception* (0.44). As for Table C.2 (PN), large effect sizes were achieved for the *meaningful/meaningless* (0.54) parameter in the visual test and *be far away* (0.66 and 0.47), *get away* (0.50 and 0.40), *deactivation tendency* ('to what extent did you feel like having a tendency not to do anything?') (0.46), *sound change* (0.51) and *pleasure perception* (0.55) in the appraisal test. As for Table C.3 (NS), large effect sizes were found for *compatibility* (0.43) in the restoration test and *meaningful/meaningless* (0.49) in the visual test and *task difficulty* ('how difficult did you perceive the task?') (0.43) and *predicted perception* ('how well did you perceive that you could predict what was going to happen?') (0.60) in the appraisal test. In Table C.4 (NN), large effect sizes were found for *being away* (0.42) in the restoration test and *meaningful/meaningless* (0.60) in the visual test, in the appraisal test, *be far away* (0.57), *get away* (0.44), *sound change* (0.44), *pleasure perception* (0.52), *predicted perception* (0.40) and *sound identification* ('to what extent could you identify the sound you just heard (apart from today)?') (0.46) provided large effect sizes.

As for Table C.5 (P), the visual test provided a large effect size for *meaningful/meaningless* (0.52) and in the appraisal test; *be far away* (0.58), *get away* (0.47) and *pleasure perception* (0.54). In Table C.6 (N (sound)), the restoration test produced large effect sizes for *being away* (0.52) and *meaningful/meaningless* (0.60) in the visual test. In the appraisal test, large effect sizes were found for *be far away* (0.57), *get away* (0.44), *sound change* (0.44), *pleasure perception* (0.52), *predicted perception* (0.40) and *sound identification* (0.46). As for Table C.7 (S), the visual test supplied *meaningful/meaningless* (0.50) and the appraisal test showed *concentration disturbance* ('how much did the sound disturb your concentration on the task?') (0.54), *be far away* (0.43), *predicted perception* (0.47) and finally *how stressed* ('how stressed do you feel right now?') (0.42) as large effect sizes. As for Table C.8 (N (image)), the same results were achieved as displayed for Table C.7 (S).

7.4. Personal Information Analyses

The results from the 'how stressed do you feel right now'-questions as well as the restoration, visual and appraisal tests - except for the first two ratings of valence and arousal - were further studied starting with the entered personal information. Since one participant diverged with more than three SD from the mean age, he was left out from the first additional analysis. The second and third investigation considered the entered VR-game knowledge, two groups were formed according to the entered skills; good (eight participants) and very good (15 participants). In order to shorten down the data presentation, only results providing large effect sizes (i. e. ≥ 0.40) are presented in D. Results: Further Analyses and Tables D.5, D.6 and D.7 together with the other statistics; df, p and F (Bonferroni, Greenhouse-Geisser). A comparison between the 'how stressed do you feel right now'-questions entered after the VR-game, in and after the appraisal tests can be seen in Tables D.1, D.2, D.3 and D.4 for PS, PN, NS and NN with respect to mean value and SD for the total of nine additional analyses belonging to 7.4. Personal Information Analyses and 7.5. Sound Perception Analyses.

7.4.1. Age

As for the first analysis, one participant was left out since he was more than three SD away in age (45 years old) from the mean value. Large effect sizes were found for the remaining 24 participants in the visual test for *meaningful/meaningless* (0.49) and for *be far away* (0.48), *get away* (0.46), *sound change* (0.48) and *pleasure perception* (0.44) in the appraisal test. Table D.5 presents the results.

7.4.2. VR-Game Knowledge

Second and third analyses divided the participants into two groups according to entered skills when playing VR-games;[5] 15 had a good (G) expertise and eight had a very good (VG) knowledge. As for the G-group, large effect sizes were found for *coherence* (0.41) in the restoration test, *simple/complex* (0.50) and *meaningful/meaningless* (0.47) in the visual test and *be far away* (0.48) and *get away* (0.46) in the appraisal test. Conclusions for the G-group are shown in Table D.6. As for the VG-group, large effect sizes occurred for *coherence* (0.48) in the restoration test, *meaningful/meaningless* (0.52) in the visual test and *sound choice* (0.41), *sound disturbance* ('how disturbing was the sound?') (0.64), *concentration disturbance* (0.66), *get away* (0.48), *body activation* ('to what extent did you feel that your body was activated?') (0.51), *sound change* (0.61), *lock out feeling* ('to what extent did you try to look out the feeling you got when hearing the sound?') (0.54), *pleasure perception* (0.73) and *how stressed* (0.42) in the appraisal test. The results are displayed in Table D.7, for the VG-group.

7.5. Sound Perception Analyses

The remaining analyses focused on sound perception. In the fourth study, the influence of tinnitus was examined when two participants were left out, suffering from the im-

[5]two participants had never tested before and were excluded from the analyses

pairment. Finally, noise sensitivity was investigated when participants were divided into a total of five different studies according to the Weinstein scores. In the fifth and sixth surveys, participants belonging to the top/bottom 30 percent of the results were studied (eight and seven participants). The seventh research treated the remaining ten participants (not belonging to the top/bottom 30 percent). In the eight and ninth investigation, participants were divided into two groups - having either a total Weinstein score > 75 (12 participants) or < 75 (12 participants), except for one participant who scored exactly 75; he was excluded from the analyses. In order to narrow down the amount of data, only results yielding large effect sizes (i. e. ≥ 0.40) will be presented in D. Results: Further Analyses and Tables D.8, D.9, D.10, D.11, D.12 and D.13 together with the other statistics; df, p and F (Bonferroni, Greenhouse-Geisser).[6]

7.5.1. Tinnitus

In the fourth analysis, two participants were excluded in order to avoid influences of the reported tinnitus. The remaining 23 participants were analyzed. Large effect sizes were found for *meaningful/meaningless* (0.50) in the visual test and *be far away* (0.59), *get away* (0.59), *sound change* (0.50) and *pleasure perception* (0.52) in the appraisal test. The statistics are summarized in Table D.8.

7.5.2. Noise Sensitivity (Weinstein)

In a test performed by Weinstein, self-report questionnaires were distributed among (both female and male college freshmen) students in order to measure noise sensitivity. Two subgroups were constructed from the results where noise sensitivity scores fell within either the top (noise-sensitive) or bottom (noise-insensitive) 30 percent of the entire population. Total group mean scores were registered to be 67.9 and 39.8. The questionnaire could give a total of 20 - 120 points; the higher the score the higher the sensitivity to noise. [Wei 78] According to Persson Waye's suggestions, participants reaching a total score in the Weinstein test > 75 could be considered as sensitive to noise whereas participants registering < 75 are not that sensitive. [Per 02]. In total, five different subgroups could be constructed from the data with regard to the Weinstein scores; in order to have a reference group, participants reaching total scores between the top/bottom 30 percent were analyzed as well.

[6] Additionally, a comparison between the 'how stressed do you feel right now'-questions entered after VR-game, in and after the appraisal tests can be seen in Tables D.1, D.2, D.3 and D.4 for PS, PN, NS and NN with respect to mean value and SD for the total of nine additional analyses belonging to 7.4. Personal Information Analyses and 7.5. Sound Perception Analyses

As for the fifth, sixth and seventh analyses, according to Weinstein, the top/bottom 30 percent ratings provide the top/bottom (25 * 0.3) 7.5 answers to be examined. Since only a whole number of participants could be analyzed, the top eight results (scoring 105, 95, 94, 92, 88, 88, 86, 86) were selected for the top group since the seventh and eight position contained the equal score of 86 which would not be possible to separate in order to get seven straight results. Large effect sizes were noticed for both analyzed 'how stressed do you feel right now'-*questions*; after VR-game (0.42) and after appraisal test (0.44), in the visual test; *simple/complex* (0.58), *unusual/ordinary* (0.42) and *meaningful/meaningless* (0.56) were found for the top 30 percent. As for the appraisal test, *task difficulty* (0.42), *be far away* (0.56), *get away* (0.44), *lock out feeling* (0.48), *pleasure perception* (0.58), *predicted perception* (0.70), *source identification* (0.51) and *how stressed* (0.43) provided large effect sizes. The results are presented in Table D.9. As for the bottom group, the lowest 30 percent (scoring 52, 54, 57, 60, 60, 67 and 68), contained seven participants since the eighth and ninth place both contained the equal total score of 69 which would be impossible to assign to only one participant. Large effect sizes were found for *simple/complex* (0.46), *unusual/ordinary* (0.42) and *meaningful/meaningless* (0.70 and 0.42) in the visual test. In the appraisal test, large effect sizes were found for *concentration disturbance* (0.46), *be far away* (0.52), *get away* (0.51), *sound change* (0.49), *pleasure perception* (0.43) and *mentally/physically strenuous* ('how mentally or physically strenuous was the sound environment?') (0.48). The outcomes can be found in Table D.10. The rest of the ten participants not belonging to either the top or the bottom 30 percent of the total Weinstein scores, formed a separate group to be analyzed. Large effect sizes were observed for *unusual/ordinary* (0.57), *meaningful/meaningless* (0.45) and *regular/irregular* (0.56) in the visual test. As for the appraisal test, large effect sizes were found for *take part again* ('to what extent would you like to take part in the sound environment again') (0.65), *be far away* (0.52), *get away* (0.48), *sound change* (0.54) and finally *pleasure perception* (0.42). The results can be seen in Table D.11.

In the eight and ninth analyses, as claimed by Persson Waye, two groups could be formed according to the total Weinstein scores since all but one participant (excluded since he scored exactly 75) belonged to either the $>$ or $<$ 75 limit. [Per 02] This provides 12 participants in both groups. As for the category $>$ 75, large effect sizes appeared for *being away* (0.41) in the restoration test, *simple/complex* (0.52) and *meaningful/meaningless* (0.46) in the visual test. In the appraisal test, large effect sizes were gained for *task difficulty* (0.40), *be far away* (0.63), *get away* (0.52), *sound change* (0.52), *pleasure perception* (0.61), *predicted perception* (0.41), *source identification* (0.43) and *how stressed* (0.53). The results are presented in Table D.12. As for the category $<$ 75, large effect sizes were present in the visual test for *simple/complex* (0.42), *meaningful/meaningless* (0.62) and *regular/irregular* (0.45) which can be seen in Table D.13.

Table 7.2.: Results from 'how stressed do you feel right now'-questions, restoration, visual and appraisal tests - analyzed for degree of freedom (df), significance (p), corrected F-value (F) and effect size (η_p^2) (Bonferroni, Greenhouse-Geisser) for sound, vision and sound and vision, S=Sound, V=Vision

Questionnaire	Area/Question	Statistics	S	V	S*V
Question	After VR-game	df	1.00	1.00	1.00
		p	0.94	0.39	0.13
		F	0.01	0.76	2.47
		η_p^2	0.00	0.03	0.09
	After appraisal test	df	1.00	1.00	1.00
		p	0.03	0.63	0.61
		F	5.33	0.23	0.26
		η_p^2	0.18	0.01	0.01
Restoration	Being Away	df	1.00	1.00	1.00
		p	0.00	0.08	0.97
		F	10.54	3.31	0.00
		η_p^2	0.31	0.12	0.00
	Fascination	df	1.00	1.00	1.00
		p	0.07	0.40	0.57
		F	3.51	0.75	0.33
		η_p^2	0.13	0.03	0.01
	Coherence	df	1.00	1.00	1.00
		p	0.43	0.04	0.44
		F	0.64	4.82	0.61
		η_p^2	0.03	0.17	0.03
	Compatibility	df	1.00	1.00	1.00
		p	0.04	0.01	0.65
		F	4.53	7.50	0.21
		η_p^2	0.16	0.24	0.01
Visual	Simple/Complex	df	1.00	1.00	1.00
		p	0.09	0.01	0.57
		F	3.10	9.02	0.34
		η_p^2	0.11	0.27	0.01
	Unusual/Ordinary	df	1.00	1.00	1.00
		p	0.33	0.22	0.64
		F	1.01	1.59	0.22
		η_p^2	0.04	0.06	0.01
	Meaningful/Meaningless	df	1.00	1.00	1.00
		p	0.10	0.00	0.26
		F	3.01	24.42	1.35
		η_p^2	0.11	0.50	0.05
	Close/Distant	df	1.00	1.00	1.00
		p	0.11	0.82	0.47
		F	2.84	0.05	0.55
		η_p^2	0.11	0.00	0.02

Continued on next pages

Table 7.2.: Continued from previous page 2(4)

Questionnaire	Area/Question	Statistics	S	V	S*V
		df	1.00	1.00	1.00
Visual	Varying/Alike all the time	p	0.08	0.05	0.33
		F	3.36	4.46	1.00
		η_p^2	0.13	0.16	0.04
		df	1.00	1.00	1.00
	Regular/Irregular	p	0.02	0.00	0.74
		F	6.02	12.25	0.11
		η_p^2	0.20	0.34	0.01
		df	1.00	1.00	1.00
	Urban/Natural	p	0.10	0.59	0.42
		F	2.89	0.30	0.68
		η_p^2	0.11	0.01	0.03
		df	1.00	1.00	1.00
Appraisal	Valence	p	0.01	0.64	0.01
		F	8.62	0.23	0.15
		η_p^2	0.28	0.23	0.15
		df	1.00	1.00	1.00
	Arousal	p	0.06	0.17	1.00
		F	3.84	2.05	0.00
		η_p^2	0.15	0.09	0.00
		df	1.00	1.00	1.00
	Sound choice	p	0.20	0.15	0.79
		F	1.77	2.28	0.08
		η_p^2	0.07	0.09	0.00
		df	1.00	1.00	1.00
	Sound disturbance	p	0.01	0.12	0.95
		F	8.33	2.67	0.00
		η_p^2	0.26	0.10	0.00
		df	1.00	1.00	1.00
	Concentration disturbance	p	0.07	0.78	0.61
		F	3.51	0.08	0.27
		η_p^2	0.13	0.00	0.01
		df	1.00	1.00	1.00
	Task difficulty	p	0.22	0.94	0.07
		F	1.59	0.01	3.68
		η_p^2	0.07	0.00	0.14
		df	1.00	1.00	1.00
	Take part again	p	0.05	0.70	0.28
		F	4.13	0.16	1.22
		η_p^2	0.15	0.01	0.05
		df	1.00	1.00	1.00
	Be far away	p	0.00	0.07	0.74
		F	22.98	3.62	0.12
		η_p^2	0.50	0.14	0.01

Continued on next pages

Table 7.2.: Continued from previous pages 3(4)

Questionnaire	Area/Question	Statistics	S	V	S*V
Appraisal	Get away	df	1.00	1.00	1.00
		p	0.00	0.22	0.59
		F	18.65	1.59	0.29
		η_p^2	0.45	0.07	0.01
	Body activation	df	1.00	1.00	1.00
		p	0.24	0.30	0.16
		F	1.43	1.11	2.07
		η_p^2	0.06	0.05	0.08
	Deactivation tendency	df	1.00	1.00	1.00
		p	0.89	0.62	1.00
		F	0.02	0.25	0.00
		η_p^2	0.00	0.01	0.00
	Sound change	df	1.00	1.00	1.00
		p	0.00	0.19	0.90
		F	18.01	1.80	0.01
		η_p^2	0.44	0.07	0.00
	Lock out feeling	df	1.00	1.00	1.00
		p	0.02	0.14	0.88
		F	6.82	2.33	0.02
		η_p^2	0.24	0.10	0.00
	Pleasure perception	df	1.00	1.00	1.00
		p	0.00	0.67	0.58
		F	19.08	0.18	0.32
		η_p^2	0.45	0.01	0.01
	Mentally/Physically strenuous	df	1.00	1.00	1.00
		p	0.06	0.03	0.11
		F	4.10	5.67	2.77
		η_p^2	0.15	0.20	0.11
	Situation control	df	1.00	1.00	1.00
		p	0.16	0.70	0.14
		F	2.26	0.35	0.14
		η_p^2	0.08	0.01	0.10
	Situation understanding	df	1.00	1.00	1.00
		p	0.16	0.70	0.14
		F	2.11	0.15	2.31
		η_p^2	0.08	0.01	0.10
	Predicted perception	df	1.00	1.00	1.00
		p	0.09	0.84	0.09
		F	3.24	0.04	3.21
		η_p^2	0.12	0.00	0.12
	Sound recognition	df	1.00	1.00	1.00
		p	0.17	0.31	0.20
		F	1.97	1.10	1.75
		η_p^2	0.08	0.05	0.07

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Table 7.2.: Continued from previous pages 4(4)

Questionnaire	Area/Question	Statistics	S	V	S*V
Appraisal	Sound identification	df	1.00	1.00	1.00
		p	0.09	0.21	0.36
		F	3.10	1.65	0.86
		η_p^2	0.12	0.07	0.04
	Source identification	df	1.00	1.00	1.00
		p	0.33	0.30	0.02
		F	0.98	1.12	5.96
		η_p^2	0.04	0.05	0.21
	How stressed	df	1.00	1.00	1.00
		p	0.01	0.58	0.27
		F	7.94	0.31	1.28
		η_p^2	0.26	0.01	0.05

8. Discussion

8.1. Analysis of Data

The similar 'how stressed do you feel right now'-questions asked after the VR-game and in and after the appraisal tests, presented in Table 7.1 when all participants were studied, provided some unexpected results. Since playing the VR-game was believed to be quite stressful, higher values were expected after the event compared to both in and after the appraisal tests. As for the PS and PN conditions, this was the case but for NS; the participants felt more stressed in general when answering the question in the appraisal test and for NN; a higher mean value was noted when completing the question after the appraisal test. In fact, for NN, the question yielded the same rating just after completing the VR-game as well as in the appraisal test. In general, larger ratings for mean values (and higher SD) were found when the negative sound (N (sound)) was presented[1]. As for the images, the structured picture (S) seems to provide slightly higher ratings (and slightly larger SD) in general compared to the non-structured picture (N (image)).

As for the investigation of large effect sizes (i. e. ≥ 0.40) in Table 7.2; only *meaningful/meaningless* in the visual test and *be far away*, *get away*, *sound change* and *pleasure perception* in the appraisal test provided the expected outcomes. This was a bit surprising as well. To start from the beginning, since the analyzed 'how stressed do you feel right now'-questions presented in Table 7.1 provided some unforeseen results, the outcomes in Table 7.2 seems to be reasonable in the section. Due to the spread of answers, the outcome of the restoration test also seems to be sensible. In the visual test, Figure 5.1 was chosen according to the hypothesis (4.1. Hypothesis) and Figure 5.2 was thereafter created in order to reflect the contradictory conditions; greater differences were expected. Nevertheless, since Figure 5.2 consists of randomly cut and randomly distributed pieces of Figure 5.1 but displayed in a rectangular order - perhaps this could be interpreted as a regular image as well? Perhaps it is possible to also provide other interpretations to the figures? Especially since only single words were selected to be judged in the visual test and not sentences with a clearer statement?

[1] which highlights the question of noise sensitivity

As for the appraisal test, it focused on the sound environment so large effect sizes were not surprisingly found for *be far away*, *get away*, *sound change* and *pleasure perception* which seem to reflect not so satisfactory conditions. Questions could be raised why for instance, *sound disturbance*, *lock out feeling* and perhaps *take part again* did not provide large effect sizes? Since some cutting and mixing were performed in the sound files, it could perhaps be difficult to recognize the sounds and its sources? Since the participants were instructed just to sit down in front of the image hearing the sound, the asked *task difficulty*, *situation control* and *situation understanding* (which supplied small (and negligible) effect sizes) could perhaps have provided some confusion in the appraisal test?

According to Figure 7.1, PS and PN were judged to provide pleasantness and deactivation (pleasant deactivation), where PS provided slightly less activation. NS and NN where considered to evoke unpleasantness and deactivation (unpleasant deactivation). The largest difference in magnitude between the four cases (PS, PN, NS and NN) was found when valences are compared; NS and NN provided unpleasantness whereas PS and PN supported pleasantness. PS and PN yielded stronger deactivation compared to NS and NN. The results seem to agree with the valence ratings of annoyance which were found to show significant difference between positive and negative environment; valence and arousal have a correlation factor of 0.6 and 0.4 to annoyance (Vǎ̈stfjǎ̈ll). This could be interpreted that the negative sound was really annoying and the positive more tolerable. Annoyance is also closely linked to performance decrements. Additionally, approximately 33 percent of the variation in annoyance could be related to acoustic parameters (Broadbent). [Ber 08]

For pictorial stimuli, pleasure and arousal are not linearly correlated but increase in either pleasure or displeasure (x-axis) tend to produce increase in ratings of arousal (y-axis) [Bra 94]. Previous results have shown that annoyance ratings are significantly lower when primed with a positive picture, the results have also indicated that the correlation is stronger for more attentional demanding tasks. [Ber 08] This seems to apply to Figure 7.1, since the structured (positive) image is judged to provide more deactivation compared to the (negative) non-structured image. Valance could be used as an interpretation of the stimulus intensity which seems to be quite weak in general for the settings. When using sound and images as stimuli, effect sizes are often found to be fairly small; even when the used stimuli are different in character. [Ber 08] This is believed to be the case, meanwhile; high SD are also found for the valence and arousal judgements. NN provided the strongest stimuli, followed by NS; PS and PN supplied the same strength.

8.2. Order Analysis

When order was considered; in what sequence the stimuli (PS, PN, NS and NN) and its components (P, N (sound), S and N (image)) appeared, large effect sizes (i. e. ≥ 0.40) were found which is displayed in Tables C.1, C.2, C.3, C.4, C.5, C.6, C.7 and C.8. The results indicate that the order has an impact on the interpretation. Large effect sizes were found for *meaningful/meaningless* in all visual tests. In the restoration test, NN and N (sound) showed large effect sizes for *being away* and NS for *compatibility*. In the appraisal test, *be far away* provided large effect sizes in all situations except for NS. Large effect sizes were also found in *get away* (in PS, PN, P, NN and N (sound)), *pleasure perception* (PS, PN, P, NN and N (sound)), *predicted perception* (NS, NN, N (sound) and S (N (image))), *sound change* (PS, PN, NN and N (sound)), *sound identification* (NN and N (sound)), *concentration disturbance*, *how stressed* (S (N (image))), *sound choice* (PS), *deactivation tendency* (PN) and *task difficulty* (NS). A striking thing when comparing Table C.7 and Table C.8, is that the in between subject factors are the same but mirrored (S; 6, 5, 10 and 3 and N; 3, 10, 5 and 6 for the assigned scores 1, 2, 3 and 4) which provided equal statistics when analyzed, in other words - the tables are equal. Additionally, the statistics are the same in NN and N (sound) in all but the *restoration* and *being away* condition.[2]

Furthermore, NN and N (sound) provided most large effect sizes (eight each) or the strongest results. This seems to be linked with Weinstein's findings that changes in noise disturbance are strongly coupled to changes in satisfaction in general [Wei 78]. When the positive sound (PS, PN, and P) are compared to the negative (NS, NN and N (sound)), a total of 16 large effect sizes were detected in the positive stimuli but 20 in the negative. When the structured image in PS and NS are compared to the findings in the non-structured image in PN and NN, the positive sound registered a total of six large effect sizes for both structured and non-structured pictures whereas the negative sound provided four large effect sizes in NS and the double (eight) in NN. The results of the order analysis could also be compared to the 'original' results provided in Table 7.2 which yielded less large effect sizes. This could suggest that order analysis has an impact of the results. In order to be more confident in what ways, the order should be provided in a more controlled process (so for instance, the results of S is not equal to N (image) in the analysis).

[2] The results were checked for typing and analyses error but the outcomes are still believed to be correct

8.3. Further Analyses

The 'how stressed do you feel right now'-questions presented after the VR-game and in and after the appraisal tests were further studied with respect to mean value and SD in Tables D.1, D.2, D.3 and D.4 - for PS, PN, NS and NN and the first to the ninth analyses presented in 8.3.1. Personal Information Analyses and 8.3.2. Sound Perception Analyses. In PS, the largest mean values were found after the VR-game and the highest SD appeared mostly in the appraisal test. In PN, the highest mean values were viewed after the VR-game, the largest SD was normally present in the same situation. As for NS, the largest mean values were mainly located after the VR-game, the highest SD were typically discovered in the appraisal test. Finally, in NN, the question in the appraisal test yielded on average the highest mean value as well as the largest SD on average. In other words, the participants seem to be most stressed just after the VR-game. After the appraisal test, the participants did not seem to be that stressed when answering the question. As for the difference in responses among the participants, the largest dissimilarities (highest SD) were found in the appraisal test. This result seem to fit slightly better with the expected outcomes compared to the findings in Table 7.1 for all participants.

8.3.1. Personal Information Analyses

As for the provided personal information, all 25 participants were within three SD units, except for one participant due to age. Therefore, the first personal information analysis excluded the participant and the results can be seen in Table D.5. The large effect sizes (i. e. ≥ 0.40) that were found is the same as what was noticed when all participants were analyzed in Table 7.2. Since only one participant was eliminated from the analysis, the results were expected to be similar. In the second and third analyses, a distinction was made due to skills when playing VR-games; the second analysis consists of 15 participants who entered a G knowledge which is displayed in Table D.6 and the third contains eight participants who submitted a VG knowledge, presented in Table D.7. Apparently, the most advanced players were the most similarly affected since the VG-team provided most large effect sizes. As for the comparison between the groups, both registered *coherence* in the restoration test, *meaningful/meaningless* in the visual test and *get away* in the appraisal test as a large effect size. Nevertheless, the G-group also submitted *simple/complex* and *be far away* and the VG-team added *sound choice*, *sound disturbance*, *concentration disturbance*, *body activation*, *sound change*, *lock out feeling*, *pleasure perception* and *how stressed*. As a parallel between Table 7.2, the G-group did not provide *sound change* and *pleasure perception* as a large effect size and the VG-group did not supply *be far away*.

8.3.2. Sound Perception Analyses

Another parameter that was entered by the participants were tinnitus which two participants suffered from. The rest of the participants (23) were analyzed in the fifth test which yielded large effect sizes in the visual test for *meaningful/meaningless* and in the appraisal test for *be far away*, *get away*, *sound change* and *pleasure perception* which can be seen in Table D.8. This is the same result that was achieved when all participants were studied in Table 7.2; either the participants suffered from a severe form of tinnitus or do not tinnitus and two participants have a major impact on the results when large effect sizes are considered.

In the additional tests, the total Weinstein score was considered in the fifth, sixth, seventh, eight and ninth analyses. According to Weinstein, the top 30 percent having the highest scores of the total population could be considered as being sensitive to sound [Wei 78], eight participants formed the fifth analysis. In addition, the bottom 30 percent with the lowest total Weinstein score was denoted as noise-insensitive, [Wei 78] seven participants belonged to the sixth analysis. The remaining ten participants not belonging to the groups formed the seventh analysis. The results are presented in Tables D.9, D.10 and D.11. As a comparison, the fifth, sixth and seventh analyses presented large effect sizes for *unusual/ordinary* and *meaningful/meaningless* in the visual test and *be far away*, *get away* and *pleasure perception* in the appraisal test. Furthermore, the participants considered to be noise-sensitive provided more large effect sizes (in 13 areas/questions) compared to the noise-insensitive group and the additional group (which provided nine and eight large effect sizes). The outcome of the fifth analysis have nothing more in common with the seventh - except for the above mentioned parameters which all three analyses share. But the fifth and seventh analyses share *simpe/complex* in the visual test as a large effect size. As for the sixth and seventh analyses, both provided *sound change*. As a comparison to Table 7.2, the fifth, sixth and seventh analyses managed to provide the large effect sizes which were discovered when all participants were analyzed - the analyses did also provide an additional large effect size; *unusual/ordinary* in the visual test which were a bit unexpected.

Nevertheless, since Persson Waye has suggested that participants having a total Weinstein score > 75 could be considered as being sensitive to noise, [Per 02] the eight analysis contained 12 participants which fulfilled the criterion. At the same time, participants having a total Weinstein score < 75 could be considered as being insensitive to noise; [Per 02] the ninth and final analysis contained 12 participants as well.[3] Tables

[3]One participant who scored exactly 75 was excluded from both analyses

D.12 and Table D.13 presents the outcomes. The only parameters that the last two analyses have in common are *simple/complex* and *meaningful/meaningless* in the visual test. As for the comparison to Table 7.2; the eight analysis matched all five large effect sizes noted by all participants and the ninth analysis managed to equal only *meaningful/meaningless* in the visual test. The participants who were considered to be noise-sensitive in the eight analysis provided more large effect sizes (in 11 areas/questions) compared to the noise-insensitive group in the ninth analysis (which provided three large effect sizes). This seems to be the general tendency in the investigated participants; sound sensitive persons (with a higher Weinstein score) contributes with additional large effect sizes - are sound sensitive persons more similar to each other compared to sound insensitive persons?[4]

8.4. Effect Sizes

This thesis uses Kirk's suggestion for classifying effect sizes; when there are three or more means, 0.10 is regarded to be a small effect size, 0.25 is estimated as medium and 0.40 or larger is recognized as a large effect size. [Kir 95] Cohen has applied other limits; 0.2 is considered to be small, 0.5 is medium and 0.8 is large. [Wal 07] Since effect sizes were found to be fairly small when using sound and images as stimuli (even when the used stimuli are different in character), [Ber 08] Kirk's recommendations were followed in this study. Nevertheless, what is meant by a small, medium or large effect size? In Cohen's terminology, a small effect size is when there is a real effect (something is really happening in the world) which could only be seen through a careful study. A large effect size is an effect which is large (and/or consistent) enough to be observed with the naked eye; very substantial. [Wal 07]

[4]When the two sound sensitive groups are compared, fifth and eight analyses, both share *simple/complex* and *meaningful/meaningless* in the visual test and *task difficulty*, *be far away*, *get away*, *pleasure perception*, *predicted perception*, *source identification* and *how stressed* in the appraisal test as large effect sizes; a total of nine parameters (out of 11 possible). As for both sound insensitive groups, sixth and ninth analyses, only *simple/complex* and *meaningful/meaningless* (two parameters out of three possible) in the visual test are registered in common.

9. Conclusion & Future Work

9.1. Conclusion

The hypothesis[1] turned out to be a bit tricky to test in the end since in the analysis of all participants, the participants were sometimes not most stressed after completing the VR-game which were intended to increase the stress level.[2] In general, the negative sound and the structured image provided slightly higher stress level ratings. As for the presented pictures which were mainly judged by the visual test, it makes unfortunately sense to rank both the structured and the non-structured image as regular which was not intended when the stimuli were designed. In the appraisal test, some parameters supplied high effect sizes while others thought to be closely related did not. One possible explanation comes from the fact that the quality of the sound files could be poor, another reason was the fact that there was sometimes a confusion of what was referred to as for instance, the task. Nevertheless, effect sizes were found to be fairly small when using sound and images as stimuli (even when the used stimuli are different in character). The analyses of pleasure and arousal in the circumplex plot, provided a distinction between the positive and negative sound which could be linked to annoyance and performance decrements. Annoyance could also be associated with the pictures where the positive (structured) image provided more deactivation or less annoyance compared to the negative (non-structured) image. Valance could also be used as an interpretation of the intensity of the stimuli which yet again seemed to be quite weak. Overall, large SD were noticed which increases the uncertainty of the results. Since the order of the presented stimuli were not intended to be analyzed in the beginning, the order was submitted without structure so the results of the order analysis are not straightforward. Nevertheless, the analysis indicate that the order has an impact on the outcome since more large effect sizes were found for the negative sound and non-structured image which corresponds to the theory that changes in noise disturbance are strongly coupled to changes in satisfaction in general.

[1] creating a non-natural scenery consisting of a moderate depth and complexity together with a focal point in combination of gross structural qualities which is displayed together with preferred sound combinations (sounds used as a background sound to mask additional (characteristic) sounds) - should provide a decrease in the arousal level from a stressed condition

[2] It would have been interesting to compare the results of the questionnaires with the salivary cortisol levels, which unfortunately did not take place

Additionally, the 25 participants were also analyzed in subgroups according to age, knowledge in VR-game playing, tinnitus and (total) Weinstein score. In order to see the impact of completing the VR-game, the stress level was also studied which now seemed to make more sense; the participants were on average more stressed when completing the VR-game. One participant was excluded due to age and the results with respect to large effect sizes matches the one presented when the entire population was studied. As for the VR-game knowledge, the players who entered a very good knowledge provided most large effect sizes which indicate that the group of eight persons provided more similar ratings compared to the team consisting of 12 persons who entered a good knowledge. As for the comparison between the results with all participants, some large effect sizes were not noted while new where recorded. Sound perception analyses were also performed. In the case of tinnitus, two participants that suffered from tinnitus were excluded and the outcome was again the same as when all participants were analyzed; either the participants suffered from a severe form of tinnitus or do not tinnitus and two participants (out of 25) have a major impact on the results when large effect sizes are considered. As for noise sensitivity, it was analyzed following two different recommendations supplied by Weinstein and Person Waye. The results indicate that participants with higher Weinstein scores are more sound sensitive with more large effect sizes. Throughout all investigations, the only large effect size which was always present was *meaningful/meaningless* in the visual test.

In retrospect, the images (both the structured and the non-structured) could be changed so the differences could be stated without confusion of the interpretation. Additional persons could also be consulted concerning the sound files and its quality and the purpose of the actual task which is referred to in the appraisal test. Additionally, the experiment took quite long time to complete so the schedule could be revised in order to shorten down the steps and the total time. This is probably possible to do since the salivary cortisol hormone was not analyzed in the end which draw away attention from the SIC tests (since the questionnaires were provided in order to supply the analysis). Nevertheless, it is important to be aware of the difficulty one faces when designing an experiment using sound and images as stimuli - effect sizes are often found to be fairly small; even when the used stimuli are different (or well designed) in character.

9.2. Future Work

It would be intriguing to see results for particularly self-reports (Weinstein, SIC, restoration, visual and appraisal tests) and physiological measures (saliva cortisol levels) -

when it comes to female participants. Weinstein found no differences between males and females so he combined the data for both sexes. [Wei 78] At the same time, women were found to be better compared to men when distinguishing between emotions, especially fear and disgust. [Science Daily] As for the physiological measures of the female cortisol levels, the first step would actually be to perform the tests! Ljungberg did for instance only examine men in her study, one of the reasons was that the menstruation cycle influences cortisol levels and she performed both multiple measurements on multiple days. [Lju 07] At the same time, people have a tendency to present information in different ways when the addressed receiver is a male compared to a female person which perhaps could influence the test results if the sexes are mixed in an investigation. Nevertheless, it would be very interesting to see results from female self-reports and physiological measures as well in the future.

Furthermore, subjective measures are an easy and fast way to evaluate emotional responses which could be used in large-scale experiments since self-reports assess the consciously felt emotional experience; the subjective representation of emotions or the emotional feelings. Self-reports could be subcategorized to verbal and visual presentations. Verbal self-reports include assessments of global emotional states or specific emotions by means of descriptions of feelings and attitudes or single open-ended questions; [Taj 08] for instance, the Weinstein, SIC, restoration, visual and appraisal tests - except for the first two rows in the appraisal test which instead used visual presentations. Visual self-reports include graphical representations of different emotions where participants are asked to check the position that best represents the current state of feelings which is used in - for instance, SAM scales. Nevertheless, subjective measures rely on the individual's capacity to be aware of and to be able to express the felt emotions which could cause problems. Furthermore, misunderstandings in the instructions, reliance on memory for an event, disruption (in most cases) in the process of assessing the experience or social response bias when dealing with determined issues (for instance, racial or gender), could evoke additional difficulties. On the other hand, behavioural measures could be very simple and thus allow for group assessment which could be used in many cases for continuous assessment without any disruption of the emotional experience. However, misunderstandings in the instructions could bias the data as well and results could sometimes be difficult to interpret when other non-emotional processes (for instance, cognitive tasks) are involved. [Taj 08]

Physiological measures involve registering changes in biological systems which are caused by emotional processes. The changes could for instance, include facial expressions or other muscle activity and be so subtle that differences could not be identified at a behavioral level (Levenson). Furthermore, physiological measures are not relying on cognitive judgements and instructions (which could case misunderstandings); tests could be performed in a continuos and automatic way (Dillon et al.). Nevertheless, the recording equipment or the feeling of being monitored could interfere with participants' experiences. At the same time, the physiological measures could be technically complex, expensive and needed to be performed individually. Another disadvantage is that different emotions could produce the same physiological response; in many occasions, it is necessary to combine various physiological measures simultaneously in order to reduce the uncertainty of a single measure (Bagozzi). [Taj 08]

As for the methods; self-reports, behavioral and physiological measures have advantages as well as disadvantages but more important - each method tackles a different aspect of emotional processes. When possible, it is strongly recommended that experimental studies combine measures at the three levels (Bradley & Lang). [Taj 08] Some studies have failed to find corresponding changes in self-reported (mental) stress and physiological measures (salivary cortisol levels). Nevertheless, some experiments have found evidence of differential effects in the results between the division of high and low noise sensitive groups which suggested that within the high noise sensitivity group - clear associations were found between performance, biological stress and subjective stress measures (particularly in the noise only condition). [Lju 07] A model of emotion measurement was, for instance, conceived where the outputs from the different methodologies (self-reports, behavioral and physiological measures) could be placed in a 3D cubic space which could improve the understanding of the existing correlations between the different measures of affect. The multilevel measurement approach does not always imply increases in complexity of the experiment but could help improving the understanding of the processes involved in human emotional responses. [Taj 08]

As for this thesis, due to the lack of strong statistical results from the self-reported measures (and possibly also funding), unfortunately - the physiological measurements (salivary cortisol levels) were not analyzed. In the future, it would be interesting to see further comparisons between self-reports and physiological measures, particularly when it comes to stress, in order to improve the procedure and measures further when performing practical experiments - especially involving both women and men.

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A. Setup & Equipment

The teaching lab (located within the Division of Applied Acoustics, Chalmers) is rectangularly shaped and has a width of approximately 5.0 m, a length of roughly 9.9 m and a height of around 3.6 m.[1] The walls are made of concrete and painted in white. The ceiling is covered with around 0.6 x 0.6 m quadratically shaped white absorbers, except for six positions which contains lamps (symmetrically spread across the ceiling) and two places which is used/intended for ventilation; also symmetrically located but in the front of the room. Hanging from the ceiling, approximately 0.1 m from the walls and 0.05 m from the ceiling, are 18 foam rubber like sheets of about 0.6 x 0.6 m, quadratically shaped, equally spread between the side walls and the rear wall in order to increase the sound absorption of the room. The floor is covered with a brownish linoleum-like (plastic) carpet. The room has no windows[2] but two doors; the largest one is located in the rear part of the room and the most commonly used door is positioned on the side wall. Figure A.1 shows a sketch of the dimensions of the room. Since the walls of the room are believed to be thick, there is actually a small 'corridor' (0.4 m - side door, 0.7 m - rear door) before the door is reached from the room.

As for the furnishing, a full-height greenish metallic ladder is fixed on the left side of the side wall (when entering through either door). Four fixed alumina pipes are positioned on the opposite (right) wall, near the corner of the frontal wall. A projector screen is fixed along the white board with a set of two lamps above, in front of the room. The projector is stationary hung from the ceiling. 14 wooden tables together with around 30 red upholstered chairs are also located in the room along with a cupboard and different music devises, loudspeakers and a scale model and some different (ongoing?) projects in the front right corner. A ventilation hole is present in the floor (covered with a metallic net), close to the rear wall and between the two doors.[3]

The screen was located just in front of the whiteboard. The size of the screen is about 1.4 x 1.0 m (width x height) and the distance between the screen and the 'relaxing area' (table, chair and lamp) is about 2.5 m, measured from the front wall to the middle position of the chair. The distance between the middle position of the chair in the relaxing

[1]Before the room turned into a lecture hall, it was part of an echoic chamber
[2]but a painted one overlooking a landscape on the side wall, opposite to the main entrance door
[3]Nevertheless, the ventilation of the room is quite poor

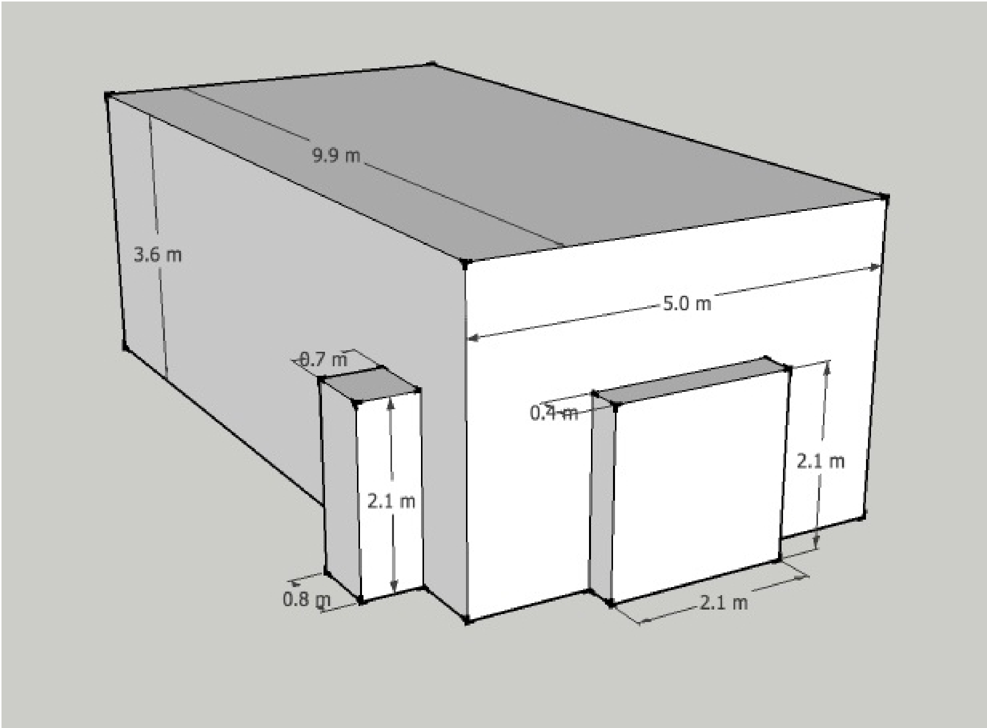


Figure A.1.: Sketch of the teaching lab (test location) (metrics in meters, m)

area to the middle position of the chair in the 'computer zone' (where Monitor 1 is located) is about 1.7 m. In other words, the distance between the screen and the computer station is about 4.2 m (2.5 + 1.7). The angle of sight when sitting on either of the two chairs facing the middle of the screen is small/good since the middle of the screen is located about 1.7 m above floor level.

The stationary projector was used to display the two images and a blank one which was visible when the participants entered the room. The projector was actually equally located between the two test centers; the relaxing area and the computer zone. This proved to be a good choice since the projector is the major noise source in the room (during the test) but still, it provides the same kind of noise over time. Except for the projector, the two loudspeakers as well as the amplifier and occasionally the used lamp were the only electric equipments of use (from time to time) in the room.

The two loudspeakers are symmetrically located above the whiteboard which in turn is symmetrically hung in the room. But the speakers are asymmetrically placed with respect to the screen (measured as the horizontal distance between the centre of the speakers and the centre of the screen). The speaker to the right is 0.8 m (2.4 - 1.6) closer to the screen compared to the left speaker, this can be noticed in Figure 6.1. The difference in path is mostly noted when the sound is turned on but since the participants will be exposed to each sound sample for around 30 minutes, the impact of the asymmetric location of the speakers is believed to be minor.

Table A.1 provides a list of the used equipment, except from the screen and cables. As for Monitor 1, located in the teaching lab, there seems to be some problem concerning the colour display since the screen had a tendency of turning into a purple/lilac shade but the conditions remained the same for participants 1 - 19 and thereafter the screen behaved normally for the rest of the participants (20 - 25).[4]

Table A.1.: List of used equipment; number 1 - 6 are used in the teaching lab, number 7 - 11; in the control room (next to teaching lab). Suffix 1 in the name is used by the participant inside the teaching lab and suffix 2, by the author in the control room.

Number	Equipment Type	Brand: Model	License Number (Additional)
1	Projector	Benq: MP622	071034-11 (KETI HU09483-7014)
2	Amplifier	Sony: DG500	5511063
3	Monitor 1	Samsung: 961BF	PF19HMDP901006A
4	Keyboard 1	Apple: M7803	KY252018LXXXA
5	Mouse 1	Apple: M5760	VJ3490NL TNWDA
6	Two (loud)speakers	Sony: -	-
7	Lamp	Luxo: L-2P 1001 (?)	-
8	Computer 1	Apple: M8570	CK3131A2N87
9	Computer 2	Asus: -	- (Crag 1)
10	Monitor 2	Dell: D1226H	59120-C3DKP
11	Mouse 2	Microsoft: -	X802382-022 (56180-523-5857737-0)

[4]The impact from Monitor 1 on the results is believed to be minor since the monitor was only used for playing the computer game and not part of the analysis. But of course, it would be preferable to have a more stable monitor.

B. Questionnaires

Figure B.1 shows the 'how stressed do you feel right now'-question, Figure B.2 presents the Weinstein test, Figure B.3 displays the intensity questionnaire of SIC and Figure B.4 submits the frequency ratings of the SIC test. Furthermore, the restoration test can be seen in Figure B.5, the visual test is introduced in Figure B.6 and finally, the appraisal test is supplied in Figure B.7.

Page 1 (1)

Please encircle the number which corresponds to how you feel or perceive the situation.

How stressed do you feel right now?

Not at all   Extremely much

1 2 3 4 5 6 7 8 9 10 11

Figure B.1.: 'How stressed do you feel right now'-question (provided before cortisol measurement)

Page 1 (3)

Several statements are listed below. Please, deside wheather you 'agree' (totally, on average or partly) alternatively 'disagree' (totally, on average or partly) with each statement.

	Agree strongly	*Agree on average*	*Partly agree*	*Partly disagree*	*Disagree on average*	*Disagree strongly*
1. I would not mind living on a noisy street if the apartment I had was nice.	❒	❒	❒	❒	❒	❒
2. I am more aware of noise than I used to be.	❒	❒	❒	❒	❒	❒
3. No one should mind much if someone turns up his stereo full blast once in a while.	❒	❒	❒	❒	❒	❒
4. At movies, whispering and crinkling candy wrappers disturb me.	❒	❒	❒	❒	❒	❒
5. I am easily awakened by noise.	❒	❒	❒	❒	❒	❒
6. If it is noisy where I am studying, I try to close the door or window or move someplace else.	❒	❒	❒	❒	❒	❒
7. I get annoyed when my neighbors are noisy.	❒	❒	❒	❒	❒	❒
8. I get used to most noises without much difficulty.	❒	❒	❒	❒	❒	❒

Figure B.2.: Weinstein test 1(3), continued on next pages

Page 2 (3)

	Agree strongly	*Agree on average*	*Partly agree*	*Partly disagree*	*Disagree on average*	*Disagree strongly*
9. How much would it matter to you if an apartment you were interested in renting was located across from a fire station?	☐	☐	☐	☐	☐	☐
10. Sometimes noises get on my nerves and get me irritated.	☐	☐	☐	☐	☐	☐
11. Even music I normally like will bother me if I am trying to concentrate.	☐	☐	☐	☐	☐	☐
12. It would not bother me to hear the sounds of everyday living from neighbors (footsteps, running water etc.)	☐	☐	☐	☐	☐	☐
13. When I want to be alone, it disturbs me to hear outside noises.	☐	☐	☐	☐	☐	☐
14. I am good at concentrating no matter what is going on around me.	☐	☐	☐	☐	☐	☐
15. In a library, I do not mind people carry on a conversation if they do it quietly.	☐	☐	☐	☐	☐	☐
16. There are often times when I want complete silence.	☐	☐	☐	☐	☐	☐
17. Motorcycles ought to be required to have bigger mufflers.	☐	☐	☐	☐	☐	☐

Figure B.2.: Weinstein test 2(3), continued on next page

Page 3 (3)

	Agree strongly	*Agree on average*	*Partly agree*	*Partly disagree*	*Disagree on average*	*Disagree strongly*
18. I find it hard to relax in a place that is noisy.	❒	❒	❒	❒	❒	❒
19. I get mad at people who make noise that keeps me from falling asleep or getting work done.	❒	❒	❒	❒	❒	❒
20. I would not mind living in an apartment with thin walls.	❒	❒	❒	❒	❒	❒
21. I am sensitive to noise.	❒	❒	❒	❒	❒	❒

Figure B.2.: Weinstein test 3(3)

Part A Page 1 (2)

Please, encircle your answers on the following questions.

Influence on daily activities
A = Do not have the symptom
B = The symptom existed, but did not influence the daily activities
C = To some extent, the symptom influenced the daily activities
D = The symptom influenced the daily activities a lot
E = The symptom immensely influenced the daily activities

SYMPTOM	**INFLUENCE**				
1. Hight blood pressure	A	B	C	D	E
2. Respiratory problems (wheezing, trouble breathing, shortness of breath etc.)	A	B	C	D	E
3. Chest pain	A	B	C	D	E
4. Back problems (back aches, back pain, neck pain etc.)	A	B	C	D	E
5. Headache	A	B	C	D	E
6. Feeling exhausted or fatigued	A	B	C	D	E
7. Lightheaded, faint or dizzy	A	B	C	D	E
8. Nausea (stomach sickness, inclination to vomit etc.)	A	B	C	D	E
9. Change in appetite (loss of appetite, overeating etc.)	A	B	C	D	E
10. Abdominal pain	A	B	C	D	E
11. Diarrhea	A	B	C	D	E
12. Blood in feces	A	B	C	D	E
13. Constipation	A	B	C	D	E
14. Urinary problems (painful urination, blood in urine etc.)	A	B	C	D	E
15. Skin rash anywhere on the body	A	B	C	D	E
16. Numbness/ tingling in hands or feet	A	B	C	D	E

Figure B.3.: SIC (Influence) test 1(2), continued on next page

Part A Page 2 (2)

17. Swollen ankles or feet (when you wake up)	A	B	C	D	E
18. Joint problems (stiffness, pain, swelling etc.)	A	B	C	D	E
19. Muscle aches or pain (not due to strenuous exercise)	A	B	C	D	E
20. Muscle twitching	A	B	C	D	E
21. Fever	A	B	C	D	E
22. Coughing	A	B	C	D	E
23. Sore throat	A	B	C	D	E
24. Nasal problems (runny nose, congested nasal passages etc.)	A	B	C	D	E
25. Ear problems (ear ache or pain, ringing or buzzing in ears etc.)	A	B	C	D	E
26. Sinus problems	A	B	C	D	E
27. Cold sores	A	B	C	D	E
28. Swollen glands in neck	A	B	C	D	E
29. Eye problems (redness, discharge, impaired or unusually blurry vision etc.)	A	B	C	D	E
30. Dental problems (bleeding or discomfort in gums, teeth or mouth; canker sores etc.)	A	B	C	D	E
31. Sleeping problems (trouble falling asleep, insomnia etc.)	A	B	C	D	E
32. Other (if not listed above)	A	B	C	D	E

___________________________________ (Please, enter what and rate it)

Figure B.3.: SIC (Influence) test 2(2)

Part B Page 1 (2)

Please, encircle your answers on the following questions.

<u>Frequency; how often</u>
1 = Do not have the symptom during the last 2 months
2 = 1-3 days during last 2 months
3 = 4-7 days during last 2 months
4 = 8-14 days during last 2 months
5 = 15-49 days during last 2 months
6 = 50-60 days (daily) days during last 2 months

SYMPTOM	FREQUENCY					
1. Hight blood pressure	1	2	3	4	5	6
2. Respiratory problems (wheezing, trouble breathing, shortness of breath etc.)	1	2	3	4	5	6
3. Chest pain	1	2	3	4	5	6
4. Back problems (back aches, back pain, neck pain etc.)	1	2	3	4	5	6
5. Headaches	1	2	3	4	5	6
6. Feeling exhausted or fatigued	1	2	3	4	5	6
7. Lightheaded, faint or dizzy	1	2	3	4	5	6
8. Nausea (stomach sickness, inclination to vomit etc.)	1	2	3	4	5	6
9. Change in appetite (loss of appetite, overeating etc.)	1	2	3	4	5	6
10. Abdominal pain	1	2	3	4	5	6
11. Diarrhea	1	2	3	4	5	6
12. Blood in feces	1	2	3	4	5	6
13. Constipation	1	2	3	4	5	6
14. Urinary problems (painful urination, blood in urine etc.)	1	2	3	4	5	6
15. Skin rash anywhere on the body	1	2	3	4	5	6
16. Numbness/ tingling in hands or feet	1	2	3	4	5	6

Figure B.4.: SIC (Frequency) test 1(2), continued on next page

17. Swollen ankles or feet (when you wake up)	1	2	3	4	5	6
18. Joint problems (stiffness, pain, swelling etc.)	1	2	3	4	5	6
19. Muscle aches or pain (not due to strenuous exercise)	1	2	3	4	5	6
20. Muscle twitching	1	2	3	4	5	6
21. Fever	1	2	3	4	5	6
22. Coughing	1	2	3	4	5	6
23. Sore throat	1	2	3	4	5	6
24. Nasal problems (runny nose, congested nasal passages etc.)	1	2	3	4	5	6
25. Ear problems (ear ache or pain, ringing or buzzing in ears etc.)	1	2	3	4	5	6
26. Sinus problems	1	2	3	4	5	6
27. Cold sores	1	2	3	4	5	6
28. Swollen glands in neck	1	2	3	4	5	6
29. Eye problems (redness, discharge, impaired or unusually blurry vision etc.)	1	2	3	4	5	6
30. Dental problems (bleeding or discomfort in gums, teeth or mouth; canker sores etc.)	1	2	3	4	5	6
31. Sleeping problems (trouble falling asleep, insomnia etc.)	1	2	3	4	5	6
32. Other (if not listed above)	1	2	3	4	5	6

___________________________________ (Please, enter what and rate it)

Figure B.4.: SIC (Frequency) test 2(2)

In the following questions, please encircle the number which corresponds to how you felt or perceived the situation.

1. I can find ways to enjoy myself here.
Totally agree Totally disagree
1 2 3 4 5

2. There is much to explore and discover here.
Totally agree Totally disagree
1 2 3 4 5

3. It is chaotic here.
Totally agree Totally disagree
1 2 3 4 5

4. I want to spend more time looking at the surroundings.
Totally agree Totally disagree
1 2 3 4 5

5. There is too much going on.
Totally agree Totally disagree
1 2 3 4 5

6. I can do things I like here.
Totally agree Totally disagree
1 2 3 4 5

7. There are landmarks to help me get around.
Totally agree Totally disagree
1 2 3 4 5

8. There is nothing worth looking at here.
Totally agree Totally disagree
1 2 3 4 5

9. Coming here helps me to get relief from unwanted demands on my attention.
Totally agree Totally disagree
1 2 3 4 5

10. I have a sense that I belong here.
Totally agree Totally disagree
1 2 3 4 5

Figure B.5.: Restoration test 1(3), continued on next pages

11. It is a place to get away from it all.
Totally agree Totally disagree
1 2 3 4 5

12. It is a confusing place.
Totally agree Totally disagree
1 2 3 4 5

13. I want to get to know this place better.
Totally agree Totally disagree
1 2 3 4 5

14. Being here is an escape experience.
Totally agree Totally disagree
1 2 3 4 5

15. I could easily form a mental map of this place.
Totally agree Totally disagree
1 2 3 4 5

16. There is a great deal of distraction.
Totally agree Totally disagree
1 2 3 4 5

17. My attention is drawn to many interesting things.
Totally agree Totally disagree
1 2 3 4 5

18. It is easy to find my way around here.
Totally agree Totally disagree
1 2 3 4 5

19. This place has fascinating qualities.
Totally agree Totally disagree
1 2 3 4 5

20. This place is boring.
Totally agree Totally disagree
1 2 3 4 5

21. It is easy to see how things are organized.
Totally agree Totally disagree
1 2 3 4 5

Figure B.5.: Restoration test 2(3), continued on next page

22. I have a sense of oneness with this setting.

Totally agree				Totally disagree
1	2	3	4	5

23. Being here helps me to relax my focus on getting things done.

Totally agree				Totally disagree
1	2	3	4	5

24. The setting is fascinating.

Totally agree				Totally disagree
1	2	3	4	5

25. Being here suits my personality.

Totally agree				Totally disagree
1	2	3	4	5

26. Spending time here gives me a break from my day-to-day routine.

Totally agree				Totally disagree
1	2	3	4	5

Figure B.5.: Restoration test 3(3)

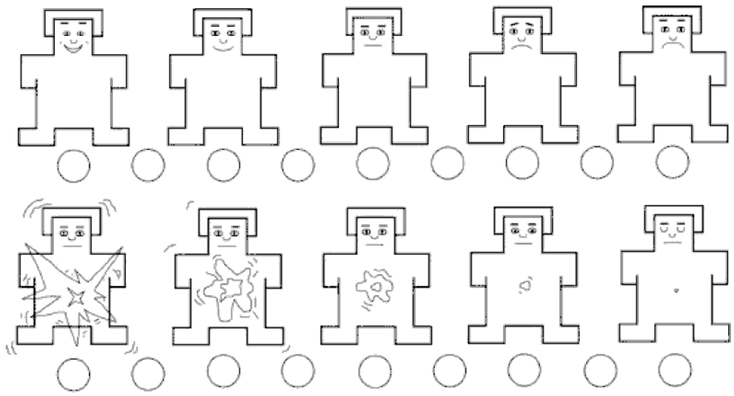
Page 1 (1)

Please, judge the screen regarding the below mentioned adjectives and provide one answer per row.

Simple	1	2	3	4	5	6	7	8	9	10	Complex
Unusual	1	2	3	4	5	6	7	8	9	10	Ordinary
Meaningful	1	2	3	4	5	6	7	8	9	10	Meaningless
Close	1	2	3	4	5	6	7	8	9	10	Distant
Varying	1	2	3	4	5	6	7	8	9	10	Alike all the time
Regular	1	2	3	4	5	6	7	8	9	10	Irregular
Urban	1	2	3	4	5	6	7	8	9	10	Natural

Figure B.6.: Visual test

1. How disturbing did you perceive the sound? In each row, please, put a mark in one of the circles below.



In the following questions, please encircle the number which corresponds to how you felt or perceived the situation.

2. How did the choice of sound environment affect you?

Not at all | | | | | | | | | Extremely disturbing

1 2 3 4 5 6 7 8 9 10 11

3. How disturbing was the sound?

Not at all | | | | | | | | | Extremely disturbing

1 2 3 4 5 6 7 8 9 10 11

4. How much did the sound disturb your concentration on the task?

Not at all | | | | | | | | | Extremely much

1 2 3 4 5 6 7 8 9 10 11

5. How difficult did you perceive the task?

Not at all | | | | | | | | | Extremely difficult

1 2 3 4 5 6 7 8 9 10 11

6. To what extent would you like to take part in the sound environment again?

Not at all | | | | | | | | | Extremely much

1 2 3 4 5 6 7 8 9 10 11

Figure B.7.: Appraisal test 1(3), continued on next pages

7. To what extent would you like to be far away from the sound you just heard?

Not at all									Extremely much	
1	2	3	4	5	6	7	8	9	10	11

8. To what extent would you like to get away from the sound environment?

Not at all									Extremely much	
1	2	3	4	5	6	7	8	9	10	11

9. To what extent did you feel that your body was activated?

Not at all									Extremely much	
1	2	3	4	5	6	7	8	9	10	11

10. To what extent did you feel like having a tendency not to do anything?

Not at all									Extremely much	
1	2	3	4	5	6	7	8	9	10	11

11. To what extent would you like to have changed the sound environment?

Not at all									Extremely much	
1	2	3	4	5	6	7	8	9	10	11

12. To what extent did you try to lock out the feeling you got when hearing the sound?

Lock out the feeling					Neither nor				Follow the feeling	
-5	-4	-3	-2	-1	0	1	2	3	4	5

13. How pleasant or unpleasant did you perceive that the sound environment was?

Unpleasant					Neither nor				Pleasant	
-5	-4	-3	-2	-1	0	1	2	3	4	5

14. How mentally or physically strenuous was the sound environment?

Not at all									Extremely much	
1	2	3	4	5	6	7	8	9	10	11

15. How controllable did the situation feel?

Not at all									Extremely much	
1	2	3	4	5	6	7	8	9	10	11

Figure B.7.: Appraisal test 2(3), continued on next page

Page 3 (3)

16. How well do you understand what is happening around you?
Not at all Extremely much
1 2 3 4 5 6 7 8 9 10 11

17. How well did you perceive that you could predict what was going to happen?
Not at all Extremely much
1 2 3 4 5 6 7 8 9 10 11

18. To what extent did you recognize the sound you just heard (apart from today)?
Not at all Extremely much
1 2 3 4 5 6 7 8 9 10 11

19. To what extent could you identify what produced the sound you heard?
Not at all Extremely much
1 2 3 4 5 6 7 8 9 10 11

20. To what extent could you identify the sources which produced the sound you heard?
Not at all Extremely much
1 2 3 4 5 6 7 8 9 10 11

21. How stressed do you feel right now?
Not at all Extremely much
1 2 3 4 5 6 7 8 9 10 11

Figure B.7.: Appraisal test 3(3)

C. Results: Order Analysis

Order analysis was performed as an in between-subject factor to be able to study the influence of the provided sequences in positive sound, structured image (PS); positive sound, non-structured image (PN); negative sound, structured image (NS) and negative sound, non-structured image (NN) and its components - positive sound (P); negative sound (N (sound)); structured image (S) and non-structured image (N (image)). The results are displayed only when large effect sizes (i. e. ≥ 0.40) are viewed - degree of freedom (df), significance (p) and corrected F-value (F) are entered (Bonferroni, Greenhous-Geisser) for sound, vision and sound and vision combined and additionally; sound and order combined, vision and order combined and finally, sound and vision and order combined. The 'how stressed do you feel right now'-questions, the restoration, visual and appraisal tests were considered in every situation - except for the valence and arousal ratings in the appraisal test. The results are shown for PS in Table C.1, PN in Table C.2, NS in Table C.3 and NN in Table C.4 as well as P in Table C.5, N (sound) in Table C.6, S in Table C.7 and finally, N (image) in Table C.8.

Table C.1.: Order analysis for PS, results only for conditions of large effect sizes (i. e. ≥ 0.40) when 'how stressed do you feel right now'-questions, restoration, visual and appraisal questionnaires are examined; df, p, F and η_p^2 (Bonferroni, Greenhous-Geisser) for sound, vision, sound and vision, sound and order, vision and order and sound, vision and order, S=Sound, V=Vision

Questionnaire	Area/Question	Statistics	S	V	S*V	S*Order	V*Order	S*V*Order
Visual	Meaningful/Meaningless	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.17	0.00	0.24	0.92	0.60	0.91
		F	2.02	24.70	1.47	0.17	0.64	0.18
		η_p^2	0.09	0.54	0.07	0.02	0.08	0.03
Appraisal	Sound choice	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.24	0.24	0.97	0.14	0.32	0.01
		F	1.49	1.47	0.00	2.08	1.23	5.66
		η_p^2	0.07	0.07	0.00	0.24	0.16	0.46
	Be far away	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.00	0.10	0.84	0.95	0.19	0.75
		F	18.49	3.00	0.03	0.12	1.74	0.41
		η_p^2	0.48	0.13	0.00	0.02	0.21	0.06
	Get away	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.00	0.30	0.75	0.64	0.56	0.40
		F	17.25	1.15	0.11	0.58	0.71	1.03
		η_p^2	0.46	0.05	0.01	0.08	0.10	0.13
	Sound change	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.00	0.36	0.61	0.79	0.45	0.22
		F	14.55	0.89	0.27	0.35	0.93	1.63
		η_p^2	0.42	0.04	0.01	0.05	0.12	0.20
	Pleasure perception	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.00	0.68	0.68	0.71	0.76	0.50
		F	15.92	0.18	0.18	0.47	0.39	0.81
		η_p^2	0.44	0.01	0.01	0.07	0.06	0.11

Table C.2.: Order analysis for PN, results only for conditions of large effect sizes (i. e. ≥ 0.40) when 'how stressed do you feel right now'-questions, restoration, visual and appraisal questionnaires are examined; df, p, F and η_p^2 (Bonferroni, Greenhous-Geisser) for sound, vision, sound and vision, sound and order, vision and order and sound, vision and order, S=Sound, V=Vision

Questionnaire	Area/Question	Statistics	S	V	S*V	S*Order	V*Order	S*V*Order
Vision	Meaningful/Meaningless	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.05	0.00	0.27	0.04	0.80	0.53
		F	4.29	17.42	1.29	3.32	0.34	0.75
		η_p^2	0.17	0.54	0.06	0.32	0.05	0.10
Appraisal	Be far away	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.00	0.24	0.70	0.01	0.23	0.51
		F	38.10	1.45	0.16	5.80	1.57	0.81
		η_p^2	0.66	0.07	0.01	0.47	0.19	0.11
	Get away	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.00	0.93	0.49	0.16	0.11	0.02
		F	19.77	0.01	0.50	1.91	2.31	4.48
		η_p^2	0.50	0.00	0.02	0.22	0.26	0.40
	Deactivation tendency	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.87	0.24	0.40	0.45	0.01	0.16
		F	0.03	1.33	0.76	0.92	5.57	1.94
		η_p^2	0.00	0.06	0.04	0.12	0.46	0.23
	Sound change	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.00	0.39	0.24	0.23	0.32	0.14
		F	20.85	0.78	1.50	1.58	1.25	2.03
		η_p^2	0.51	0.04	0.07	0.19	0.16	0.23
	Pleasure perception	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.00	0.92	0.53	0.03	0.79	0.06
		F	24.66	0.01	0.40	3.50	0.35	2.83
		η_p^2	0.55	0.00	0.02	0.34	0.05	0.30

Table C.3.: Order analysis for NS, results only for conditions of large effect sizes (i. e. ≥ 0.40) when 'how stressed do you feel right now'-questions, restoration, visual and appraisal questionnaires are examined; df, p, F and η_p^2 (Bonferroni, Greenhous-Geisser) for sound, vision, sound and vision, sound and order, vision and order and sound, vision and order, S=Sound, V=Vision

Questionnaire	Area/Question	Statistics	S	V	S*V	S*Order	V*Order	S*V*Order
Restoration	Compatibility	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.07	0.01	0.06	0.41	0.60	0.01
		F	3.68	7.30	3.90	1.00	0.63	5.22
		η_p^2	0.15	0.26	0.16	0.13	0.08	0.43
Visual	Meaningful/Meaningless	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.24	0.00	0.11	0.48	0.40	0.56
		F	4.29	19.80	2.85	0.86	1.04	0.71
		η_p^2	0.07	0.49	0.12	0.11	0.13	0.10
Appraisal	Task difficulty	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.28	0.94	0.29	0.90	0.01	0.64
		F	1.25	0.01	1.17	0.20	4.95	0.57
		η_p^2	0.06	0.00	0.06	0.03	0.43	0.08
	Predicted perception	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.27	0.53	0.22	0.05	0.00	0.03
		F	1.30	0.41	1.58	3.04	10.03	3.59
		η_p^2	0.06	0.02	0.07	0.31	0.60	0.35

Table C.4.: Order analysis for NN, results only for conditions of large effect sizes (i. e. ≥ 0.40) when 'how stressed do you feel right now'-questions, restoration, visual and appraisal questionnaires are examined; df, p, F and η_p^2 (Bonferroni, Greenhous-Geisser) for sound, vision, sound and vision, sound and order, vision and order and sound, vision and order, S=Sound, V=Vision

Questionnaire	Area/Question	Statistics	S	V	S*V	S*Order	V*Order	S*V*Order
Restoration	Being Away	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.00	0.08	0.70	0.46	0.01	0.62
		F	12.20	3.43	0.16	0.89	4.50	0.60
		η_p^2	0.37	0.14	0.01	0.11	0.42	0.08
Visual	Meaningful/Meaningless	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.11	0.00	0.35	0.95	0.19	0.97
		F	2.85	31.57	0.92	0.12	1.76	0.08
		η_p^2	0.12	0.60	0.04	0.02	0.20	0.01
Appraisal	Be far away	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.00	0.25	0.90	0.11	0.12	0.23
		F	26.84	1.43	0.02	2.29	2.22	1.57
		η_p^2	0.57	0.07	0.00	0.26	0.25	0.19
	Get away	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.00	0.52	0.94	0.77	0.16	0.10
		F	15.55	0.43	0.01	0.38	1.90	2.29
		η_p^2	0.44	0.02	0.00	0.05	0.22	0.26
	Sound change	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.00	0.33	0.59	0.81	0.69	0.33
		F	15.99	1.00	0.29	0.32	0.50	1.21
		η_p^2	0.44	0.05	0.01	0.05	0.07	0.15
	Pleasure perception	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.00	0.88	0.67	0.12	0.38	0.69
		F	21.36	0.02	0.18	2.21	1.07	0.49
		η_p^2	0.52	0.00	0.01	0.25	0.14	0.07
	Predicted perception	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.09	0.83	0.04	0.16	0.02	0.22
		F	3.27	0.05	4.48	1.92	4.48	1.61
		η_p^2	0.14	0.00	0.19	0.22	0.40	0.19
	Sound identification	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.02	0.63	0.33	0.04	0.01	0.35
		F	6.19	0.24	0.99	3.33	5.62	1.16
		η_p^2	0.24	0.02	0.05	0.33	0.46	0.15

Table C.5.: Order analysis for P, results only for conditions of large effect sizes (i. e. ≥ 0.40) when 'how stressed do you feel right now'-questions, restoration, visual and appraisal questionnaires are examined; df, p, F and η_p^2 (Bonferroni, Greenhous-Geisser) for sound, vision, sound and vision, sound and order, vision and order and sound, vision and order, S=Sound, V=Vision

Questionnaire	Area/Question	Statistics	S	V	S*V	S*Order	V*Order	S*V*Order
		df	1.00	1.00	1.00	3.00	3.00	3.00
Visual	Meaningful/Meaningless	p	0.06	0.00	0.65	0.33	0.54	0.83
		F	4.02	22.38	0.21	1.20	0.74	0.30
		η_p^2	0.16	0.52	0.01	0.15	0.10	0.04
		df	1.00	1.00	1.00	3.00	3.00	3.00
Appraisal	Be far away	p	0.00	0.20	0.82	0.16	0.15	0.94
		F	27.31	1.79	0.05	1.91	1.96	0.13
		η_p^2	0.58	0.08	0.00	0.22	0.23	0.02
		df	1.00	1.00	1.00	3.00	3.00	3.00
	Get away	p	0.00	0.63	0.73	0.63	0.27	0.05
		F	17.73	0.24	0.12	0.58	1.42	3.13
		η_p^2	0.47	0.01	0.01	0.08	0.18	0.32
		df	1.00	1.00	1.00	3.00	3.00	3.00
	Pleasure perception	p	0.00	0.83	0.70	0.24	0.74	0.99
		F	23.90	0.05	0.15	1.52	0.43	0.03
		η_p^2	0.54	0.00	0.01	0.19	0.06	0.01

Table C.6.: Order analysis for N (sound), results only for conditions of large effect sizes (i. e. ≥ 0.40) when 'how stressed do you feel right now'-questions, restoration, visual and appraisal questionnaires are examined; df, p, F and η_p^2 (Bonferroni, Greenhous-Geisser) for sound, vision, sound and vision, sound and order, vision and order and sound, vision and order, S=Sound, V=Vision

Questionnaire	Area/Question	Statistics	S	V	S*V	S*Order	V*Order	S*V*Order
Restoration	Being Away	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.00	0.08	0.70	0.46	0.01	0.62
		F	12.20	3.43	0.16	0.89	4.49	0.60
		η_p^2	0.16	0.52	0.01	0.15	0.10	0.04
Visual	Meaningful/Meaningless	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.11	0.00	0.35	0.95	0.19	0.97
		F	2.85	31.57	0.92	0.12	1.76	0.08
		η_p^2	0.12	0.60	0.04	0.02	0.20	0.01
Appraisal	Be far away	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.00	0.25	0.90	0.11	0.12	0.23
		F	26.84	1.43	0.02	2.29	2.22	1.57
		η_p^2	0.57	0.07	0.00	0.26	0.25	0.19
	Get away	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.00	0.52	0.94	0.77	0.16	0.11
		F	15.57	0.43	0.01	0.38	1.90	2.29
		η_p^2	0.44	0.02	0.00	0.05	0.22	0.26
	Sound change	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.00	0.33	0.60	0.81	0.69	0.33
		F	15.99	1.00	0.29	0.32	0.50	1.21
		η_p^2	0.44	0.05	0.01	0.05	0.07	0.15
	Pleasure perception	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.00	0.88	0.67	0.12	0.38	0.69
		F	21.36	0.02	0.18	2.21	1.07	0.49
		η_p^2	0.52	0.00	0.01	0.25	0.14	0.07
	Predicted perception	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.09	0.83	0.04	0.16	0.02	0.22
		F	3.27	0.05	4.74	1.92	4.48	1.61
		η_p^2	0.14	0.00	0.19	0.22	0.40	0.19
	Sound identification	df	1.00	1.00	1.00	3.00	3.00	3.00
		p	0.02	0.63	0.33	0.04	0.01	0.35
		F	6.19	0.24	0.99	3.33	5.62	1.16
		η_p^2	0.24	0.01	0.05	0.33	0.46	0.15

Table C.7.: Order analysis for S, results only for conditions of large effect sizes (i. e. ≥ 0.40) when 'how stressed do you feel right now'-questions, restoration, visual and appraisal questionnaires are examined; df, p, F and η_p^2 (Bonferroni, Greenhous-Geisser) for sound, vision, sound and vision, sound and order, vision and order and sound, vision and order, S=Sound, V=Vision

Questionnaire	Area/Question	Statistics	S	V	S*V	S*Order	V*Order	S*V*Order
		df	1.00	1.00	1.00	3.00	3.00	3.00
Visual	Meaningful/Meaningless	p	0.49	0.00	0.47	0.07	0.62	0.91
		F	0.48	21.16	0.55	2.72	0.60	0.18
		η_p^2	0.02	0.50	0.03	0.28	0.08	0.03
		df	1.00	1.00	1.00	3.00	3.00	3.00
Appraisal	Concentration disturbance	p	0.33	0.26	0.75	0.04	0.00	0.12
		F	1.02	1.35	0.10	3.24	7.82	2.20
		η_p^2	0.05	0.06	0.01	0.33	0.54	0.25
		df	1.00	1.00	1.00	3.00	3.00	3.00
	Be far away	p	0.00	0.05	0.94	0.06	0.59	0.48
		F	14.98	4.47	0.01	2.89	0.66	0.86
		η_p^2	0.43	0.18	0.00	0.30	0.09	0.11
		df	1.00	1.00	1.00	3.00	3.00	3.00
	Predicted perception	p	0.10	0.74	0.02	0.14	0.01	0.03
		F	3.04	0.12	6.33	2.08	5.84	3.82
		η_p^2	0.13	0.01	0.24	0.24	0.47	0.36
		df	1.00	1.00	1.00	3.00	3.00	3.00
	How stressed	p	0.07	0.15	0.68	0.52	0.01	0.51
		F	3.75	2.20	0.18	0.77	4.78	0.79
		η_p^2	0.16	0.10	0.01	0.10	0.42	0.11

The statistics for S is equal to N (image) (this is checked for typing and analysis error but not believed to be a mistake)

Table C.8.: Order analysis for N (image), results only for conditions of large effect sizes (i. e. ≥ 0.40) when 'how stressed do you feel right now'-questions, restoration, visual and appraisal questionnaires are examined; df, p, F and η_p^2 (Bonferroni, Greenhous-Geisser) for sound, vision, sound and vision, sound and order, vision and order and sound, vision and order, S=Sound, V=Vision

Questionnaire	Area/Question	Statistics	S	V	S*V	S*Order	V*Order	S*V*Order
		df	1.00	1.00	1.00	3.00	3.00	3.00
Visual	Meaningful/Meaningless	p	0.49	0.00	0.47	0.07	0.62	0.91
		F	0.48	21.16	0.55	2.72	0.60	0.18
		η_p^2	0.02	0.50	0.03	0.28	0.08	0.03
		df	1.00	1.00	1.00	3.00	3.00	3.00
Appraisal	Concentration disturbance	p	0.33	0.26	0.75	0.04	0.00	0.12
		F	1.02	1.35	0.10	3.24	7.82	2.20
		η_p^2	0.05	0.06	0.01	0.33	0.54	0.25
		df	1.00	1.00	1.00	3.00	3.00	3.00
	Be far away	p	0.00	0.05	0.94	0.06	0.59	0.48
		F	14.98	4.47	0.01	2.89	0.66	0.86
		η_p^2	0.43	0.18	0.00	0.30	0.09	0.11
		df	1.00	1.00	1.00	3.00	3.00	3.00
	Predicted perception	p	0.10	0.74	0.02	0.14	0.01	0.03
		F	3.04	0.12	6.33	2.08	5.84	3.82
		η_p^2	0.13	0.01	0.24	0.24	0.47	0.36
		df	1.00	1.00	1.00	3.00	3.00	3.00
	How stressed	p	0.07	0.15	0.68	0.52	0.01	0.51
		F	3.75	2.20	0.18	0.77	4.78	0.79
		η_p^2	0.16	0.10	0.01	0.10	0.42	0.11

The statistics for N (sound) is equal to S (this is checked for typing and analysis error but not believed to be a mistake)

D. Results: Further Analyses

The amount of participants, 25 in total, provided possibilities for further analyses. Comparisons to the 'how stressed do you feel right now'-questions asked after the VR-game, in and after the appraisal tests (order 13, 17 and 18 in Table 6.1) were performed due to mean value and standard deviation (SD) in positive sound, structured image (PS); positive sound, non-structured image (PN); negative sound, structured image (NS) and negative sound, non-structured image (NN) for the first - nineth additional analyses. The results for PS are displayed in Table D.1, for PN in Table D.2, for NS in Table D.3 and finally, for NN in Table D.4.

In the following investigations, large effect sizes (i. e. ≥ 0.40) were the targeted area of interest and are displayed when found as well as the additional statistics - degree of freedom (df); significance (p) and corrected F-value (F) (Bonferroni, Greenhous-Geisser) for sound, vision and sound and vision combined when the 'how stressed do you feel right now'-questions, the restoration, visual and appraisal tests were studied.

Table D.5 presents the results for the analysis when one participant was excluded due to age (24 were studied). Table D.6 displays the data for 15 participants due to good (G) knowledge in VR-games. In addition, Table D.7 exhibits the conclusion from eight participants due to very good (VG) skills in VR-games. Table D.8 show the outcomes when two participants were left out due to tinnitus (23 were examined). Finally, the total Weinstein score provided some additional five cases of investigation; Table D.9 presents the analysis of eight participants - belonging to top 30 percent of the highest score (according to Weinstein), Table D.10, the seven participants associated with the bottom 30 percent (according to Weinstein) and the remaining ten participants can be found in Table D.11. It was suggested that the total Weinstein score could be separated into two groups according to the final score (stated by Persson Waye); 12 participants are available in Table D.12 - reaching > 75 and 12 participants are viewed in Table D.13 - reaching < 75.[1]

[1] At the same time, one participant was excluded from the last two analyses since he scored exactly 75 in the Weinstein test

Table D.1.: Comparison between 'how stressed do you feel right now'-questions when PS is presented, concerning mean value and SD

Further Analysis	No. of Participants	Parameter	Mean Value	SD
1st: Age	24	After VR-game	4.13	2.0
		In appraisal test	3.48	2.4
		After appraisal test	3.50	2.0
2nd: G-group (VR)	15	After VR-game	4.47	2.3
		In appraisal test	3.87	2.7
		After appraisal test	3.80	2.4
3rd: VG-group (VR)	8	After VR-game	4.00	1.8
		In appraisal test	2.71	1.6
		After appraisal test	3.00	1.2
4th: No Tinnitus	23	After VR-game	4.17	2.0
		In appraisal test	3.50	2.4
		After appraisal test	3.48	2.0
5th: Weinstein: Top 30 percent	8	After VR-game	3.63	1.9
		In appraisal test	3.29	1.5
		After appraisal test	3.25	1.0
6th: Weinstein: Bottom 30 percent	7	After VR-game	4.14	1.7
		In appraisal test	3.57	1.6
		After appraisal test	3.43	1.0
7th: Weinstein: Excluded from 5th and 6th	10	After VR-game	4.80	2.2
		In appraisal test	3.80	3.3
		After appraisal test	3.80	2.9
8th: Weinstein: $>$ 75 score	12	After VR-game	3.83	1.9
		In appraisal test	2.91	1.6
		After appraisal test	3.17	1.4
9th: Weinstein: $<$ 75 score	12	After VR-game	4.67	2.3
		In appraisal test	4.42	2.7
		After appraisal test	4.08	2.3

Table D.2.: Comparison between 'how stressed do you feel right now'-questions when PN is presented, concerning mean value and SD

Further Analysis	No. of Participants	Parameter	Mean Value	SD
1st: Age	24	After VR-game	4.79	2.2
		In appraisal test	3.91	2.2
		After appraisal test	3.75	2.3
2nd: G-group (VR)	15	After VR-game	5.33	2.7
		In appraisal test	4.60	2.5
		After appraisal test	4.00	2.5
3rd: VG-group (VR)	8	After VR-game	4.50	1.5
		In appraisal test	3.00	1.2
		After appraisal test	3.62	1.8
4th: No Tinnitus	23	After VR-game	5.04	2.0
		In appraisal test	4.09	2.3
		After appraisal test	3.83	2.3
5th: Weinstein: Top 30 percent	8	After VR-game	5.25	2.4
		In appraisal test	3.43	1.6
		After appraisal test	3.38	1.7
6th: Weinstein: Bottom 30 percent	7	After VR-game	4.86	2.6
		In appraisal test	4.71	1.8
		After appraisal test	4.14	1.7
7th: Weinstein: Excluded from 5th and 6th	10	After VR-game	4.70	2.2
		In appraisal test	3.90	2.8
		After appraisal test	3.80	2.9
8th: Weinstein: $>$ 75 score	12	After VR-game	4.92	2.1
		In appraisal test	3.36	1.4
		After appraisal test	3.33	1.6
9th: Weinstein: $<$ 75 score	12	After VR-game	4.92	2.6
		In appraisal test	4.83	2.5
		After appraisal test	4.42	2.6

Table D.3.: Comparison between 'how stressed do you feel right now'-questions when NS is presented, concerning mean value and SD

Further Analysis	No. of Participants	Parameter	Mean Value	SD
1st: Age	24	After VR-game In appraisal test After appraisal test	4.75 4.78 4.37	2.2 2.5 2.3
2nd: G-group (VR)	15	After VR-game In appraisal test After appraisal test	4.80 5.13 4.73	2.3 2.5 2.6
3rd: VG-group (VR)	8	After VR-game In appraisal test After appraisal test	4.63 4.29 4.25	2.2 2.3 2.2
4th: No Tinnitus	23	After VR-game In appraisal test After appraisal test	4.52 4.86 4.52	2.0 2.4 2.4
5th: Weinstein: Top 30 percent	8	After VR-game In appraisal test After appraisal test	3.88 5.14 5.38	1.6 2.9 2.9
6th: Weinstein: Bottom 30 percent	7	After VR-game In appraisal test After appraisal test	4.57 4.43 3.71	1.4 1.9 1.1
7th: Weinstein: Excluded from 5th and 6th	10	After VR-game In appraisal test After appraisal test	5.40 5.00 4.40	2.8 2.7 2.6
8th: Weinstein: > 75 score	12	After VR-game In appraisal test After appraisal test	4.33 5.18 5.00	1.8 2.2 2.5
9th: Weinstein: < 75 score	12	After VR-game In appraisal test After appraisal test	5.08 4.92 4.33	2.6 2.5 2.3

Table D.4.: Comparison between 'how stressed do you feel right now'-questions when NN is presented, concerning mean value and SD

Further Analysis	No. of Participants	Parameter	Mean Value	SD
1st: Age	24	After VR-game	4.37	2.2
		In appraisal test	3.70	2.5
		After appraisal test	4.46	2.7
2nd: G-group (VR)	15	After VR-game	4.80	2.7
		In appraisal test	5.27	2.6
		After appraisal test	5.07	3.0
3rd: VG-group (VR)	8	After VR-game	4.12	1.6
		In appraisal test	3.71	1.6
		After appraisal test	3.62	1.7
4th: No Tinnitus	23	After VR-game	4.57	2.4
		In appraisal test	4.91	2.5
		After appraisal test	4.61	2.7
5th: Weinstein: Top 30 percent	8	After VR-game	4.25	2.4
		In appraisal test	4.71	2.6
		After appraisal test	5.13	3.2
6th: Weinstein: Bottom 30 percent	7	After VR-game	5.43	2.2
		In appraisal test	5.14	2.6
		After appraisal test	4.57	1.7
7th: Weinstein: Excluded from 5th and 6th	10	After VR-game	4.10	2.3
		In appraisal test	4.60	2.6
		After appraisal test	4.00	2.8
8th: Weinstein: $>$ 75 score	12	After VR-game	3.92	2.0
		In appraisal test	5.00	2.3
		After appraisal test	4.83	3.0
9th: Weinstein: $<$ 75 score	12	After VR-game	5.33	2.4
		In appraisal test	4.92	2.6
		After appraisal test	4.50	2.2

Table D.5.: Analysis excluding 1 participant (due to age), results only for conditions of large effect sizes (i. e. ≥ 0.40) when 'how stressed do you feel right now'-questions, restoration, visual and appraisal questionnaires are examined (24 participants); df, p, F and η_p^2 (Bonferroni, Greenhous-Geisser) for sound, vision and sound and vision, S=Sound, V=Vision

Questionnaire	Area/Question	Statistics	S	V	S*V
Visual	Meaningful/Meaningless	df	1.00	1.00	1.00
		p	0.15	0.00	0.16
		F	2.22	22.02	2.12
		η_p^2	0.09	0.49	0.08
Appraisal	Be far away	df	1.00	1.00	1.00
		p	0.00	0.09	0.86
		F	20.24	3.11	0.03
		η_p^2	0.48	0.12	0.00
	Get away	df	1.00	1.00	1.00
		p	0.00	0.20	0.70
		F	18.55	1.75	0.16
		η_p^2	0.46	0.07	0.01
	Sound change	df	1.00	1.00	1.00
		p	0.00	0.24	0.80
		F	20.11	1.49	0.06
		η_p^2	0.48	0.06	0.00
	Pleasure perception	df	1.00	1.00	1.00
		p	0.03	0.68	0.65
		F	17.08	0.18	0.21
		η_p^2	0.44	0.01	0.01

Table D.6.: Analysis including G-group (due to VR-game knowledge), results only for conditions of large effect sizes (i. e. ≥ 0.40) when 'how stressed do you feel right now'-questions, restoration, visual and appraisal questionnaires are examined (15 participants); df, σ, F and η_p^2 (Bonferroni, Greenhous-Geisser) for sound, vision and sound and vision, S=Sound, V=Vision

Questionnaire	Area/Question	Statistics	S	V	S*V
Restoration	Coherence	df	1.00	1.00	1.00
		p	0.43	0.01	0.26
		F	0.66	9.66	1.36
		η_p^2	0.05	0.41	0.09
Visual	Simple/Complex	df	1.00	1.00	1.00
		p	0.07	0.00	1.00
		F	3.84	13.74	0.00
		η_p^2	0.22	0.50	0.00
	Meaningful/Meaningless	df	1.00	1.00	1.00
		p	0.28	0.00	0.65
		F	1.27	12.50	0.21
		η_p^2	0.08	0.47	0.02
Appraisal	Be far away	df	1.00	1.00	1.00
		p	0.00	0.33	0.38
		F	12.94	1.00	0.83
		η_p^2	0.48	0.07	0.06
	Get away	df	1.00	1.00	1.00
		p	0.00	0.05	0.28
		F	11.75	4.62	1.28
		η_p^2	0.46	0.05	0.28

Table D.7.: Analysis including VG-group (due to VR-game knowledge), results only for conditions of large effect sizes (i. e. ≥ 0.40) when 'how stressed do you feel right now'-questions, restoration, visual and appraisal questionnaires are examined (8 participants); df, p, F and η_p^2 (Bonferroni, Greenhous-Geisser) for sound, vision and sound and vision, S=Sound, V=Vision

Questionnaire	Area/Question	Statistics	S	V	S*V
Restoration	Coherence	df	1.00	1.00	1.00
		p	0.04	0.30	0.26
		F	6.50	1.26	1.47
		η_p^2	0.48	0.15	0.17
Visual	Meaningful/Meaningless	df	1.00	1.00	1.00
		p	0.09	0.03	0.09
		F	3.80	7.54	3.80
		η_p^2	0.33	0.52	0.35
Appraisal	Sound choice	df	1.00	1.00	1.00
		p	0.11	1.00	0.09
		F	3.57	0.00	4.23
		η_p^2	0.37	0.00	0.41
	Sound disturbance	df	1.00	1.00	1.00
		p	0.02	0.00	0.33
		F	10.51	0.01	2.89
		η_p^2	0.64	0.00	0.33
	Concentration disturbance	df	1.00	1.00	1.00
		p	0.01	1.00	066
		F	11.59	0.00	1.90
		η_p^2	0.66	0.00	0.24
	Get away	df	1.00	1.00	1.00
		p	0.06	0.42	0.95
		F	5.58	0.76	0.01
		η_p^2	0.48	0.11	0.00
	Body activation	df	1.00	1.00	1.00
		p	0.30	0.05	0.22
		F	1.31	6.25	1.88
		η_p^2	0.18	0.51	0.24
	Sound change	df	1.00	1.00	1.00
		p	0.02	0.49	0.00
		F	9.40	0.54	0.00
		η_p^2	0.61	0.08	0.00
	Lock out feeling	df	1.00	1.00	1.00
		p	0.04	1.00	0.72
		F	7.13	0.00	0.15
		η_p^2	0.54	0.00	0.02
	Pleasure perception	df	1.00	1.00	1.00
		p	0.01	0.89	0.44
		F	16.60	0.02	0.70
		η_p^2	0.73	0.00	0.10

Continued on next page

Table D.7.: Continued from previous page 2(2)

Questionnaire	Area/Question	Statistics	S	V	S*V
Appraisal	How stressed	df	1.00	1.00	1.00
		p	0.08	0.74	0.14
		F	4.27	0.13	2.84
		η_p^2	0.42	0.02	0.32

Table D.8.: Analysis excluding 2 participants (due to tinnitus), results only for conditions of large effect sizes (i. e. ≥ 0.40) when 'how stressed do you feel right now'-questions, restoration, visual and appraisal questionnaires are examined (23 participants); df, p, F and η_p^2 (Bonferroni, Greenhous-Geisser) for sound, vision and sound and vision, S=Sound, V=Vision

Questionnaire	Area/Question	Statistics	S	V	S*V
Visual	Meaningful/Meaningless	df	1.00	1.00	1.00
		p	0.12	0.00	0.18
		F	2.70	21.66	1.89
		η_p^2	0.11	0.50	0.08
Appraisal	Be far away	df	1.00	1.00	1.00
		p	0.00	0.10	0.69
		F	30.28	2.94	0.16
		η_p^2	0.59	0.12	0.01
	Get away	df	1.00	1.00	1.00
		p	0.00	0.36	0.81
		F	24.58	0.90	0.06
		η_p^2	0.54	0.04	0.00
	Sound change	df	1.00	1.00	1.00
		p	0.00	0.33	0.70
		F	20.94	0.99	0.15
		η_p^2	0.50	0.05	0.01
	Pleasure perception	df	1.00	1.00	1.00
		p	0.00	0.52	0.86
		F	22.32	0.43	0.03
		η_p^2	0.52	0.02	0.00

Table D.9.: Analysis including top 30 percent Weinstein score participants (due to Weinstein score), results only for conditions of large effect sizes (i. e. ≥ 0.40) when 'how stressed do you feel right now'-questions, restoration, visual and appraisal questionnaires are examined (8 participants); df, p, F and η_p^2 (Bonferroni, Greenhous-Geisser) for sound, vision and sound and vision, S=Sound, V=Vision

Questionnaire	Area/Question	Statistics	S	V	S*V
Question	After VR-game	df	1.00	1.00	1.00
		p	0.38	0.06	0.25
		F	0.89	5.09	1.58
		η_p^2	0.11	0.42	0.18
	After appraisal test	df	1.00	1.00	1.00
		p	0.05	0.83	0.72
		F	5.50	0.05	0.14
		η_p^2	0.44	0.01	0.02
Visual	Simple/Complex	df	1.00	1.00	1.00
		p	0.02	0.20	0.09
		F	9.68	2.06	3.90
		η_p^2	0.58	0.23	0.36
	Unusual/Ordinary	df	1.00	1.00	1.00
		p	0.29	0.30	0.06
		F	1.30	1.25	5.07
		η_p^2	0.16	0.15	0.42
	Meaningful/Meaningless	df	1.00	1.00	1.00
		p	0.02	0.06	0.54
		F	8.76	5.09	0.41
		η_p^2	0.56	0.42	0.06
Appraisal	Task difficulty	df	1.00	1.00	1.00
		p	0.08	0.34	0.51
		F	4.36	1.07	0.50
		η_p^2	0.42	0.15	0.08
	Be far away	df	1.00	1.00	1.00
		p	0.03	0.16	0.46
		F	7.78	2.58	0.62
		η_p^2	0.56	0.30	0.09
	Get away	df	1.00	1.00	1.00
		p	0.07	0.36	0.14
		F	4.70	0.97	2.91
		η_p^2	0.44	0.14	0.33
	Lock out feeling	df	1.00	1.00	1.00
		p	0.16	0.09	0.43
		F	2.72	4.54	0.72
		η_p^2	0.35	0.48	0.13
	Pleasure perception	df	1.00	1.00	1.00
		p	0.03	0.92	0.44
		F	8.23	0.01	0.68
		η_p^2	0.58	0.00	0.10

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Table D.9.: Continued from previous page 2(2)

Questionnaire	Area/Question	Statistics	S	V	S*V
Appraisal	Predicted perception	df	1.00	1.00	1.00
		p	0.31	0.29	0.01
		F	1.22	1.38	14.09
		η_p^2	0.17	0.19	0.70
	Source identification	df	1.00	1.00	1.00
		p	0.45	0.74	0.05
		F	0.65	0.13	6.25
		η_p^2	0.10	0.02	0.51
	How stressed	df	1.00	1.00	1.00
		p	0.08	0.17	0.23
		F	4.47	2.40	1.78
		η_p^2	0.43	0.29	0.23

Table D.10.: Analysis including bottom 30 percent Weinstein score participants (due to Weinstein score), results only for conditions of large effect sizes (i. e. ≥ 0.40) when 'how stressed do you feel right now'-questions, restoration, visual and appraisal questionnaires are examined (7 participants); df, p, F and η_p^2 (Bonferroni, Greenhous-Geisser) for sound, vision and sound and vision, S=Sound, V=Vision

Questionnaire	Area/Question	Statistics	S	V	S*V
Visual	Simple/Complex	df	1.00	1.00	1.00
		p	0.84	0.06	0.06
		F	0.05	5.19	5.25
		η_p^2	0.01	0.46	0.47
	Unusual/Ordinary	df	1.00	1.00	1.00
		p	0.19	0.08	0.26
		F	2.21	4.28	1.54
		η_p^2	0.27	0.42	0.20
	Meaningful/Meaningless	df	1.00	1.00	1.00
		p	0.56	0.01	0.08
		F	0.38	13.74	4.27
		η_p^2	0.06	0.70	0.42
Appraisal	Concentration disturbance	df	1.00	1.00	1.00
		p	0.06	0.40	0.23
		F	5.13	0.84	1.83
		η_p^2	0.46	0.12	0.23
	Be far away	df	1.00	1.00	1.00
		p	0.04	0.60	0.70
		F	6.60	0.31	0.16
		η_p^2	0.52	0.05	0.03
	Get away	df	1.00	1.00	1.00
		p	0.05	0.69	0.93
		F	6.44	0.17	0.01
		η_p^2	0.51	0.03	0.00
	Sound change	df	1.00	1.00	1.00
		p	5.70	1.73	1.72
		F	5.70	1.73	1.72
		η_p^2	0.49	0.22	0.22
	Pleasure perception	df	1.00	1.00	1.00
		p	0.08	0.30	0.71
		F	4.56	1.31	0.16
		η_p^2	0.43	0.18	0.03
	Mentally/Physically strenuous	df	1.00	1.00	1.00
		p	0.35	0.06	0.36
		F	1.03	5.57	1.00
		η_p^2	0.15	0.48	0.14

Table D.11.: Analysis excluding top/bottom 30 percent Weinstein score participants (due to Weinstein score), results only for conditions of large effect sizes (i. e. ≥ 0.40) when 'how stressed do you feel right now'-questions, restoration, visual and appraisal questionnaires are examined (10 participants); df, p, F and η_p^2 (Bonferroni, Greenhous-Geisser) for sound, vision and sound and vision, S=Sound, V=Vision

Questionnaire	Area/Question	Statistics	S	V	S*V
Visual	Unusual/Ordinary	df	1.00	1.00	1.00
		p	0.39	0.01	0.81
		F	0.83	12.10	0.06
		η_p^2	0.08	0.57	0.01
	Meaningful/Meaningless	df	1.00	1.00	1.00
		p	0.27	0.02	0.85
		F	1.39	7.38	0.04
		η_p^2	0.13	0.45	0.00
	Regular/Irregular	df	1.00	1.00	1.00
		p	0.20	0.01	0.65
		F	1.95	11.32	0.23
		η_p^2	0.18	0.56	0.03
Appraisal	Take part again	df	1.00	1.00	1.00
		p	0.20	0.00	0.08
		F	1.89	16.86	3.82
		η_p^2	0.17	0.65	0.30
	Be far away	df	1.00	1.00	1.00
		p	0.01	0.32	0.60
		F	9.62	1.12	0.30
		η_p^2	0.52	0.11	0.03
	Get away	df	1.00	1.00	1.00
		p	0.02	0.49	0.69
		F	8.26	0.52	0.17
		η_p^2	0.48	0.06	0.02
	Sound change	df	1.00	1.00	1.00
		p	0.01	0.68	0.45
		F	10.34	0.18	0.61
		η_p^2	0.54	0.02	0.06
	Pleasure perception	df	1.00	1.00	1.00
		p	0.03	0.84	0.68
		F	6.51	0.05	0.18
		η_p^2	0.42	0.01	0.02

Table D.12.: Analysis including participants with a Weinstein score > 75 (due to Weinstein score), results only for conditions of large effect sizes (i. e. ≥ 0.40) when 'how stressed do you feel right now'-questions, restoration, visual and appraisal questionnaires are examined (12 participants); df, p, F and η_p^2 (Bonferroni, Greenhous-Geisser) for sound, vision and sound and vision, S=Sound, V=Vision

Questionnaire	Area/Question	Statistics	S	V	S*V
Restoration	Being Away	df	1.00	1.00	1.00
		p	0.02	0.09	0.75
		F	7.62	3.38	0.11
		η_p^2	0.41	0.23	0.01
Visual	Simple/Complex	df	1.00	1.00	1.00
		p	0.01	0.10	0.07
		F	11.88	3.27	4.10
		η_p^2	0.52	0.23	0.27
	Meaningful/Meaningless	df	1.00	1.00	1.00
		p	0.05	0.01	0.64
		F	4.89	9.28	0.23
		η_p^2	0.31	0.46	0.02
Appraisal	Task difficulty	df	1.00	1.00	1.00
		p	0.03	0.54	0.42
		F	6.75	0.40	0.70
		η_p^2	0.40	0.04	0.07
	Be far away	df	1.00	1.00	1.00
		p	0.00	0.04	0.25
		F	16.90	5.76	1.52
		η_p^2	0.63	0.37	0.13
	Get away	df	1.00	1.00	1.00
		p	0.01	0.52	0.13
		F	11.00	0.46	2.77
		η_p^2	0.52	0.04	0.22
	Sound change	df	1.00	1.00	1.00
		p	0.01	0.37	0.40
		F	10.74	0.88	0.77
		η_p^2	0.52	0.08	0.07
	Pleasure perception	df	1.00	1.00	1.00
		p	0.00	0.81	0.60
		F	15.44	0.06	0.29
		η_p^2	0.61	0.01	0.03
	Predicted perception	df	1.00	1.00	1.00
		p	0.10	0.39	0.03
		F	3.21	0.80	6.98
		η_p^2	0.24	0.07	0.41
	Source identification	df	1.00	1.00	1.00
		p	0.38	1.00	0.02
		F	0.83	0.00	7.64
		η_p^2	0.08	0.00	0.43

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Table D.12.: Continued from previous page 2(2)

Questionnaire	Area/Question	Statistics	S	V	S*V
Appraisal	How stressed	df	1.00	1.00	1.00
		p	0.01	0.49	0.32
		F	11.29	0.51	1.10
		η_p^2	0.53	0.05	0.10

Table D.13.: Analysis including participants with a Weinstein score < 75 (due to Weinstein score), results only for conditions of large effect sizes (i. e. ≥ 0.40) when 'how stressed do you feel right now'-questions, restoration, visual and appraisal questionnaires are examined (12 participants); df, p, F and η_p^2 (Bonferroni, Greenhous-Geisser) for sound, vision and sound and vision, S=Sound, V=Vision

Questionnaire	Area/Question	Statistics	S	V	S*V
Visual	Simple/Complex	df	1.00	1.00	1.00
		p	0.90	0.02	0.18
		F	0.02	8.00	2.10
		η_p^2	0.00	0.42	0.16
	Meaningful/Meaningless	df	1.00	1.00	1.00
		p	0.46	0.00	0.18
		F	0.59	18.03	2.02
		η_p^2	0.05	0.62	0.16
	Regular/Irregular	df	1.00	1.00	1.00
		p	0.26	0.01	0.89
		F	1.39	9.08	0.02
		η_p^2	0.11	0.45	0.00