Diplomarbeit

Titel der Arbeit

What will Happen, if Sound Quality Meets Construal Level?

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Angestrebter akademischer Grad

Magister der Naturwissenschaften (Mag. rer. nat.)

Wien, im Oktober 2012

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Contents

Acknowledgment

Abstract

Individuals' construal level is influenced by proximity or distance. Distance can be social, temporal or spatial. Hence, physically defined conditions also could determine construal level. However, what will happen, if physically defined conditions are always the same but impression is different? Music and sound quality are dynamic elements of a room. Low vs. high sound quality is characterized by technical difference as well as sound distribution. Our consideration was that individuals get less or more information by using bad or good sound distribution and less or more complex reverberation, which leads to a different room size rating. This room size perception difference may cause a different construal level. Therefore we compared a low quality loudspeaker with a high quality loudspeaker. We either played background or foreground music. Seventy-nine individuals of different genders, age and education participated. Participants had to complete different questionnaires about construal level, mood and different personality traits. They had to listen to music in a dark room dazzled by two lamps to ensure that music was in the center of attention. There were two main results. Firstly, results indicated that participants listening to background music coming out of a high quality loudspeaker had a lower construal level than participants listening to background music coming out of a low quality loudspeaker. Secondly, participants listening music coming out of a high quality loudspeaker rated room size smaller than participants listening to music coming out of a low quality loudspeaker.

Keywords: sound quality, music, construal level, room size perception

What will Happen, if Sound Quality

Meets Construal Level?

Weekly or daily you have to buy products, like milk or bread, you need for everyday life. Nearby your apartment there is your favorite supermarket. You know exactly how this supermarket is appointed and what you have to expect. Imagine going to this supermarket. First you may expect that almost every supermarket is constructed to meet the needs of right-handed people. So the entry of the supermarket is on the right side of the building. You know the supermarket is clearly structured as well. First there is fruit. Next, there are different types of meat or fish followed by buns and sausages. This allows you to find the products you want more easily. Nothing is left to chance. Everything is done for a good shopping experience and certainly for the sales volume. The most expensive products are well – placed at eye level. The smell of fresh bread spreads out in the entire supermarket. Mirrors aim to increase the offer. Different colored light helps point out the strengths of the products. Furthermore, you can hear music and advertising messages over loudspeakers especially designed for this particular type of supermarket.

Everything listed has been well studied and managers know about the effects. They even use this knowledge when they plan to rebuild existing supermarkets or to build new supermarkets.

However, there is limited space for design (e.g. room size, light, color, product placement) but each element of design could have an important impact on the mind, which has not been entirely explored yet. The mind may be influenced by physical conditions. One important factor of the mind is the *construal level* (CL). The construal level theory (Liberman, Sagristano, & Trope, 2002; Trope, Liberman, & Wakslak, 2007) postulates that there are two different categories of thinking depending on

proximity or distance. The CL could be determined by social, temporal or spatial proximity or distance. Generally, proximity is related to concrete thinking (*low CL*). In contrast, distance is related to abstract thinking (*high CL*). Concrete thinking people think in a more complex, unstructured, superficial and detailed way. Abstract thinking people think more easily, globally and are geared to reach higher goals. The closer a person or an event or the smaller spatial distance is, the lower the CL.

The construal level theory is relevant to the shopping atmosphere because of two different considerations: Firstly, construal level can be manipulated by making simple changes in space. Meyers-Levy and Zhu (2007) manipulated CL by the height of the ceiling. The higher the ceiling, the higher was the CL. But it only worked, when the participants were made aware of the ceiling height. Meyers-Levy et al. achieved this aim by hanging things, like lamps, on the ceiling. Secondly, construal level influences behavior. Individuals indicate a different behavior depending on different issues of the construal level theory. According to whether the focus is on proximity or distance, people would rather prefer an apartment closer to work or an apartment farther away (Liberman, Trope, & Wakslak, 2007).

Meyers-Levy et al.'s study (2007) suggests that other trivial manipulations in space can change CL as well. Usually the room size cannot be altered. Hence, room size and height cannot easily be changed. However, there are dynamic elements of a room that may influence CL and may be more important than room size. An important element of the atmosphere is music. Music influences perception as well as behavior, which led to a lot of different studies. Milliman's studies (1982; 1986) for example demonstrated that people, who heard slow music, remained longer in the store and bought more than people who heard fast music. North and Hargreaves (1998) demonstrated that there would be different effects on sales volume, if in a

cafeteria "no music" or "easy listening music" or "Pop" or "classical music" was played. Bailey and Areni (2006) demonstrated that people estimated duration shorter while listening to familiar music. Generally, these ones and some more of them (e.g.Mattila & Wirtz, 2001; North, Hargreaves, & McKendrick, 2000; Wilson, 2003) are studies on content-based music. Scientists only varied the type or rhythm or duration of the music and they examined the effect of music in different settings.

Nevertheless, there is no study about music and CL, neither we could find any study how sound quality influences perception and behavior nor could find any study about sound quality and CL.

Generally, it is a gap in the science community as well as in the planning of supermarkets to neglect sound quality because there is a sensible growth of the development of loudspeakers' quality. Loudspeakers are no longer just a necessary bulky medium to transfer music to the listener's ear. Developers of loudspeakers seem to pursue two different goals. Either they construct loudspeakers as objets d'art or they construct loudspeakers just as "silent" invisible objects for the atmosphere. However, primarily the focus of development is on sound quality. Though, quality per se does not mean improvement. First of all, the psychological value of this development has to be determined to be part of the atmosphere. Afterwards the results can be transferred to other settings such as the supermarket atmosphere. In other words: It is essential to do basic research.

However, it has to be clarified if high quality loudspeakers have any important impact on the behavior, regardless of music. Therefore it is principally important to clarify if there are any differences between *low* and *high quality* loudspeakers linked to psychological factors. The technical quality difference between low and high quality loudspeakers results in their types and characteristics. Low quality

loudspeakers are primarily characterized by poor transport of the sound. This means that it is just possible to transfer a small frequency range. Besides, low quality loudspeakers spread out the sound conically directly to the listener. In contrast, high quality loudspeakers are like public address systems. That means they are characterized by comprehensive transport of the sound. It is possible to transfer a wide frequency range. In addition, the sound waves of these loudspeakers spread out over a circular pattern: that means the sound waves do not spread out directly to the listener. Depending on how sound waves spread out, it is more or less possible for the listener to localize the source of the sound. However, this indicates that sound quality may also influence perception of distance.

First of all, Individuals are able to localize the source of a sound because of the position of the ears. One ear is on the left side of the head, the other one on the right side. Hence, left and right are defined. This is the prerequisite for the ability of localization. There are two factors, which determine if individuals are able to localize the source of a sound. Firstly, time is a decisive factor for the localization (Hartmann, 1999). Sound waves first reach one ear. After a certain time they reach the other ear. Hence, there is some time difference between the right and left ear. A shorter time difference occurs if the source of sound is in front of or behind individuals. However, if the source of sound comes from another place, there is a longer time difference. Individuals are not able to localize the source of a sound, if it is not placed in front of or behind them. Nevertheless, sound waves reach both ears within a shorter time. Secondly, reverberation is also a very important part of localizing because it is an important distance cue (Shinn-Cunningham, 2001). Hence, it depends on how complex the reverberation is. The more the sound waves hit

different surfaces the more complex reverberation is. The more complex reverberation is the more difficult it is to localize the source of a sound.

However, it is plausible that if the sound waves of one loudspeaker spreads out conically directly to the listener's ear, it could be easier to localize the loudspeaker, as the sound first reaches one ear and produces less complex reverberation. However, if the sound spreads out to the listener in a circular pattern but not directly to the listener it could be more difficult to localize the loudspeaker, as the sound reaches both ears simultaneously and produces more complex reverberation.

By localizing sound waves we may establish a relationship with the environment. If we are able to localize the source of the sound, we may be able to estimate the distance to the source. The rating of the distance influences our thinking in accordance with construal level theory.

Therefore room size perception determines if individuals have a low or high CL. Low or high sound quality may have the same effect as high or low height in Meyers-Levy et al.'s study (2007). Therefore technical difference and distribution of sound waves are important. Firstly, we consider individuals to perceive the room more consciously, while listening to music coming out of high quality loudspeakers. Hence, individuals get more information about the room through high quality loudspeakers than through low quality loudspeakers. Individuals perceive the room larger and higher, while listening to music coming out of high quality loudspeakers. Secondly, we consider that there is a clearer reverberation coming out of low quality loudspeakers, which makes it easier for individuals to localize the source of the sound. If individuals listen to music coming out of low quality loudspeakers, they will have an important distance cue. Hence, individuals perceive the room smaller and

lower while listening to music coming out of low quality loudspeakers. These two considerations indicate that individuals may have a high CL by listening to music coming out of high quality loudspeakers. However, they may have a low CL by listening to music coming out of low quality loudspeakers.

However, this impact may not be a result of room size perception. There are other subjective components of room perception, which are determined by individuals' perception of space. On the one hand there is subjective comfort, on the other hand spatial perception, which might even be sufficient predictors for CL.

H1: Participants listening to the high quality loudspeaker have a significantly higher CL, compared to participants listening to the low quality loudspeaker.

H2: Participants listening to the low quality loudspeaker localize the position of the loudspeaker significantly more often compared to those listening to the high quality loudspeaker. Participants listening to a low quality loudspeaker perceive their decision of the localization significantly more confidently and simply compared to participants listening to the high quality loudspeaker.

H3: Participants listening to the high quality loudspeaker perceive the room as significantly larger and higher compared to those listening to the low quality loudspeaker.

H4: Participants listening to the high quality loudspeaker perceive their subjective comfort significantly better and their spatial perception significantly higher compared to participants listening to the low quality loudspeaker.

However, there are some other components which may influence CL. Music may influence CL. One type of music which may affect CL in one or another direction is background versus foreground music. Background music means instrumental music without vocal performance. This type of music is used in movies or radios or television shows to enhance the atmosphere or to generate some excitement. Background music is comparable with distance, as different listeners can interpret it in many different ways. Besides, it is easier to relax. Moreover, it is easier to be lost in thought. In contrast, foreground music means instrumental music with vocal performance. This type of music is more common in everyday life. Furthermore, it is used to tell a story. Hence, foreground music is comparable with proximity, as there is just one interpretation possible and the listener has to pay more attention compared to the listener of background music. Hence, we consider that music may influence CL.

H5:   Participants listening to background music have a significantly higher CL compared to those listening to foreground music.

Scientists emphasize that people's mood influences their thinking and behavior. Moreover, mood is also a very important factor for CL. Gasper and Clore (2002) demonstrated that people in a good mood are more likely to "see the forest" (are more in a global focus) whereas people in a bad mood are more likely to "see the trees" (in a more local focus). However, low vs. high sound quality may affect mood. Individuals listening to music coming out of the low quality loudspeaker may perceive music as unpleasant, which may cause bad mood. Bad mood causes low CL.

H6:   Participants listening to music coming out of a high quality loudspeaker

have a significantly better mood compared to those listening to music

coming out of a low quality loudspeaker.

H7:   The better mood the higher CL.

There may be connections between CL and sound quality depending on the

different room size perception with an interrelation of sound quality and localizability.

There may also be other factors that influence the results. One important aspect is

the influence of personality traits. Individuals per se have a different perception that

influences their strategy. There are two ways of how individuals integrate the context

(Kitayama, Duffy, Kawamura, & Larsen, 2003). Either people are more capable of

incorporating contextual information (holistic processing) or they are more capable of

ignoring contextual information (analytic processing). Generally, individuals in a more

holistic perception may have more problems with localization, as they are less

focused on details compared to analytic processing people. Hence, they may use

more information for example reverberation, which create less confidence.

H8:   Participants with a holistic processing are significantly more insecure in

their decision concerning the loudspeaker's position compared to

participants with an analytic processing.

Another personality trait factor may be the ability of involvement. Witmer and

Singer (1998) define involvement as a psychological state experience as a

consequence of focusing one's energy and attention on a coherent set of stimuli or

meaningfully related activities and events (Witmer et al., 1998, p. 227). If individuals

are focusing on an activity, they may be more focused on details, which is

comparable with low CL. Hence, the ability of involvement may influence CL.

Especially the ability to engage in music is very important for this study. Moreover,

the low vs. high sound quality and background vs. foreground music manipulation

may just work, if individuals are able to engage.

H9:   The higher involvement the lower CL.

Furthermore, CL may be influenced by the test arrangement itself. There are

three factors that may influence individuals' CL. Firstly, there is the perception of

quality. Individuals may rate sound quality in a different way, which may influence CL.

Hence, there may be a difference between objective sound quality and subjective

sound quality, which influences CL. Secondly, participants' rate of volume may

influence participants' rate of quality. Hence, volume of music may influence well-

being in a negative way. Thirdly, participants' music preference may influence CL.

Preferred music may influence well-being in a positive way. Those factors depend on

the test arrangement because they are determined during testing. Those factors are

comparable to mood. However, they are more specific, whereas mood is more

universal.

H10:   The higher participants perceive sound quality the higher CL.

H11:   The louder participants perceive sound the lower they rate sound

       quality.

H12:   The more participants prefer music the higher CL.

The results may also be influenced by expertise and experience with music,

which are determined before the study. Expertise factors include four different

factors. Firstly, there is the importance of music. Secondly, there is the frequency of

listening to music per day. Thirdly, there is the knowledge of music and fourthly there is the knowledge of sound systems. The first two ones are more general factors, the others are more specific ones. Music may be important for individuals and they often listening to music but they may not be interested in details. Hence, they may or may not be concerned with music history or technical structure of sound systems or something like that. However, importance of music and frequency of listening to music per day are more or less prerequisites for the last two factors "knowledge of music" and "knowledge of sound systems". If individuals are interested in music, listen to music and have knowledge of music and sound systems, these factors may influence confidence and simplicity of localization as well as judgment of quality and music preference.

H13:   The higher participants' expierence (importance of music and frequency of listening to music per day) the higher they rate subjective quality and the more they prefer music.

H14:   The higher expertise of participants (knowledge of music and knowledge of sound systems) the more confidently and simply they perceive their decision of localization.

We conducted a lab study to test our hypotheses in which we varied low vs. high quality and background vs. foreground music. In order to measure CL we applied Kimchi and Palmer's questionnaire (1982) and Behavioral Identification Form (BIF) of Vallacher and Wegner (1989). Furthermore, in order to measure room size perception we applied four items: square meter rating and height rating as well as subjective comfort and spatial perception. In order to measure localizability we applied three items: localization, confidence and simplicity. In order to measure mood

we applied PANAS scales (Watson, Clark, & Tellegen, 1988). In order to measure

the ability to integrate the context we applied the framed line task (FLT) based on the

Kitayama et al.'s study (2003). In order to measure ability of involvement we applied

Witmer et al's questionnaire (1998). In order to measure music experience we

applied three items: subjective quality, volume, music preference. In order to

measure music expertise we applied three items: importance of music, frequency,

knowledge of sound systems and knowledge of music.

Each participant was tested separately. Participants were assigned by chance

to one of the four conditions. He or she had to complete different tests on the

computer and had to complete one paper-pencil test before or while listening to

music coming out of a loudspeaker. We ensured that music was in the center of

attention by darkening the room, dazzling the participants and covering the

loudspeakers. Participants believed that there were four different loudspeakers

because they could see 4 cables to the right side of the room where the amplifier was

placed. In reality there was just one loudspeaker. In each condition the target

loudspeaker was hanging in the same place. The duration of the study was 20 to 30

minutes.

Methods

Design and Participants

In order to test the effect of sound quality and music on CL, we established a 2x2 design to vary low quality vs. high quality and background vs. foreground music. Hence, there were four conditions. Participants either listened to background music coming out of a low quality or high quality loudspeaker or listened to foreground music coming out of a low quality or high quality loudspeaker. We assigned participants to one of four conditions by chance.

Seventy-nine subjects (33 male) participated in the study. One part of the participants received benefit for seminars. Other participants were recruited on the street or via facebook. The average age of the participants was 25,72 (SD_{age} = 5,24). The youngest was 20 years old and the oldest was 62 years old. Seventy-two students participated, 53 of them are psychology students. The other students for example were studying law, physics or journalism. Three of 72 students were also working for example as fitness trainer, music schoolteacher or operator. Seven of the 79 participants were working such as lawyer, primary schoolteacher or businessman. No participant had to be excluded from the study because of education or work.

Twenty participants (7 male) participated in the background music/high quality condition. Nineteen participants (9 male) participated in the background music/low quality condition. Twenty participants (8 male) participated in the foreground music/high quality condition. Twenty participants (9 male) participated in the foreground music/low quality condition. All participants completed the study. No one had to be excluded because of some disorders during the testing. Participants did not know what the study was about. Therefore no one had to be excluded. Some

participants had completed CL questionnaires before, but we did not exclude them, as they did not know what those questionnaires purposed.

Procedure

The different questionnaires for the established hypotheses were embedded in a larger study. Hence, it is necessary to describe the whole process of the study.

Participants were tested separately. Participants were led into a dark room. The room was 2.5 x 5.5 meters. In the middle of the room there was a table. On the table there was a notebook. Two desk lamps on the left and right behind the notebook dazzled participants. Behind the table a curtain covered the supposed 4 loudspeakers. In reality only one loudspeaker was behind the curtain, according to the conditions either a low quality loudspeaker or a high quality loudspeaker. Participants just could see 4 cables to the right side of the room where the amplifier was placed and the test director was sitting during the testing. Participants should believe that each of the 4 loudspeakers would transfer music. They could not see the test director because computers blocked view.

Firstly, participants had to fill in demographic data (sex, age, study and semester as well as work) using the notebook. Then participants were asked to stand up and go to the table on the right side where they had to read instructions for the framed line task and to memorize the target line. Afterwards they were asked to return and complete the paper-pencil questionnaire the test director had prepared. Then participants had to complete the involvement questionnaire using the notebook again.

After participants had finished the questionnaire, they were asked to tell the test director to start playing the music. First of all they had to listen to music for 2

minutes. The test director signalized participants to continue. From that moment on music was played until the end of the testing.

After 2 minutes listening to the music participants had to answer different budget planning tasks, which were part of another study. Afterwards participants had to complete Kimchi Palmer Figures (Kimchi et al., 1982) as well as the Behavioral Identification Form (BIF; Vallacher et al., 1989).

Then participants had to complete different purchase decision tasks, which were also part of the other study.

Afterwards participants were asked the perception of the room size and the subjective experience as well as the expertise experience. Furthermore, participants were asked which of the 4 loudspeakers was playing music. Therefore numbers were put up 1 meter above the loudspeakers. There was a clear separation between left and right. The distance between the loudspeakers number 1 and 2 as well as number 3 and 4 was 1 meter whereas the distance between number 2 and 3 was 2 meters. Furthermore, they were also asked about confidence and simplicity of their decision. That was a check if the manipulation worked.

Afterwards participants had to complete the PANAS scales (Watson, et al., 1988). Finally, participants were asked if they had any idea what that study intended to propose or if they had ever completed some of those questionnaires before the study. This was necessary to eliminate participants who tended to guess right and to minimize the falsification of the study.
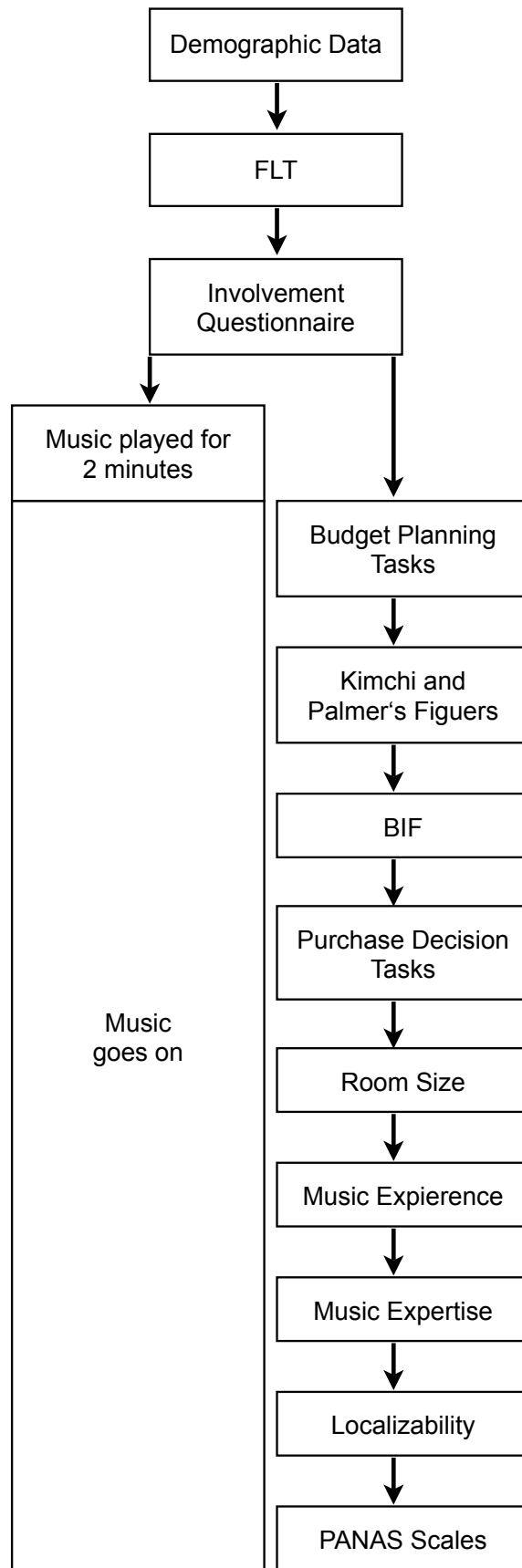
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Figure 1. Study Procedure.

Materials

In our study the low quality loudspeaker was made by Philips and is called SBC 3207 (computer loudspeaker). The frequency range is between 100 and 18 000 Hz and 6 W. The high quality loudspeaker was made by "New Tec Audio" and is called "Cono solo". Its frequency range is between 120 and 20 000 Hz and 170 W. The difference between the computer loudspeaker and the "Cono solo" equates the description (see above). Just one loudspeaker was used for a better comparability.

While the original music was played in the condition "foreground music", the instrumental version was played in the condition "background music". The following music was played: In the foreground music condition we played "Heart of Gold" interpreted by Neil Young, "Nessaja" interpreted by Peter Maffay, "The Rose" interpreted Bette Midler and "Das ist dein Tag" interpreted by Gregor Glanz (a song by Udo Jürgens). In the background music condition we played the instrumental version "Heart of Gold" in the style of Neil Young, "Nessaja" in the style of Peter Maffay, "The Rose" in the style of Bette Midler and "Das ist dein Tag" in the style of Udo Jürgens. These songs had been selected because they are not in the charts at the moment and represent different types of music. In this way we tried to attract participants' attention. The sequence of both conditions was the same. The duration of "foreground music" was 15 min 11 s and the duration of "background music" was 15 min 38 s. Volume approximately corresponded from 65 to 80 dBs. The strong difference arose due to the fact that volume was part of the composition, on the other hand we used different types of music. The songs were played with different instruments as well.

"Heart of Gold" is a Rock song. The interpreter sings the song in English. The instruments used in this song are the following ones: guitar, harmonica and drums.

"Nessaja" is a Rock song. The interpreter sings the song in German. At the end there

is a spoken part. The instruments used in this song are the following ones: keyboard,

synthesizer and drums. "The Rose" is a Pop song. This duet song is sung in English.

The instruments used in this song are the following ones: piano and synthesizer.

"Das ist dein Tag" is a so-called "Schlager" music. The interpreter sings the song in

German. The instruments used in this song are the following ones: piano, synthesizer

and drums. At the end of the song there is a chorus.

We used two different questionnaires to measure the CL. On the one hand there is Kimchi Palmer Figures (1982). Participants had to decide which one of the presented two figures resembled the target figure. Figure 2 shows an example for that task. According to this fact the target figure is a triangle composed of triangles. The participant could choose either the triangle composed of quadrats or the quadrat composed of triangles. The triangle composed of quadrats corresponds to high

Figure 2. Example for the presentation of the items of Kimchi and Palmer's figures (1982). Above there is the target figure, the left figure corresponds to high CL, the right figure corresponds to low CL. (Kimchi, 1992, p. 32)

CL because it looks like the entire target figure. The quadrat composed of triangles

corresponds to low CL because its components look like the target figure. Therefore

there are 12 items (α = .848). The sum of the answers illustrates if participants had a

low or high CL (0 = low CL , 12 = high CL).

Besides, participants had to complete the "Behavior Identification Form" (BIF)

tasks (Vallacher & Wegner, 1989). Participants were presented an activity for

example "Picking an apple". He or she had to decide if this activity was either "Pulling

an apple off a branch" or „getting something to eat". The former category is

equivalent to low CL because it is a concrete statement. The other one is equivalent to high CL because it is a "geared to a higher goal" statement. Therefore there are 24 items (α = .739). The sum of the answers illustrates if the participant has a rather low or high CL (0 = *low CL*, 24 = *high CL*).

We used two different aspects to measure the perception of the entire room. On the one hand participants had to estimate the room size in square meters and the height of the room and on the other hand participants had to estimate their spatial perception on a 6-point scale divided in subjective comfort (1 = *not good at all*, 6 = *very well*) and spatial perception (1 = *not modern*, 6 = *very spacious).*

We used PANAS scales (Watson, et al., 1988) to measure mood. On a 5-point scale (1 = *very little or not at all*, 6 = *most*) participants had to estimate how they were feeling during the study. Therefore there are 20 different adjectives such as "active" (α = .807).

The framed line task (FLT) based on the study of Kitayama et al. (2003) was used to measure how the participant is able to integrate or ignore the context. In Kitayama et al.'s study (2003) participants had to remember a line embedded in a frame in a very short time. There were two different places in their test arrangement: At one place participants had to memorize the target line and at the other place they had to draw the target line on the questionnaire. This procedure was done in a similar way in my study. In my study the participant had 15 seconds to memorize the absolute length of the line (48 millimeter) in a 147 x 147 millimeter frame. Afterwards he/she got a questionnaire with 5 Items (α = .897). On each second page there was one blank frame (size: 88 x 88, 118 x 118, 59 x 59, 147 x1 47 and 29 x 29) where he/she had to draw the line. There was a blank sheet between the items so that the other frames could not be noticed.

Witmer et al's questionnaire (1998) was used to measure the ability of involvement. There are two different important factors. On the one hand the ability to focus on something, on the other hand the ability to involve in something. The ability to focus on something is a prerequisite to the ability to involve. We used 8 items (α = .494) on a 7-point scale (1 = *not at all* , 7 = *much*) for the factor "focus" such as "How mentally alert do you feel at the present time?" We used 7 items (α = .651) on a 7-point scale (1 = *not at all* , 7 = *much*) for the factor "involvement" such as "How frequently do you find yourself closely identifying with the characters in a story line?".

We used different items to measure subjective aspects determined during the testing. We asked participants on a 6-point scale (1 = *worst*, 6 = *very well)* how he or she perceived the quality of the music to measure perceived quality. We asked participants on a 6-point scale (1 = *very quiet*, 6 = *very loud*) how he or she perceived volume of the music to measure the volume. We asked participants on a 6-point scale (1 = *not at all*, 6 = *very well*) how much he or she liked the music to measure music preference.

We used different items to measure expertise. We asked participants on a 6-point scale (1 = *very low*, 6 = *much*) how important music in their lives is to measure importance of music. We asked participants on a 6-point scale (1 = *very little*, 6 = *very often*) how often they listened to music per day to measure frequency. We asked participants on a 6-point scale (1= *very low*, 6 = *much*) how much knowledge of music and how much knowledge of sound systems they have.

Results

Main Analysis

      Effects of Sound Quality and Music on Construal Level. We supposed that Participants listening to the high quality loudspeaker have a significantly higher CL, compared to participants listening to the low quality loudspeaker (H1). We also supposed that Participants listening to background music have a significantly higher CL compared to those listening to foreground music (H5).

      We analyzed Kimchi Palmer Figures as well as BIF, which are the two CL-scales. Each item of CL-scales has two choices. We categorized choices either to low or high CL. We coded low CL with 0 and high CL with 1. We summarized each participant's answers to one CL-scale (high value = high CL). We could not summarize Kimchi Palmer Figures and BIF. However, the correlation between the two questionnaires is $r(79) = 0{,}290$, $p = 0{,}009$, so it is too low to summarize them. Therefore we analyzed them separately.

      Neither there are significant correlations between age, study and Kimchi Palmer Figures or between age, study and BIF, $r(79) < -.204$, $p > .071$. There is a significant correlation between BIF and genders, $r(79) = -.319$, $p = .004$. Hence, we make BIF analysis in observance of genders.

      In order to test hypotheses H1 and H5, we conducted an ANOVA with sound quality and music as independent factors and Kimchi Palmer Figures as dependent measure. We conducted an ANCOVA with sound quality and music as independent factors and BIF as dependent measure as well as genders as covariate.

      The multiple ANOVA revealed no significant main effect for Kimchi Palmer Figures between low ($M_{CL} = 6.95$, $SD_{CL} = 3.15$) and high quality ($M_{CL} = 6.09$, $SD_{CL} = 3.67$), $F(1,75) = 1.365$, $p = .246$, $\eta_p^2 = .018$. The multiple ANCOVA revealed no

significant main effect for BIF between low (M_{CL} = 13.1, SD_{CL} = 5.61) and high quality (M_{CL} = 12.48, SD_{CL} = 4.57), $F(1,74)$ = .734, p = .394, η_p^2 = .010. Hence, we could not confirm hypothesis H1.

The multiple ANOVA revealed no significant main effect for Kimchi Palmer Figures between background (M_{CL} = 5.93, SD_{CL} = 3.1) and foreground music (M_{CL} = 7.08, SD_{CL} = 3.66), $F(1,75)$ = 2.254, p = .138, η_p^2 = .029. The multiple ANCOVA revealed no significant main effect for BIF between background (M_{CL} = 13.46, SD_{CL} = 5.03) and foreground music (M_{CL} = 12.13, SD_{CL} = 5.12), $F(1,74)$ = 1.421, p = .237, η_p^2 = .019. Hence, we could not confirm hypothesis H5.

The multiple ANCOVA for BIF revealed a significant gender effect, $F(1,74)$ = 9.060, p = .004, η_p^2 = .109. The multiple ANCOVA for BIF revealed no significant interaction between music and quality, $F(1,74)$ = .325, p = .571, η_p^2 = .004. However, the ANOVA for Kimchi Palmer Figures revealed a significant interaction between music and quality, $F(1,75)$ = 4,628, p = .035, η_p^2 = .058 (see figure 3).
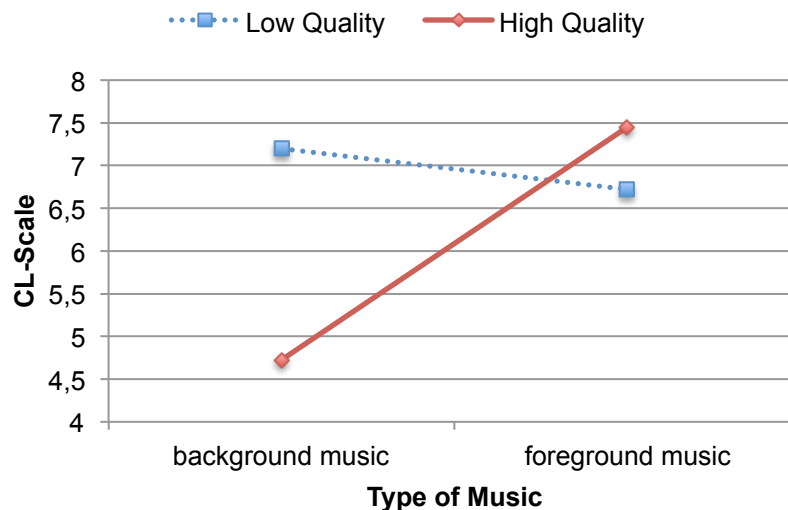
Figure 3. CL measured with Kimchi Palmer Figures as a function of Type of Music and Quality of Loudspeaker. High values indicate a high level of construal level. There is a significant interaction between Music and Quality.

We analyzed the significant interaction more detailed by using post-hoc tests. We found no significant difference between low (M_{CL} = 6.72, SD_{CL} = 3,48) and high quality (M_{CL} = 7.45, SD_{CL} = 3.88) in the foreground music condition, $t(38) = .629$, $p = .533$. However, we discovered a significant difference between low and high quality in the background music condition, $t(37) = -2,684$, $p = .011$. Participants who listened to background music coming out of the low quality speaker (M_{CL} = 7.2, SD_{CL} = 2.82) had a higher CL than participants who listened to background music coming out of the high quality loudspeaker (M_{CL} = 4.72, SD_{CL} = 2.94).

There also was a significant difference between foreground (M_{CL} = 7.45, SD_{CL} = 3.88) and background music (M_{CL} = 4.7, SD_{CL} = 2.94) in the high quality loudspeaker condition, $t(38) = 2,503$, $p = .017$. Participants listening to foreground music coming out of a high sound quality loudspeaker had a higher CL compared to those listening to background music coming out of a high sound quality loudspeaker. There was no significant difference between foreground and background music in the low quality loudspeaker condition, $t(37) = -.477$, $p = .637$.

Effects of Sound Quality on Localizability. We supposed that participants listening to the low quality loudspeaker localize the position of the loudspeaker significantly more often compared to those listening to the high quality loudspeaker. We also supposed that participants listening to a low quality loudspeaker perceive their decision of the localization significantly more confidently and simply compared to participants listening to the high quality loudspeaker (H2).

We analyzed participants' "hit" frequency. The target loudspeaker was behind number 2. We defined number 2 as "hit", whereas the other numbers were defined as "non-hits". Just 7 participants could not localize the loudspeakers. One of them could

not localize the low quality speaker. Six of the 7 participants were women. "Non-hits" were number 1, which was next to the target number. No one chose number 3 or 4.

We also compared confidence and simplicity of their decision. There are no significant correlations between age, genders, work and confidence or simplicity, $r(79) < .213$, p > .060. We conducted an ANOVA with music and sound quality as independent factors and confidence as dependent measure. The main effect of sound quality and music and the interaction between sound quality and music were all not significant, $F(1,75) < 2.866$, $p > .095$, $\eta_p^2 < .037$. We conducted an ANOVA with music and sound quality as independent factors and simplicity as dependent measure. The main effect of sound quality and music and the interaction between sound quality and music were all not significant, $F(1,75) < 1.110$, $p > .295$, $\eta_p^2 < .015$. Hence, we could not confirm hypothesize H2.

Effects of Sound Quality on Room Size Perception. We supposed that participants listening to the high quality loudspeaker perceive the room as significantly larger and higher compared to those listening to the low quality loudspeaker (H3).

We analyzed participants' square meter and height rate. There is no significant correlation between gender, age, work and square meter or height, $r(79) < .195$, $p > .084$. However, we could not summarize the two variables to one because there is no significant correlation, $r(79) = .139$, $p = .223$. Hence, we have to analyze square meter and height rate separately.

We conducted an ANOVA with music and sound quality as independent factors and square meter as dependent measure. The ANOVA revealed a significant difference between low ($M_{ca} = 14.46$, $SD_{ca} = 4.795$) and high quality ($M_{ca} = 12.48$, $SD_{ca} = 3.58$), $F(1,75) = 4.254$, $p = .043$, $\eta_p^2 = .054$. Participants listening to music

coming out of a low quality loudspeaker rated room size larger compared to those listening to music coming out of a high quality loudspeaker. The room had 13.75 square meters. Hence, participants listening to music coming out of a low quality loudspeaker overestimated room size and those listening to music coming out of a high quality loudspeaker underestimated room size. The main effect of music and the interaction between sound quality and music were all not significant, $F(1,75) <$ .969, $p > .328$, $\eta_p^2 < .013$ (see figure 4).

We conducted an ANOVA with music and sound quality as independent factors and height as dependent measure. The main effect of sound quality and music and the interaction between sound quality and music were all not significant, $F(1,75) < 1.471$, $p > .229$, $\eta_p^2 < .019$. Hence, we just could confirm hypothesize H3 for square meter but not for height.
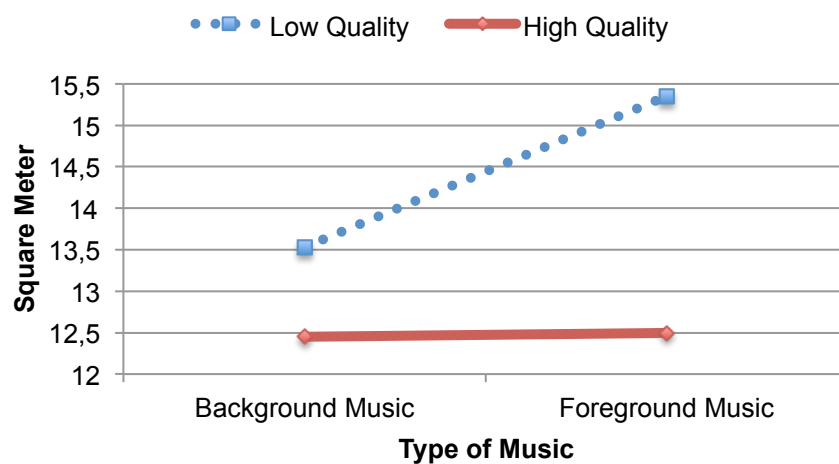
Figure 4. Square meter rating as a function of Type of Music and Quality of Loudspeaker. High values indicate a high room size rating. There is a significant main effect between low and high quality.

Effects of Sound Quality on Spatial Perception. We supposed that participants listening to the high quality loudspeaker perceive their subjective comfort

significantly better and their spatial perception significantly higher compared to participants listening to the low quality loudspeaker (H4).

We analyzed participants' comfort and spatial perception rate. There are no significant correlations between age, work, genders and subjective comfort or spatial perception, $r(79) < -.207$, p > .067.

We conducted an ANOVA with music and sound quality as independent factors and subjective comfort as dependent measure. The main effect of sound quality and music and the interaction between sound quality and music were all not significant, $F(1,75) < 1.721$, $p > .194$, $\eta_p^2 > .022$. We conducted an ANOVA with music and sound quality as independent factors and spatial perception as dependent measure. . The main effect of sound quality and music and the interaction between sound quality and music were all not significant, $F(1,75) < .788$, $p > .377$, $\eta_p^2 < .010$. Hence, we could not confirm hypothesize H4.

Effects of Sound Quality on Mood. We supposed that participants listening to music coming out of a high quality loudspeaker have a significantly better mood compared to those listening to music coming out of a low quality loudspeaker (H6).

We analyzed the PANAS scales. We summarized the scales to one mood scale. We coded 1 with bad mood and 6 with good mood. Therefore we had to change the direction of all bad mood scales. There are no significant correlations between age, work and mood, $r(79) < -.159$, $p > .161$. However, there is a significant correlation between genders and mood, $r(79) = -.337$, $p = .002$.

We conducted an ANCOVA with music and sound quality as independent factors and mood as dependent measure. The main effect of music and the interaction between sound quality and music were all not significant, $F(1,74) < .551$,

$p > .460$, $\eta_p^2 < .007$. There is a main effect of genders, $F(1,74) = 10.041$, $p = .002$, $\eta_p^2 < .119$. As a result, we could not confirm H6.

Effects of Mood on Construal Level. We supposed that the better mood the higher CL (H7).

We correlated mood and the two CL-scales. There is a significant correlation $r(79) = .408$, $p < .01$, between mood and Kimchi Palmer Figures. There also is a significant correlation $r(79) = .518$, $p < .01$, between mood and BIF. Hence, we could confirm H7.

Effects of Personality trait on Localizability. We supposed that participants with a holistic processing are significantly more insecure in their decision concerning the loudspeaker's position compared to participants with an analytic processing (H8).

We analyzed participants' FLT pattern. We measured the length of line and summarized them to one FLT-scale. We had to exclude many participants (17 participants) for this analysis because there were too strong deviations between the items. Participants should transfer target length of line in the frame to each other frame but many of them transferred ratio between line length and frame length to each other frame. Moreover, there is no significant correlation between FLT and confidence or simplicity, $r(58) < .102$, $p > .447$. As a result, we could not confirm H8.

Effects of Involvement on Construal Level. We supposed that the higher involvement the lower CL (H9).

We analyzed Involvement questionnaire. We summarized items to a focus and an involvement scale. The correlation between the two scales is $r(79) = .275$, $p = .029$. However, the correlation is too low to summarize the two scales to one. We found no significant correlation between focus scale and Kimchi Palmer Figures, $r(79) = -.146$, $p = .255$ nor between focus scale and BIF $r(79) = -.089$, $p = .487$.

Furthermore, we did not find any significant correlation between involvement scale and Kimchi and Palmer's figure $r(79) = -.037$, $p = .745$ nor between involvement scale and BIF $r(79) = -.046$, $p = .688$. As a result, we could not confirm H9.

Effects of Subjective Quality on Construal Level. We supposed that the higher participants perceive sound quality the higher CL (H10).

We analyzed participants' subjective sound quality rate. We did not find any correlation between subjective sound quality and Kimchi Palmer Figures, $r(79) = -.020$, $p = .864$) nor between subjective sound quality and BIF, $r(79) = .048$, $p = .672$. Hence, we could not confirm H10.

Effects of Volume on Subjective Quality. We supposed that the louder participants perceive sound the lower they rate sound quality (H11).

We analyzed participants' volume rate. We found a significant correlation $r(79) = -.210$, $p = .0315$ between volume and subjective sound quality. The louder participants perceived music the less they rated sound quality. Hence, we could confirm H10.

Effects of Music Preference on Construal Level. We supposed that the more participants prefer music the higher CL (H12).

We analyzed participants' music preference rate. We found a significant correlation $r(79) = -.201$, $p = .038$ between music preference and Kimchi Palmer Figures but we did not find any correlation $r(79) = .070$, $p = .269$ between music preference and BIF. The correlation indicates that the more participants like music the lower CL. This is contrary to our expectation. Hence, we could not confirm H11.

Effects of Music Experience of Subjective Quality and Music Preference. We supposed that the higher participants' experience (importance of music and

frequency of listening to music per day) the higher they rate subjective quality and the more they prefer music (H13).

We analyzed participants' importance of music and frequency of listening to music per day rate. We found a significant correlation $r(79) = .271$, $p = .016$ between importance of music and subjective quality. The more important music was the higher participants' rate of quality. We found a significant correlation $r(79) = .222$, $p = .049$ between importance of music and music preference. The more important music was the more participants preferred music. We did not find any significant correlation $r(79) = .163$, $p = .152$ between frequency and subjective quality, but we found a significant correlation $r(79) = .249$, $p = .027$ between frequency and music preference. The more participants listened to music per day the more they preferred music. Hence, we could confirm H13.

Effects of Music Expertise on Localizability. We supposed that the higher expertise of participants (knowledge of music and knowledge of sound systems) the more confidently and more simply they perceive their decision of localization (H14).

We analyzed participants' rate of music knowledge and sound systems knowledge. We found a strong correlation $r(79) = .592$, $p = .000$ between knowledge of music and knowledge of sound systems. There is no significant correlation between knowledge of music and confidence, $r(79) = .178$, $p = .116$ but there is a correlation between knowledge of music and simplicity, $r(79) = .199$, $p = .0395$. The more participants knew about music the simply they perceived their decision. There is a correlation between knowledge of sound systems and confidence, $r(79) = .218$, $p = .054$ but there is no significant correlation between knowledge of sound systems and simplicity, $r(79) = .173$, $p = .126$. The more participants knew about sound systems the more confidently they perceived their decision. Hence, we just could

confirm H13 for the relationship between knowledge of sound systems and

confidence.

Further Analysis

      Confidence and Simplicity Differences between Genders. We analyzed

data more detailed. We checked if there are confidence and simplicity differences.

We conducted an ANOVA with genders as independent factor and confidence or

simplicity as dependent measure. We found no main effect for simplicity, $F(1,77) =$

1.012, $p = .317$, $\eta_p^2 = .013$. We found a significant confidence difference between

women ($M_{conf} = 4.61$, $SD_{conf} = 1.064$) and men ($M_{conf} = 5.03$, $SD_{conf} = .810$), $F(1,77) =$

3.656, $p = .060$, $\eta_p^2 = .045$. Women were more insecure compared to men.

      Mood and CL Differences between Genders. We analyzed mood more

detailed. Analyzes revealed that gender differences may interfere with mood. We

conducted an ANOVA with gender as independent factor and mood as dependent

measure. The ANOVA between women and men indicates a significant difference,

$F(1,77) = 9.833$, $p = .002$, $\eta_p^2 = .113$. Women ($M_{mood} = 3.73$, $SD_{mood} = .88$) were in a

better mood than men ($M_{mood} = 2.99$, $SD_{mood} = 1.21$). We analyzed if there is a

significant difference between women and men to one of the two CL-scales. We

conducted an ANOVA with genders as independent factor and Kimchi Palmer

Figures or BIF as dependent measure. We found no main effect for Kimchi Palmer

Figures, $F(1,77) = .866$, $p = .355$, $\eta_p^2 = .011$. The ANOVA for BIF revealed a

significant difference between genders, $F(1,77) = 8.742$, $p = .004$, $\eta_p^2 = .102$.

Women ($M_{CL} = 14.15$, $SD_{CL} = 4.83$) had a higher CL than men ($M_{CL} = 10.88$, $SD_{CL} =$

4.88).

      Effect of Music on Music Preference. Furthermore, we analyzed music

preference rate more detailed. We conducted an ANOVA with sound quality and

music as independent factor and music preference as dependent measure. The main effect of sound quality and the interaction between sound quality and music were all not significant, $F(1,75) < .525$, $p = .471$, $\eta_p^2 = .007$. However, there is a significant difference between background and foreground music, $F(1,75) = 11.817$, $p = .001$, $\eta_p^2 = .136$. Participants preferred background music ($M_{like} = 4.38$, $SD_{like} = 1.067$) to foreground music ($M_{like} = 3.5$, $SD_{like} = 3.5$).

Subjective Sound Quality Differences. We analyzed participants' subjective sound quality rate more detailed. We conducted an ANOVA with sound quality and music as independent factor and subjective sound quality as dependent measure. . The main effect of sound quality and music as well as the interaction between sound quality and music were all not significant, $F(1,75) < 2.242$, $p > .139$, $\eta_p^2 < .029$. Besides, there is no significant correlation, $r(79) = .153$, $p = 177$, between mood and subjective sound quality.

Sound Quality correlations between Music Experiences. We analyzed correlations between participants' experience and subjective quality as well as between participants' experience and music preference more detailed, as correlations are significantly one-tailed and very small. We could indicate that there is a difference between low and high quality. In the low quality condition there is no important correlation between importance of music and subjective quality, $r(39) = -.003$, $p = .846$ and between importance of music and music preference, $r(39) = .110$, $p = .503$. There is no significant correlation between frequency and subjective quality, $r(39) = -.028$, $p = .867$ and between frequency and music preference, $r(39) = .087$, $p = .599$). However, in the high quality condition there is a correlation between importance of music and subjective quality, $r(40) = .499$, $p = .001$ as well as between importance of music and music preference, $r(40) = .330$, $p = .038$. In addition, there

is a correlation between frequency and subjective quality, $r(40) = .498$, $p = .001$ as well as between frequency and music preference, $r(40) = .381$, $p = .015$. However, only correlations revealed those differences. There were no further differences.

Sound Quality correlations between Music Expertise. We also analyzed correlations between expertise of participants and confidence as well as expertise of participants and simplicity more detailed, as correlations just were significantly one-tailed and very small. We could indicate that there is a difference between low and high quality correlations. In the low quality condition there is no significant correlation between knowledge of music and confidence, $r(39) = -.048$, $p = .774$ and between knowledge of music and simplicity, $r(39) = .027$, $p = .870$. There is no significant correlation between knowledge of sound systems and confidence, $r(39) = .057$, $p = .729$ and between knowledge of sound systems and simplicity, $r(39) = .075$, $p = .648$. However, in the high quality condition there is a significant correlation between knowledge of music and confidence $r(40) = .364$, $p = .021$) as well as between knowledge of music and simplicity, $r(40) = .341$, $p = .031$). The more participants knew about music the more confidently and more simply they perceived their decision. There is a significant correlation between knowledge of sound systems and confidence, $r(40) = .340$, $p = .032$ but there is no significant correlation between knowledge of sound systems and simplicity, $r(40) = .251$, $p = .118$). The more participants knew about sound systems the more confidently they perceived their decision. No further analysis showed differences between low and high sound quality.

Discussion

It is known that room height influences construal level (Meyers-Levy et al., 2007) and music influences behavior and perception. In this study we investigated if low vs. high sound quality influences room size perception and construal level. Our study shows for the first time that loudspeaker's quality affects room size perception. We found that playing music coming out of a high quality loudspeaker led to a smaller room size rating. Our study also shows for the first time that loudspeaker's quality affects construal level. CL measured with Kimchi Palmer Figures indicated that playing background music coming out of a high quality loudspeaker led to a lower CL.

Generally, results for CL run contrary to our expectations. Participants listening to background music coming out of a low quality loudspeaker overestimated room size and had a higher CL, whereas participants listening to background music coming out of a high quality loudspeaker underestimated room size and had a low CL. However, the results are similar to those of Meyers-Levy et al's study (2007). Meyers-Levy et al. (2007) indicated the higher the ceiling, the higher CL.

Result contrary to CL-Effect. We found some results, which are contrary to main results. There was no construal level difference between participants listening to foreground music coming out of a high quality loudspeaker and participants listening to foreground music coming out of a low quality loudspeaker.

Hence, sound quality manipulation did not work regardless of which type of music was presented and did not work regardless of which loudspeaker played music. At the first glance, it could be assumed that music preference could explain this contrary effect, because participants preferred background music to foreground

music. The manipulation just worked in the background music condition, whereas in the foreground music condition the effect of sound quality on CL was not available.

Preference may be a prerequisite for those differences. If individuals like presented music, they may feel good. As a consequence they may not further analyze music and for this reason sound quality could affect individuals. If individuals do not like presented music, they may have to observe music all the time. As a consequence sound quality cannot affect individuals.

Furthermore, participants listening to foreground music coming out of a high sound quality loudspeaker had a higher CL compared to those listening to background music coming out of a high sound quality loudspeaker.

We assumed that foreground music is comparable with proximity and background music is comparable with distance. However, there was no room size perception difference between foreground and background music. The music structure difference between foreground and background music may be an explanation. Background music may cause low CL because background music may attract attention less strongly. However, foreground music may cause high CL because foreground music needs more attention because of the voices. This just worked if sound quality was good. If there was a poor sound quality, participants might implicitly have ignored music. Hence, the manipulation could not develop its full effect.

Moreover, those findings could not be replicated with BIF. BIF and Kimchi Palmer Figures correlate positively together. However, the correlation is too small. BIF indicates just a significant difference between genders. Hence, women have a higher construal level compared to men. This may be due to the fact that Kimchi Palmer Figures are nonverbal whereas BIF is verbal. Kimchi Palmer Figures may be

more "mathematically" and reflects more the room dimensions. BIF may require "linguistic" and reflect gender differences. A high CL for example means, "getting something to eat", which is a goal. A low CL for example means, "taking an apple from the tree", which is an action. Women in principle may have a high CL, as they may think about the actions' consequence. Men in principle may have a low CL, as they may just think about the action.

Explanation for Room Size Perception Difference. We searched for an explanation for room size perception difference. At first glance, it could be assumed that localizability could explain room size perception difference, because the source of a sound is a very important distance cue. However, room size difference cannot be explained by localizability. There were marginally more participants who could not localize the high quality loudspeaker. We assumed that at least confidence and simplicity of the decision concerning the loudspeaker's position could explain room size differences. There were just four possible loudspeaker positions where the loudspeaker could be located. May be, the low number of choice was the reason to guess right. However, the decision per se might have been less confident and difficult. There was no confidence and simplicity difference between the low and high sound quality loudspeaker.

However, men were more confident than women in their decision where the loudspeaker was located. This could be an explanation why more women than men could not localize the right loudspeaker.

Mood affected CL. The better mood was, the higher CL. Participants had a bad or good mood regardless of music or sound quality. There were no mood differences between low and high sound quality or background and foreground music.

However, there was a gender difference. Women had a better mood than men. CL measured with BIF indicated women had a higher CL than men. Hence, mood also may have affected this gender difference. This result confirms Gasper et al's results (2002), who could indicate that mood affect CL.

Sound Quality Differences. There were significant positive correlations between importance of music and perception of sound quality as well as importance of music and music preference. Furthermore, there were positive correlations between frequency of listening to music per day and perception of sound quality as well as frequency of listening to music per day and music preference. However, these correlations only occurred while participants were listening to music coming out of high quality loudspeaker. Correlations between knowledge of music and confidence as well as knowledge of music and simplicity showed the same pattern. Furthermore, thus also applies to correlations between knowledge of sound systems and confidence.

This indicates that high quality may affect these correlations but it might also have been a mere chance. We did not find further differences between low and high quality. Participants in the high sound quality condition implicitly rated their knowledge and impression more consistent because they probably could concentrate more easily, which led to a significant correlation. However, participants in the low sound quality condition rated inconsistently because they probably were distracted by low quality. Probably they focused their attention rather on music.

Effect of Subjective Sound Quality on Results. Participants did not recognize sound quality because there was no subjective sound quality rating difference between low and high sound quality. Moreover, there was no significant correlation between mood and subjective sound quality. Furthermore, subjective

sound quality did not influence CL. However, rating of volume influenced subjective sound quality. Participants rated poor quality if music was loud. The components of music affected sound quality evaluation but did not affect CL. Hence, mood and low vs. high sound quality/background music may just be the only predictors for CL differences.

Difficulties of Personality traits. Involvement or holistic vs. analytic processing did not influence results. We believe that Witmer et al's questionnaire (1998) was not the right questionnaire to measure music involvement. Witmer et al's questionnaire (1998) was created to measure how intensive individuals are able to involve in films or computer games. The items are designed for visual activities but they are not designed for auditive activities. This could be the reason for the result. However, results also indicated that involvement did not influence CL. This result may be an indication that involvement does not influence CL but it is not sufficient to reject hypothesis. We did not manipulate the ability of involvement. Hence, another study will have to clarify the role of involvement for CL.

Kitayama et al.'s questionnaire (2003) was difficult to carry out. Although participants had to read instructions and we explained once more, there were obviously some misunderstandings concerning the task they had to carry out. We also can neither confirm nor reject our considerations. However, those personality traits also do not provide an explanation for CL differences.

Small Effect Size. All significant results have a small effect size. This may be due to the fact that sound quality has a small effect size at all. Music may be all-dominant. Individuals firstly turn their attention to music. They evaluate music regardless of sound quality. On the other hand, the design of the study itself might have produced a small effect size. The room was very small. The distance between

participants and the loudspeaker's position was very short. It was easy for participants to localize source of sound in both conditions. It may be that in a larger room it will be more difficult to localize a source of a sound or may make other differences between low and high quality clearer, which may increase effect size.

       Conclusion. Results indicate it is worth analyzing the difference between low and high quality loudspeakers more detailed. The clearest result was that participants listening to background music coming out of a low quality loudspeaker overestimated room size and had a high CL, whereas participants listening to background music coming out of a high quality loudspeaker underestimated room size and had a low CL. Hence, the room size estimation reflected participants' perception. A replication of this study will be necessary. The study should be replicated in a larger room with more loudspeaker positions. Items especially involvement should be reconsidered. We did not analyze if the results have a positive or negative effect for shopping atmosphere. One central question could be, do costumers feel more comfortable and buy more products if they are listening to music coming out of a low or high quality loudspeaker? Are there any advantages or disadvantages for room size perception difference between low and high quality loudspeakers? Hence, one of the next steps also could be to find out the value of the results. It also could be interesting to find out why the CL manipulation worked while participants were listening to background music but did not work while participants were listening to foreground music. It is necessary to determine what else instead of music preference could provide a better explanation.

       Although we could not elicit exactly the value of the results, this study indicates that supermarket designers should become more aware of loudspeakers' quality when adapting professional sound applications. Indeed, costumers cannot

perceive sound quality, but sound quality affects costumers. This means loudspeakers implicitly work in the background and affect behavior and perception. However, sound quality and music are parts of the atmosphere, which should not be underestimated. This study should motivate to elaborate the effect of sound quality in more detail.

Reference

Bailey, N., & Areni, C. S. (2006). When a few minutes sound like a lifetime: Does atmospheric music expand or contract perceived time? *Journal of Retailing, 82*(3), 189-202. doi: 10.1016/j.jretai.2006.05.003

Gasper, K., & Clore, G. L. (2002). Attending to the Big Picture: Mood and Global Versus Local Processing of Visual Information. *Psychological Science, 13*(1), 34-40.

Hartmann, W. M. (1999). How We Localize Sound. *Physics Today, 52,* 24-29.

Kimchi, R. (1992). Primacy of Wholistic Processing and Global/Local Paradigm: A Critical Review. *Psychological Bulletin, 112*(1), 24-38.

Kimchi, R., & Palmer, S. E. (1982). From and Texture in Hierachically Constructed Patterns. *Journal of Experimental Psychology: Human Perception and Performance, 8*(4), 521-535.

Kitayama, S., Duffy, S., Kawamura, T., & Larsen, J. T. (2003). Perceiving an Object and Its Context in Different Cultures: A Cultural Look at New Look. *Psychological Science, 14*(3), 201-206.

Liberman, N., Sagristano, M. D., & Trope, Y. (2002). The effect of temporal distance on level of mental construal. *Journal of Experimental Social Psychology, 38*(6), 523-534. doi: 10.1016/s0022-1031(02)00535-8

Liberman, N., Trope, Y., & Wakslak, C. (2007). Construal Level Theory and Consumer Behavior. *JOURNAL OF CONSUMER PSYCHOLOGY, 17*(2), 113-117.

Mattila, A. S., & Wirtz, J. (2001). Congruency of scent and music as a driver of in-store evaluations and behavior. *Journal of Retailing, 77*(2), 273-289. doi: 10.1016/s0022-4359(01)00042-2

Meyers-Levy, J., & Zhu, R. J. (2007). The Influence of Ceiling Height: The Effect of Priming on the Type of Processing That People Use. *JOURNAL OF CONSUMER RESEARCH, 34*, 174-186.

Milliam, R. E. (1982). Using Background Music to Affect the Behavior of Supermarket Shoppers. *The Journal of Marketing, 46*(3), 86-91.

Milliman, R. E. (1986). The Influence of Background Music on the Behavior of Restaurant Patrons. *Journal of Consumer Research, 13*(2), 286-289.

North, A. C., & Hargreaves, D. J. (1998). The Effect of Music on Atmosphere and Purchase Intentions in a Cafeteria. *Journal of Applied Social Psychology, 28*(24), 2254-2273. doi: 10.1111/j.1559-1816.1998.tb01370.x

North, A. C., Hargreaves, D. J., & McKendrick, J. (2000). The Effects of Music on

Atmosphere in a Bank and a Bar1. *Journal of Applied Social Psychology,

30*(7), 1504-1522. doi: 10.1111/j.1559-1816.2000.tb02533.x

Shinn-Cunningham, B. (2001). LOCALIZING SOUND IN ROOMS Retrieved 3.Juli,

2012, from http://cns.bu.edu/~shinn/pages/pdf/SIGGRAPH.pdf

Trope, Y., Liberman, N., & Wakslak, C. (2007). Construal Levels and Psychological

Distance: Effects on Representation, Prediction, Evaluation, and Behavior.

Journal of Consumer Psychology, 17(2), 83-95. doi: 10.1016/s1057-

7408(07)70013-x

Vallacher, R. R., & Wegner, D. M. (1989). Levels of personal agency: Individual

variation in action identification. *Journal of Personality and Social Psychology,

57*(4), 660-671. doi: 10.1037/0022-3514.57.4.660

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and Validation of Brief

Measures of Positiv and Negative Affect: The PANAS Scales. *Journal of

Personality and Social Psychology, 54*(6), 1063-1070.

Wilson, S. (2003). The Effect of Music on Perceived Atmosphere and Purchase

Intentions in a Restaurant. *Psychology of Music, 31*(1), 93-112. doi:

10.1177/0305735603031001327

Witmer, B. G., & Singer, M. J. (1998). Measuring Presence in Virtual Environments:

A Presence Questionnaire. *Presence, 7*(3), 225-240.

Appendix

Preparing

The test director assigned each participant an individual "participant number" and assigned the participant to one of the four experimental conditions consisting of "Context" and "Condition".

Figure 5. Preparing (original version)

Explanation at the beginning

Welcome to this study! This study is about behavior and music. The study will be used only for scientific purposes. Your information will be treated confidentially and will be anonymously evaluated, so no conclusions are available on your person. The In the study the participation is voluntary and can be canceled at any time without giving reasons.

Herzlich willkommen zu dieser Studie.
In dieser Studie geht es um Verhalten und Musik. Die Studie wird ausschließlich für wissenschaftliche Zwecke verwendet. Ihre Angaben werden vertraulich behandelt und anonymisiert ausgewertet, so dass keine Rückschlüsse auf Ihre Person möglich sind. Die Teilnahme an der Studie ist freiwillig und kann jederzeit ohne Angabe von Gründen abgebrochen werden.

Weiter

Figure 6. Explanation at the beginning (original version)

Demographic data

The information about the participants: sex, age, student (yes/no), work, study

and semester of the study.

Geschlecht
○ weiblich
○ männlich

Bitte geben Sie ihr Alter an.

Sind Sie Student?
○ Ja
○ Nein

Falls Student/in: Bitte geben Sie ihre Studienrichtung an.

Falls Student/in: Bitte geben Sie an in welchem Fachsemester Sie sich befinden.

Falls Sie kein(e) StudentIn sind, welchen Beruf üben Sie aus?

Weiter

Figure 7. Demographic data (original version)

Frame Line Task Instruction

On the table, which is located next to you on the right site, you will find the instruction of the task that we ask you to edit first. After you have read the instructions, we ask you to return to your present place in order to edit the actual task. Your test director will now lead you to the table next to you on the right site. If you have any further questions you can ask your test director at any time.

Figure 8. Frame Line Task Instruction (original version)

Frame Line Task Explanation

Your task:

The experimenter now gives you a sheet. On this sheet you can see a quadrat. In the quadrat there is drawn a line from top to bottom.

Remember the length of the line! You have 15 seconds for it.

Then you get more sheets on which each is a quadrat. Your task is to draw the line with the same length and position into the other quadrats.

Example task:

Remember the length and position of this line in in the quadrat:

The line should be drawn in different sized squares.

Example:

Ihre Aufgabe:

Vom Versuchsleiter bekommen Sie nun ein Blatt. Auf diesem Blatt ist ein Viereck zu sehen. Im Viereck ist ein Strich von oben nach unten eingezeichnet.

Merken Sie sich die Länge des Striches! Sie haben dafür 15 Sekunden Zeit.

Danach bekommen Sie weitere Blätter auf denen jeweils ein Viereck zu sehen ist. Ihre Aufgabe ist es, jedes weitere Viereck mit einem Strich der selben Länge und Position zu versehen.

Beispielaufgabe:

Merken Sie sich die Länge und Position dieses Striches im Viereck:
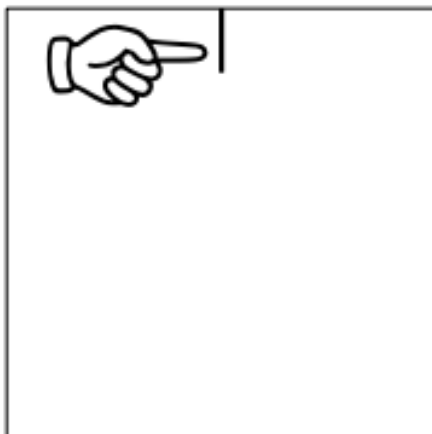
Der Strich soll in unterschiedlich großen Vierecken eingezeichnet werden. Beispiel:
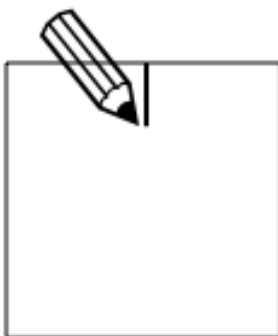
Figure 9. Frame Line Task explanation (original version)

Involvement questionnaire (Witmer & Singer, 1998)

Ability to Focus (7 point scale)

- o Do you easily become deeply involved in movies or TV dramas?

- o How mentally alert do you feel at the present time?

- o How physically fit do you feel today?

- o How good are you at blocking out external distractions when you are involved in something?

- o When watching sports, do you ever become so involved in the game that you react as if you were one of the players?

- o When playing sports, do you become so involved in the game that you lose track of time?

- o Have you ever gotten excited during a chase or fight scene on TV or in the movies?

- o When playing sports, do you become so involved in the game that you lose track of time?

Ability to Involvement (7 point scale)

- o Do you ever become so involved in a television program or book that people have problems getting your attention?

- o Do you ever become so involved in a movie that you are not aware of things happening around you?

- o How frequently do you find yourself closely identifying with the characters in a story line?

- o Do you ever become so involved in a daydream that you are not aware of things happening around you?

- o Do you ever have dreams that are so real that you feel disoriented when you awake?

- o Have you ever gotten scared by something happening on a TV show or in a movie?

- o Have you ever remained apprehensive or fearful long after watching a scary movie?

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Wir bitten sie nun einige Fragen zu beantworten.

Bitte beantworten sie nun folgende Fragen von 'gar nicht' bis 'sehr'

	gar nicht						sehr
Wie leicht fällt es ihnen in Filme oder Fernsehsendungen 'einzutauchen'?	○	○	○	○	○	○	○
Wie geistig wach fühlen sie sich in diesem Moment?	○	○	○	○	○	○	○
Wie körperlich fit fühlen sie sich heute?	○	○	○	○	○	○	○
Wie gut können sie sich gegenüber Ablenkungen abschotten, wenn sie an etwas arbeiten?	○	○	○	○	○	○	○

Figure 10. Involvement questionnaire (Witmer et al., 1998) (original version)

Bitte beantworten sie nun die folgenden Fragen von 'so gut wie nie' bis 'so gut wie immer'.

	so gut wie nie						so gut wie immer
Wenn sie sich Sportsendungen ansehen, passiert es ihnen, dass sie so in die Sendung eintauchen, dass sie sich verhalten, als wären sie einer der Spieler?	○	○	○	○	○	○	○
Passiert es ihnen, dass sie so in sportliche Aktivitäten vertieft sind, dass sie die Zeit vergessen?	○	○	○	○	○	○	○
Passiert es ihnen, dass sie sich in eine Verfolgungsjagdszene oder Kampfszene in einer Fernsehsendung oder in einem Film hineinsteigern?	○	○	○	○	○	○	○
Passiert es ihnen, dass sie sich in etwas so vertiefen, dass sie die Zeit vergessen?	○	○	○	○	○	○	○
Passiert es ihnen, dass sie derart in eine Fernsehsendung oder ein Buch 'eintauchen', dass Mitmenschen Probleme haben ihre Aufmerksamkeit zu erhalten?	○	○	○	○	○	○	○
Vertiefen sie sich jemals so sehr in ein Buch, dass sie nicht merken, was um sie herum passiert?	○	○	○	○	○	○	○
Wie häufig identifizieren sie sich mit den Personen in einer Geschichte?	○	○	○	○	○	○	○
Versinken sie so sehr in Tagträumen, dass sie nicht merken, was um sie herum passiert?	○	○	○	○	○	○	○
Haben sie Träume, die so real sind, dass sie verwirrt sind, wenn sie aufwachen?	○	○	○	○	○	○	○
Passiert es ihnen, dass sie sich vor Dingen in Fernsehsendungen oder Filmen fürchten?	○	○	○	○	○	○	○
Sind sie noch lange nach einem Horrorfilm verängstigt oder besorgt?	○	○	○	○	○	○	○

[Weiter]

Figure 11. Involvement questionnaire (Witmer et al., 1998) (original version)

Instruction to listen to music

Our experiment is about music and behavior, as already mentioned. Now you will immediately hear music. You will hear music during the further testing. We would like to ask you first of all to listen to the music for 2 minutes. After that you can start with the further tests. Please signalize the test director that you are ready to listen to music.

Figure 12. Instruction to listen to music (original version)

1. Kimchi et al's questionnaire explanation

   In the following part, you will get presented three figures. Please select one of

the two figures, which in your opinion appear similar to the figure above.

It is your personal opinion. There is no "right" or "false".

Once you are ready, press Next.

Figure 13. Kimchi et al's questionnaire explanation (original version)

Kimchi Palmer Figures

Which figure looks similar to the model figure? (Figure 1 or Figure 2) 12 randomized

items.
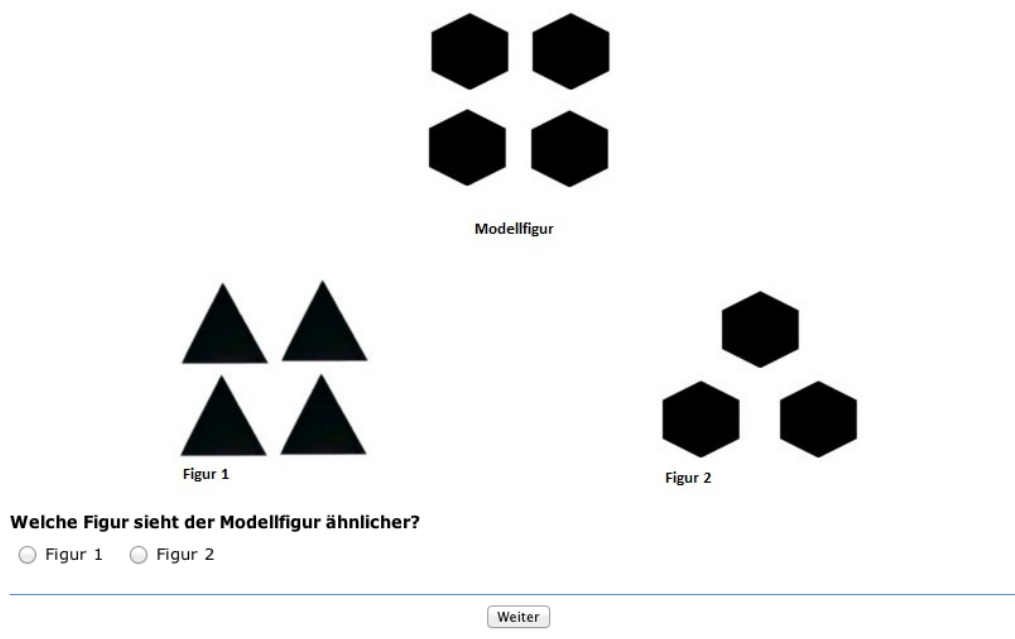
Figure 14. Kimchi Palmer Figures (original version)

Behavioral Identification Form

Please choose the best description for each activity and mark it with a cross.

Creating a List (systematizing something or writing down things)

Reading (following printed text or acquiring knowledge)

Washing clothes (removing odors from clothes or putting clothes in the machine)

Picking an apple (getting something to eat or taking an apple from the tree)

Felling a tree (swinging an ax or making firewood)

Measuring a room to install a carpet (Remodeling the apartment or using a tape measure)

Cleaning the house (showing a clean house or hovering the floor)

Painting a room (Painting with a paint roller / brush or giving the room a fresh look)

Paying the rent (continuing living in the apartment or making a bank transfer)

Taking care for houseplants (watering the plant or beautifying the room)

Locking the door (putting the key into the lock or making the house safe)

voting (influencing the election result or filling in a ballot)

Climbing a tree (having a good view or crabbing hold of branches)

Filling in a personality test questionnaire (answering questions or to learning

more about yourself)

Brushing your teeth (to preserving loss of teeth or moving a brush in your mouth)

Writing a test (to answering questions or demonstrating knowledge)

Greeting someone (to saying hello or being friendly)

Overcoming temptation (to saying no or to showing discipline)

Food (to ingesting food or to chewing and to swallow)

Planting a garden (seeding plants or to providing fresh vegetables)

Travelling by car (following a map or seeing different places)

Getting a cavity filled (protecting teeth or going to the dentist)

Talking to a child (teaching something to a child or using simple words)

Pressing the doorbell (moving a finger or seeing if someone is at home)

Figure 15. Section of Behavioral Identification Form (original version)

Room Size Perception

We would like to ask you to answer some questions about the room in which you
are.

o   What size do you think the room is? Please write the answer in square meters.
    (giving free)

o   What height do you think the room is? Please answer in cm. (giving free)

o   How do you feel in this room? From I'm feeling "not good at all" to I'm feeling
    "very well". (6-point scale)

o   How spacious does the room look? From "not modern" to "very spacious". (6-
    point scale)

Figure 16. Room Size Perception items (original version)

Subjective Music Experience

Now we ask you to indicate how you personally perceived the music played during the test?

- o How was the quality of the music? (6-point scale)

- o How did you feel the volume of music? (6-point scale)

- o How much did you like the music? (6-point scale)

Figure 17. Subjective Music Experience items (original version)

Music Expertise

Please answer the following questions:

- o How important is music in your life? (6-point scale)

- o On an average day, how often do you listen to the music? (6-point scale)

- o How would you rate your knowledge of music? (6-point scale)

- o How would you rate your knowledge of sound systems? (6-point scale)

Figure 18. Music Expertise items (original version)

Localization

We would like to ask you some questions about the loudspeakers and the location of the music.

- o Which of the four loudspeakers is playing the music? Please note that the music just is coming from only one loudspeaker. The numbers of the loudspeakers are hanging above the real loudspeakers.

- o How sure were you while making your dicision?

- o How easy was the decision to you?

Wir möchten sie nun bitten einige Fragen zu den Lautsprecher und der Lokalisierung der Musik zu beantworten.

Aus welcher der vier Lautsprecher wurde Musik gespielt?
Bitte beachten sie, dass die Musik lediglich aus einem Lautsprecher ertönt ist. Die Nummern der Lautsprecher hängen über den eigentlichen Lautsprechern.

 1   2   3   4
 ○   ○   ○   ○

Wie sicher sind sie sich ihrer Entscheidung?

gar nicht sicher   sehr sicher
 ○   ○   ○   ○   ○   ○

Wie einfach fiel ihnen die Entscheidung?

gar nicht einfach   sehr einfach
 ○   ○   ○   ○   ○   ○

Weiter

Figure 19. Localization items (original version)

PANAS Scale

This questionnaire contains a series of words to describe different feelings and sensations. Read each word and indicate the intensity of each word in the scale. You have the option to choose between five different levels.

Please indicate how you are feeling at the moment.

Words: active, distressed, interested, elated, angry, strong, guilty, scared, hostile, stimulated, proud, irritable, enthusiastic, ashamed, awake, nervous, determined, alert, confused, anxious

Dieser Fragebogen enthält eine Reihe von Wörtern, die unterschiedliche Gefühle und Empfindungen beschreiben. Lesen Sie jedes Wort und tragen dann in die Skala neben jedem Wort die Intensität ein. Sie haben die Möglichkeit, zwischen fünf Abstufungen zu wählen.

Geben Sie bitte an, wie Sie sich **in diesem Moment** fühlen.

	ganz wenig oder gar nicht				äußerst
aktiv	○	○	○	○	○
bekümmert	○	○	○	○	○
interessiert	○	○	○	○	○
freudig erregt	○	○	○	○	○
verärgert	○	○	○	○	○
stark	○	○	○	○	○
schuldig	○	○	○	○	○
erschrocken	○	○	○	○	○
feindselig	○	○	○	○	○
angeregt	○	○	○	○	○
stolz	○	○	○	○	○
gereizt	○	○	○	○	○
begeistert	○	○	○	○	○
beschämt	○	○	○	○	○
wach	○	○	○	○	○
nervös	○	○	○	○	○
entschlossen	○	○	○	○	○
aufmerksam	○	○	○	○	○
durcheinander	○	○	○	○	○
ängstlich	○	○	○	○	○

Weiter

Figure 20. PANAS scales (original version)

Proposition

Finally, we would like to ask you to write down your thoughts about the

experiment. What do you think was the reason of the experiment? Were some tasks

familiar to you?

Figure 21. Proposition (original version)

End of the study

Now the study is completed. Thank you for taking part in the study. Please

signalize the test director that the study is completed.

Figure 22. End of the study (original version)

Ich habe mich bemüht, sämtliche Inhaber der Bildrechte ausfindig zu machen und ihre Zustimmung zur Verwendung der Bilder in dieser Arbeit eingeholt. Sollte dennoch eine Urheberrechtsverletzung bekannt werden, ersuche ich um Meldung bei mir.

Lebenslauf

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Ausbildung

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                    Homepagebetreuung, Assistent Kommunikationsseminare
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                    Koordination Beirat „barrierefrei studieren"

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                    Schreiben von Geschichten

Sebastian Püller   1.Oktober 2012