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Master Thesis

- The effect of music tempo on perceived crowding in retailing -

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Oslo, 30/08/2016

Wen Hua

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Summary

In the marketing field the influence of in-store atmospherics on consumers' shopping behavior is widely accepted. We seek to understand the effects of in-store music tempo on perceived crowding and how music tempo can affect emotions, arousal and perceived control occurring in retail stores. Hence, our research questions are the following:

Does music tempo influence the perceived crowding? Do arousal, perceived control, positive and negative emotions, mediate the relationship between music tempo and perceived crowding?

In line with these research questions, we formulate four hypotheses: (1) fast tempo music will increase arousal, (2.a) fast tempo music will decrease negative and (2.b) increase positive emotions, (3) fast music will increase perceived control, (4) music tempo influences the perceived crowding via four mediators.

The pretest and three studies were conducted in order to check our hypotheses. The laboratory experiment was designed as a 3 (low-density: medium-density: high-density) x 3 (no music: slow music: fast music) and 2 (low: high) x 3 randomized between-subject factorial design with ***perceived crowding*** as the dependent variable. Significant main effects of density condition and music tempo were found, in addition to partially significant results for approach/avoidance tendency and pleasure-arousal-dominance behavioral responses.

Keywords: *Perceived crowding, density condition, music tempo, PAD, approach/avoidance.*

1. Introduction

The effect of in-store atmospherics on consumers shopping behavior is widely explored and investigated in the marketing field. The ambiance of retail stores has been recognized as an increasingly important element during the last three decades (Areni and Kim 1994; Baum and Valins 1977; Eroglu and Machleit 1990; Herrington 1996; Kotler 1973; Turley and Milliman 2000; Van Rompay et al. 2008). Nowadays, many marketers, who work with retail stores, consider the store atmosphere as a significant instrument to influence customer satisfaction, improving the overall shopping experience and use it as a communication tool between the company and customers (de Farias et al. 2014). They try to catch buyers' attention, to make them spend more money, stay in the store longer, persuade them into unplanned purchases.

Many different factors are measured and examined, however, the phenomenon of social crowding gets a lot of attention in research on retail stores. The phenomenon is also studied in other spheres of our life, like public transport (Kim et al. 2015), sales (van Rompay et al. 2012), concerts and festivals (Hoon et al. 1997; Lee et al. 1997), mass social events (Hani and Drury 2014) and restaurants (Milliman 1986). The phenomenon of crowding consists of spatial and social crowding, and in this research we have studied specifically non-hedonic settings, where social crowding is the relevant part. This phenomenon of social crowding is a huge part of our everyday life, and yet it is not well investigated.

There also has been made a significant research effort on background music, especially in the retail and advertising industry (Dube and Morin 1999). Background music has been studied as a major element to influence store environment, having a significant impact on customers' behavior (Spangenberg and Henderson 1996). Moreover, various dimensions of music, for instance, music timbre, rhythm and music cognition have different effects on customer arousal, satisfaction and sales volume etc. However, among sufficient academic studies (Dion 2004; Dube, Chebat, and Morin 1995; Eroglu and Machleit 1990; Eroglu, Machleit, and Barr 2005a; Eroglu, Machleit, and Chebat 2005b; Kaltcheva, and Weitz 2006; Knöferle, Spangenberg, Herrmann, and Landwehr 2012; Sherrod 1974), not all of them were real-life store context experiments.

1.1 Research question

In this paper, we seek to understand combined effects of music tempo on perceived crowding in the retail settings, and how music tempo can affect emotions, arousal and perceived control. In non-hedonic settings, like grocery stores, density usually causes negative, stressful feelings and the lack of control (Frank Pons, Eroglu, and Machleit 1990; Grewal et al. 2003; Machleit et al. 1994; Michon et al. 2005). Previous studies have shown that music can influence arousal (Andersson et. al. 2012), a dimension of emotions, in such a way that it levels out negative emotions. Hence, our research questions are:

Does music tempo influence the perceived crowding? Do arousal, perceived control, positive and negative emotions, mediate the relationship between music tempo and perceived crowding?

1.2 Contribution to the current state of research

The influence of music on emotions has been studied for several years. Different dimensions of music, such as music mode and context, affect customers' behavior differently through their emotions. The main contribution of the paper to the field of research is an investigation on *how music tempo can level out the negative effects of perceived crowding on emotions occurred in-store*. To our knowledge, this has not been investigated previously in this manner. This study complements the forthcoming field experiment conducted by Knöferle et al.

2. Theoretical background and previous research

2.1 The concepts of crowding and social density

Crowding is considered as an unpleasant experience in a shopping situation (Michon et al. 2005). According to stimulus overload theory, crowding is experienced when stimulation of the environment exceeds individual's capacity to process it (Desor 1972; Milgram 1970). This psychological state can occur as the result of physical, social, or personal factors, which makes individuals more sensitive to the potential constraint of limited space. Since people have different interpretations on crowding, due to different cultural background or living environment, participants should perceive the crowding by themselves rather than regard the given settings as crowded environment. In our research, **perceived crowding** is used as a dependent variable**,** which is a subjective evaluation of the individual usually accompanied by discomfort, aggression, and stress that arises from a situation of scarce space (Stokols 1972; Rapoport 1975).

Density is strictly related to the number of people and/or objects in a given space (Stokols et al. 1973; Sundstrom 1975). Based on the definition of density, researchers distinguish between social density and spatial density. We use **density** in terms of social (human) density, which refers to a high number of individuals in a physical setting. And we do not take spatial density into consideration, which refers to the lack of space (Dion 2004; Pons et al. 2006). Limited personal space and reduced privacy are usually associated with high-density settings, where individuals cannot move freely, hence, one's freedom of movement is limited and the feeling of failure to own any territory occurs (Sinha and Nayyar 2000). In our studies, we use **density condition** as a categorical independent variable, and the three categories assigned as low, medium and high-density.

Speaking about the significant impact of crowding on consumers' evaluations of service experiences, the majority of the studies emphasize negative outcomes for customers elicited by crowded settings (Pons, Eroglu, and Machleit 1990; Grewal et al. 2003; Machleit et al. 1994; Eroglu and Harrell 1986; Eroglu and Machleit 1990; Harrell et al. 1980; Machleit et al. 2000; Rollo et al. 2009). Previous research has shown that the level of in-store crowding perceived by customers can influence their decision-making process and outcome, in addition to overall satisfaction with shopping activities (Eroglu and Machleit 1990). Shoppers perceive retail crowding when density restricts individual's goals and activities (Eroglu et al. 2005b). Consequently, crowding is inclined to trigger psychological anxiety of shoppers who experience a lack of personal space and a freedom restriction (Michon et al. 2005).

2.2 The effects of music on customers' behavior

Over the last two decades, a number of research papers on effects of music on customers' behavior in the retailing industry has witnessed a steady increase (Meyer 1967). Service environment is the main field of research, testing the relationship between background music and customers' behavior (Caldwell and Hibbert 2002; Herrington 1996; Hunter and Schellenberg 2011). Numerous articles have already suggested that background music can have a significant effect on sales volume, perceived and actual time spent in the shopping environment (Smith and Curnow 1966) and in-store traffic flow in the retail setting (Yalch and Spangenberg 1988, 1990, 1993). Those studies illustrated that background music can influence consumers in both behavioral and non-behavioral way, such as moods, purchase intentions, and product selection (Chebat 1997). Also, according to Bitner (1992), customer satisfaction in the retail setting highly correlates with background music. Besides the significant influence of music on customers' behavior, music tempo is regarded as an important factor during the purchasing. **Music tempo** is the rate or speed at which rhythm progresses, and we use it as the independent variable in this research.

Studies, illustrating positive relationship between musical tempo and customer purchasing behavior, show an U-shape of music preference and that the range of 70 to 110 BPM (Beats Per Minute) is the favored tempo (Dowling and Harwood 1986; Fraisse 1982; Holbrook and Anand 1988). After deeper research on the effects of music on customer behavior, Milliman (1982) demonstrated that music tempo affects the speed with which consumers move around a store. He revealed individuals spent less time when exposed to fast tempo music in contrast to slow tempo music. However, according to the study of Clare and Sally (1986), no significant evidence was found that music tempo can influence the time spent (actual and perceived time) and money spent comparing to the valid explanation of the relationship between music preference and behavior (time and money spent). Moreover, Berlyne claimed that quick tempo music is more arousing than slow tempo music and a pretest by Milliman (1986) proved that fast and slow music stimulate different levels of customers' arousal.

2.3 The Pleasure-Arousal-Dominance (PAD) model

Pleasure is a dimension to measure how much happiness and satisfaction a person feels (Mehrabian and Russell 1964). Positive and negative affective states, representing pleasure and displeasure, are measured as the basis of PAD model. Optimistic feelings are leading to positive emotions and negative states induce people to underestimate their ability and analytical thinking (Isen 2000). Negative emotion expresses an intention of avoiding other people and desire of holding control. While positive emotions express an attempt to approach people and to have more interactions with others (Schachter and Singer 1962). Since both positive and negative emotions can occur simultaneously, when customers are placed in a crowded area (Hui and Bateson 1991), we use **positive and negative emotions** as mediating factors.

Plenty of articles verify music tempo has a significant influence on customers' emotions (Maciel et al 2010; Marcelino et al 2011; Lai and Chiang 2012; Vaccaro et al 2011; Cheng, Wu and Yen 2009). Frijida (1993) claimes that emotions are not only the reactions to appraisal, but the tendency of humans' actions. Therefore, customers' emotions can influence their purchasing behaviors, which can increase sales volume and customer satisfaction (Bagozzi 1999). Berlyne (1967) revealed an inverted U-relationship between arousal and pleasure caused by music tempo. Valence-arousal model is a well-grounded model that assesses and gives a specific description of emotions in music research as well. However, one notable limitation of the valence-arousal model is that music enables to convey mixed emotions, both sadness, and happiness, which is unclear and hard to measure (Eerola and Vuoskoski 2011).

Arousal represents the amount of stimulations that are generated by the surroundings. Arousal and non-arousal scores in PAD model are calculated to measure how energized or soporific one person feels. Arousal, as a psychological and physiological state, is the reflection of increased activities of a sympathetic branch (Damasio 1999). It is commonly monitored by heart rate, bodily tension, electrodermal activity, or other physical indications (Mehrabian and Russell 1974). In this research, we use **arousal** as the mediating factor, since arousal can be influenced significantly by music during the purchasing.

Several studies showed that music can increase psychological and physiological arousal, especially loud high tempo music (Dalton et. al 2007, Davenport 1972, Fontaine and Schwalm 1979, Mcnamara and Ballard 1999, North and Hargreaves 1999, Husain et al. 2002). In the process of purchasing, the tempo of background music affects customers' arousal, consequently, increased arousal will lead to an increased purchasing behavior (Smith and Cunow 1966). In addition, a large amount of evidence illustrates that customers prefer music with moderate arousal rather than high arousal (Yalch and Spangenberg 1990).

Dominance is measuring how much a person feels "in control" over the surroundings. "Control" and "lack of control" are calculated to present dominance and submissiveness in PAD model. Control is defined as the necessity to express one's proficiency, dominance, and superiority over the environment (White 1959) and the concept of control is operationalized in three different ways: cognitive control, behavioral control, and decisional control (Averill 1973). *Cognitive control* is divided into predictability and cognitive reinterpretation of a situation.

Behavioral control refers to the "availability of a response which may directly influence or modify the objective characteristics of an event" (Averill 1973, p. 293). And, *decisional control* means a "choice in the selection of outcomes or goal" (Averill 1973, p. 289). **Perceived control** is defined as the belief that one can determine one's own internal states and behavior, influence one's environment, and/or bring about desired outcomes (Wallston, et al., 1987). According to the study of Van Rompay et al (2008), perceived control is a crucial mediating factor between *density* and *perceived crowding*.

Previous studies have shown that the higher social density is, the lower perceived control people experience over their social surroundings. This happens because high social density contains elements of social interference and related perceptions (Hui and Bateson 1991; Lefcourt 1973; Machleit, Eroglu, and Mantel 2000; Van Rompay et al. 2008). Hence, social density affects the degree of social power or the perceived control. (Rucker, Galinsky, and Dubois 2012). Studies also have shown that, when perceived control increases, it begins to exert a significant, positive effect on individual psychological and physical prosperity, which includes task performance (Burger 1987), physiological responses (Szpiler and Epstein 1976), tolerance of pain and frustration (Sherrod et al. 1977), physiological well-being (Langer and Rodin 1977), and self-report of distress and anxiety (Staub, Tursky, and Schwartz 1971).

2.4 Hypotheses

Based on our previous theorizing, we found that there should be a potential relationship between music tempo and perceived crowding.

Music is a complex structure of sounds and there are several parameters that can stimulate people, for example, pitch and tempo. Musical pieces played in a major key at a fast tempo are judged more stimulating and arousing than those played in a minor key at a slow tempo (e.g., Peretz et al., 1998; Fritz et al., 2009). An increase in arousal level is associated with the internal clock of the person, and Droit-Volet (2013) suggested that fast tempo music can speed up the internal clock. Moreover, the study revealed that variations in tempo are indeed associated with different subjective levels of arousal. Music played at a faster tempo is judged as more arousing in comparison to another one that is played at a slow tempo. Hence, our first hypothesis is:

H1: Fast tempo music increases arousal.

The emotional valence in music can be understood by classifying it into "happy" or "sad" music, which are positive and negative emotions. Juslin and Sloboda (2001) findings supported the outstanding power of music to influence listeners' emotions. Fast tempo leads to evoke positive emotions, while slow tempo leads to evoke negative emotions (Scherer 2004). Following Knöferle and colleagues' (2012) research scenario and obtained results, hypothetically, we can plot two setups of how fast tempo music in the grocery store affects negative effects of perceived crowding: *Firstly,* fast music might reduce the negative emotions induced by crowding. Studies conducted during the last decade showed the consistency of emotional responses to the music (Peretz et al., 1998; Bigand et al., 2005). *Secondly,* fast music might increase positive emotions in high-density condition setups. This was supported by Mattila and Wirtz (2001), where consumers' self-reported satisfaction and behavioral intentions increased. The latter arguments lead us to the second hypothesis:

H2:

a) Fast tempo music decreases negative emotions.

b) Fast tempo music increases positive emotions.

Several research papers about crowding have suggested that perceived control contribute significantly to the effects of crowding. Ittelson and Rivlin (1970) emphasized 'freedom of choice' as a key concept in understanding the concept of crowding. According to Sherrod's (1974) third proposition, negative aftereffects produced by crowding, may be reduced by providing some means, for example, music. Following the research of Ward and Barnes (2001), perceived control in the retail environment is related to fast music and emotions. Thus, we would like to check in our study whether the music tempo can mitigate the negative aftereffects and increase the sense of perceived control as a scent does it in Madzharov's (2015) experiment. Hence, our third hypothesis is as follows:

H3: Fast music increases perceived control.

And our last, hypothesis is about mediating effect of all independent variables between music tempo and perceived crowding.

H4: Music tempo influences the perceived crowding through four mediators.

According to Hevner (1937) and Juslin (1997), tempo is seen as the most important feature of the modulating effect on emotions, hence, Gabrielsson and Lindström (2010) showed that tempo may affect a spectrum of emotions: from positive (surprise, happiness) to negative (anger, fear). According to Kaltcheva and Weitz (2006), if the activity is not completely satisfying, people will try to perform it as efficient as possible. In addition, any kind of high-arousal ambient stimuli (bright light, loud music, screens with animation) will be unpleasant, due to the requirement of extra energy for completing the shopping task, consequently, increasing negative emotions, and decreasing perceived sense of control. Hence, by choosing a web based experiment, we confront the challenge of the above mentioned phenomenon affecting participants under stressful conditions. This is tackled by people participating in the experiment being informed about the time it will take to conduct the experiment.

2.5 Theoretical framework

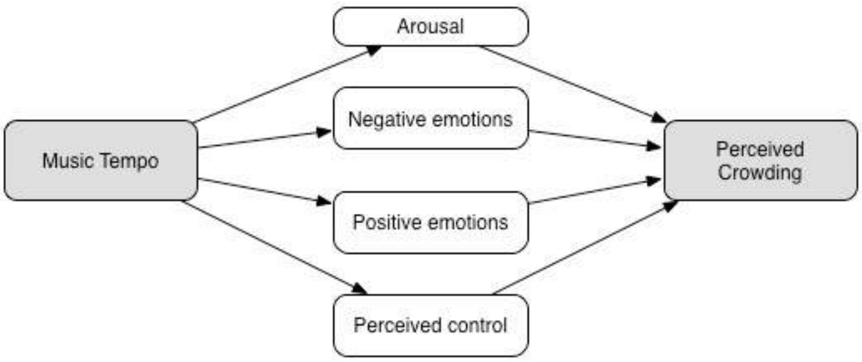


Figure 1. *Theoretical framework*

The theoretical framework (see Figure 1) displays the research model which seeks to examine the impact of music tempo on perceived crowding in the retail settings. The model has four mediators: arousal, negative emotions, positive emotions and perceived control. The model reveals that fast tempo music should increase arousal and perceived control, and as mediators, they will potentially decrease the level of perceived crowding. In addition, fast tempo music may decrease negative and increase positive emotions, which will potentially decrease the level of perceived crowding too.

3. Pretest

3.1 Method

Design

The pretest was designed to test our stimulus material: photos and music pieces. We have used six pictures with different amount of people on each, to represent different density levels (see Appendix 1). After that, three out of six photos would be selected to represent three density levels: low, medium and high (see Appendix 2).

Previous studies have shown that participants in high-density conditions reported the space to be substantially more crowded, than those in low-density conditions did (O'Guinn et al. 2015). However, that study represents only two states (low/high) of density, consequently, in our research we want to prove the effect additionally for the medium-density level.

To measure perceived crowding, the likert scale validated by Machleit, Kellaris, and Eroglu (1994) and later used by Machleit, Eroglu, and Mantel (2000) is used. The scale includes two dimensions of perceived crowding: human crowding and spatial crowding. Our research concentrates on human crowding, which is measured through the participant's rating of the following items: "How crowded is this shopping aisle for you?", "How comfortable do you feel in this shopping aisle?", "How confined do you feel in this shopping aisle?" and "How ill at ease do you feel in this shopping aisle?" (Clare, and Sally 2002).

The second part of the experiment was to check how participants perceive music tempo (slow vs. fast). Hence, we have used the following classical piece of music Glenn Gould (piano)-Johann Sebastian Bach – Partita No. 3 a-moll, BWV 827 – VI. Scherzo, making it 42 and 105 BPM with the help of the software – Garage Band. This classical music piece has been chosen because it is not popular among the public and participants would not be influenced by any lyrics.

Sample

The recruitment of the participants was conducted through publishing a survey link in a student society group on Facebook. Consequently, the majority of the participants that we have recruited were students, where 58% of the respondents were female and 42% of them were male. There were 87 participants and the age of them ranged from 19 to 32 years old and people from 23 to 27 contributed mostly (see Appendix 4.1). We got a wide range of data, covering both European and Asian countries, but the major data came from Norway, Ukraine, and China, contributing 75% of the data (see Appendix 4.2).

Procedure

We conducted an online survey to measure and define which photos should be used for low, medium and high density. Six pictures, showing different number of shopping customers in a shopping aisle (from one to six) were displayed to the participants. We used seven-points likert scale from “a little” to “a lot”, to measure perceived crowding. Four dimensions: crowded, comfortable, confined and ill at ease, were used to calculate perceived crowding level. After showing six pictures, participants would listen to two pieces of music with two different tempi, slow and fast. Seven points likert scale (1-7) was used to test the perceived tempo and how pleasant the music was, from “very low” to “very fast” and “not pleasant at all” to “very pleasant”. There is no natural point of zero on music tempo, therefore, we started the scale from 1. Personal information, gender, age and country of birth, were asked to see whether there appears a significant difference between different groups of participants.

We have conducted a pretest to validate that the three levels of density were perceived as low, medium and high. This will be a contribution to the state of research as this validation have not been conducted previously (O'Guinn, Tanner, and Maeng 2015; Machleit, Eroglu, and Mantel 2000; Eroglu, Machleit, and Chebat 2005).

3.2 Results

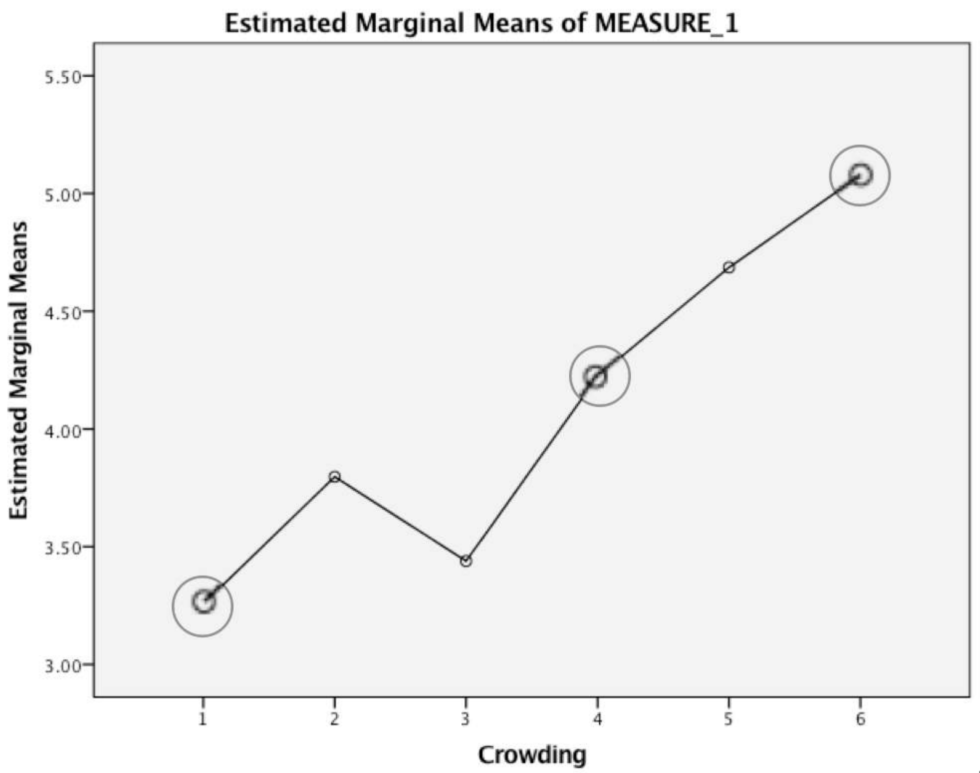
We have run a couple of ANOVAs to analyze crowding perception and music tempo. Repeated measures ANOVA (General Linear model), was used to compare means for all six photos between each other. One-way ANOVA (Univariate Analysis of variance) was used for the means of first seen photos in the survey. Hence, we obtained “pure” effect of the *crowding perception*, controlling the ceiling effect, and compared it with the results from the repeated measures ANOVA.

Crowding. The results from the One-way ANOVA of first picture ratings showed that the mean of six pictures ranged from 3.68 to 4.95, which were not significantly different. However, the mean of repeated measures ANOVA for all pictures, indicated there was a slight increase, ranging from 3.25 to 5.08. Therefore, when participants rated how crowded the photos were, they were moderately influenced by the following pictures, that may have framed their answers.

The data points were distributed randomly and almost equally. There was a significant main effect of *perceived crowding* for the first seen pictures, $F(5, 81) = 2.35$, $p = 0.048$ ($p < .05$).

In the Repeated Measures ANOVA, the significance value is .00, so we accepted the hypothesis, that the variance of the differences between photos were statistically significant. In other words, Mauchly’s test indicated that the assumption of sphericity has been violated, $\chi 2(14) = 121.1$, $p = .00$.

Since our values for Mauchly's Test of Sphericity $\varepsilon < .75$ (Greenhouse-Geisser = .52, and Huynh-Feldt = .54), we should use the Greenhouse-Geisser corrected values. Using this correction, F-value was statistically significant, $p = .00$, therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = .52$). The results showed that there was a significant effect of the *perceived crowding* on each shown picture. $F(2.61, 190.75) = 58.77$, $p = .00$ (p <.05) (see Appendix 8).



Graph 1. ***Estimated marginal means of six photos***

From the pairwise comparison, first and third pictures were not significantly different $p = 1.00$, therefore, we chose the first picture as low-density level. According to Graph 1, the second and fourth pictures represented a medium-density level. The fourth photo had a higher mean and bigger difference from other photos, thus it was chosen to represent medium-level density. Comparing fourth and sixth photos, the sixth one had a bigger significant difference, hence it was chosen to represent the high-density level in the next studies (see Appendix 9).

Music. Fifty-five participants have finished the whole questionnaire, and the responses were almost equally divided between two conditions (29, 26 for slow and fast respectively). We have analyzed the first listened piece of music, to observe the pure effect. It was done to control for framing effect and bias from respondents so that we have mitigated comparison of two pieces of music. We have run two analyses, for tempo and pleasantness separately. The results for One-way ANOVA (tempo) of the first music played, showed that the mean of two conditions varied from 3.55 (slow condition) to 5.92 (fast condition), which had a significant difference. There was a significant main effect of *music tempo*, $F(1, 53) = 74.26$, $p = .00$ ($p < .05$) (see Appendix 10). However, the results for One-way ANOVA (pleasantness) of the first music played, showed that the mean of two conditions varied from 3.93 (slow condition) to 4.54 (fast condition), which resulted in statistically insignificant results. In addition, both conditions have higher standard deviation than in the ANOVA for tempo. Consequently, there was no significant main effect of *pleasantness*.

Therefore, for the study 1, 2, and 3, we have changed our music to well-known compositions of the musical band “Coldplay”. This strategy has been already used in the field experiment by Klemens Knöferle et al. (2012) and has shown significant results.

4. Study 1

4.1 Method

Design

An online questionnaire was conducted to measure how participants perceive the crowding under different conditions. One picture was randomly shown from three others (low, medium and high-density) with fast, slow, or no background music. It has been done to check whether the *music tempo* has influenced *perceived crowding* in the shopping environment. For the experiment, we have used a between-subjects design with three groups. The control group had no background music while rating *perceived crowding* on the photos. While manipulation groups had fast and slow music playing while rating. The experiment is a 3 (low-density: medium-density: high-density) x 3 (no music: slow music: fast music) randomized between-subjects factorial design with *perceived crowding* as the dependent variable (see Table 1).

		Music tempo condition		
		No music	Slow tempo	Fast tempo
Crowding density condition	Low-density	1	2	3
	Medium-density	4	5	6
	High-density	7	8	9

Table 1. ***Overview of conditions***

In fast music condition, we have used music piece by Coldplay - "Hurts like heaven" which is 180 Beats Per Minute (BPM), which is consistent with what Balch and Lewis (1996) and Oakes (2003) classified as fast music tempo. In slow music condition, another song of the musical band Coldplay was used - "Trouble", which is 70 BPM, and also consistent with above mentioned scientific sources. Choosing a modern pop song increases the likelihood of participants having an equal familiarity to the song. We decided to take only one artist so that the compositions would be more homogeneous and we would have more control over stimulus material in the study by minimizing confounding. In the first study, people were asked to evaluate tempo and pleasantness of the song, to ensure that the selected songs were perceived as fast or slow (depending on the condition the participant was randomly assigned to).

Sample

Our study was conducted on the base of Amazon mechanical Turk HIT, which is a crowdsourcing internet marketplace, requiring human intelligence to answer a question. A HIT (Human Intelligence Task) represents a single, self-contained task that a participant can work on, submit an answer, and collect a reward for completing (Amazon Mechanical Turk, 2016). The pros of our recruitment method are that it is convenient and really fast, a large sample can be effectively recruited and that we get to research people from different age groups. The con is that we have lower control of the experiment itself, and the sample group is dominated by the Americans. Nine hundred people participated in our survey in study 1 representatively, forming a sufficient database. The majority of the respondents were from the USA and the second biggest group was from India, contributed with 6% of replies in study 1. In study 1, the age of participants ranged from 19 to 73 and the mean was 34 years old and people from 23 to 35 contributed mostly. Around 60% of participants were females and 40% of them were male in study 1 (see Appendix 5).

Procedure

We ran an online questionnaire for study 1 to prove whether music tempo affects perceived crowding. Some participants have heard a piece of music (slow/ fast) while seeing a picture (low/medium/high-density). Other respondents would only see the picture without sound. After imagining themselves in the given shopping environment, the participants were asked to answer the questions about the shopping environment evaluation. Same as in the pretest, four dimensions of perceived crowding were evaluated by seven points likert scale. For respondents who heard the music, they were asked to evaluate the tempo and pleasantness of the music while the participants in the no-music group have not seen these questions.

When measuring a set of independent variables: positive/negative emotions, dominance and arousal, the Pleasure-Arousal-Dominance emotional state model (Mehrabian, and Russell 1974) was used (see Appendix 7).

Last part of the survey covered personal information (gender, country of birth, and age), to show whether there was an obvious divergence between different groups of participants.

4.2 Results

We received nine hundred answers altogether after releasing the survey. However, to make sure our participants were not interrupted and influenced by other external factors, we have filtered the data according to the time participants spent on the picture. Hence, those who spent more than 160 seconds and less than 8 seconds were eliminated from the database. Therefore, the total amount of participants was 820, which had normal distribution across all three density conditions (see Appendix 4). Additionally, distribution within different conditions was also close to normal.

For statistical analyses, we have run different ANOVAs in SPSS, which was used to test if the mean difference of perceived crowding between fast, slow or no music conditions was statistically significant. This enabled us to detect possible main effects of music and perceived crowding, and the interaction effect between each other.

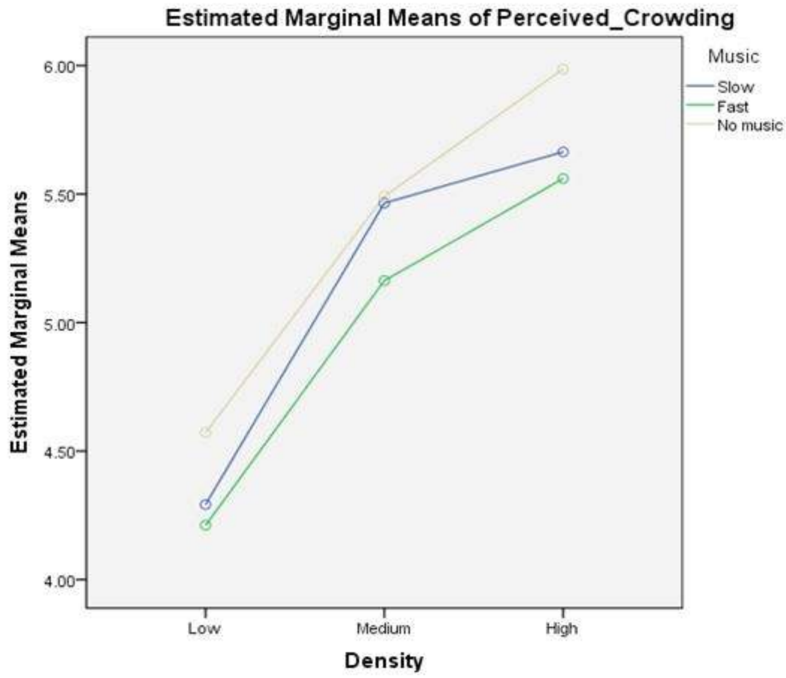
Music and Crowding

Results of One-way ANOVA showed the significant main effect of music condition on perceived tempo, $F(1, 563) = 980.88$, p = .00 (see Appendix 11).

We checked how much time participants spent on seeing pictures, and the results showed that participants spent less time to engage themselves in the shopping situation when there is no music. Bonferroni post hoc analysis showed that there was no difference between fast and slow music conditions, while slow vs. no music, and fast vs. no music appeared to be statistically different.

From the results of Two-way ANOVA, there were significant main effect of density and music on perceived crowding, $F(2, 811) = 108.86$, $p = .00$ and $F(2, 811) = 7.41$, $p = .00$ (see Appendix 12). Participants perceived the different level of crowding in different density conditions, which is consistent with the assumption of our study.

Overall, the results from Two-way ANOVA indicated that music itself influences perceived crowding, while music tempo did not have a significant effect on it.



Graph 2. ***Estimated marginal means of perceived crowding***

Bonferroni post hoc analysis gave us the following results (see Graph 2):

- In medium-density condition, there was a significant difference for fast vs. no music, $p = .00$. Fast music lowered perceived crowding while slow music did not.
- In high-density, the result of significant difference for fast vs. no music, $p = .00$ indicated the influence of music on perceived crowding.
- In low-density condition, there were no significant differences between all music conditions. However, it was possible to see the tendency that existence of the background music in the low-level density potentially might have an effect on the pleasantness (slow vs. no music condition $p = .38$, and fast vs. no music $p = .11$).

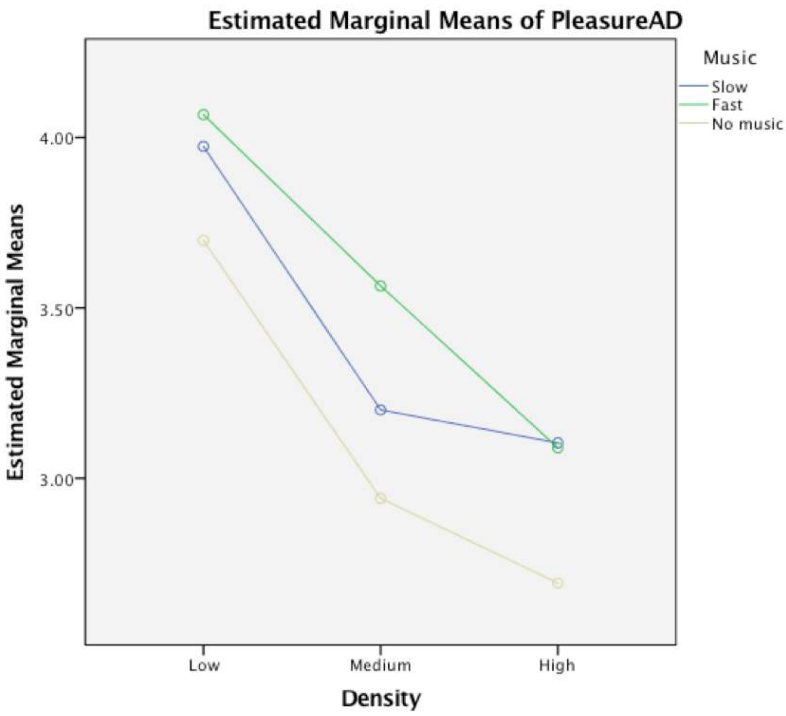
Pleasure Arousal Dominance (PAD)

We have run three separate Two-way ANOVAs to analyze three dimensions of PAD model. Density condition and music conditions were two factors that we used in the analysis to see whether there are any main or/and interactive effect between them. All main effects for *pleasure*, *arousal*, and *dominance* were significant. However, all interaction effects between density condition and music condition were insignificant.

Pleasure. There were two significant main effects of density and music conditions, $F(2, 811) = 46.98$, $p = .00$ and $F(2, 811) = 10.89$, $p = .00$ respectively. Pleasure tended to decrease when the density increased, which is consistent with our hypothesis. Pairwise comparison of density conditions was significant on all levels at the confidence interval 95% for medium vs. high-density, and at the 99% confidence interval for the rest pairwise comparisons (see Appendix 13).

Pleasure tended to increase when the music tempo increased, which is consistent with our hypothesis. Pairwise comparison of music conditions was significant for slow vs. no music, fast vs. no music at the confidence interval 99%, and showed no significant difference for the rest pairwise comparisons. Hence, the music tempo does not matter for pleasantness, it matters whether there is any music or not.

Bonferroni post hoc analysis gave us the following results (see Graph 3): In the medium-density condition, there was a significant difference for fast vs. no music conditions ($p = .00$). And in the high-density condition, there was a significant difference for slow vs. no music conditions ($p = .05$).

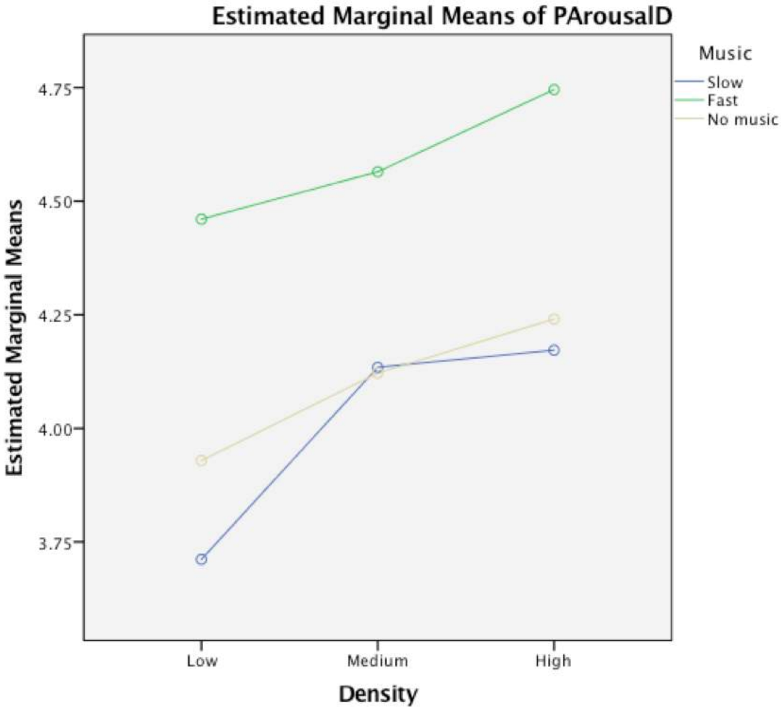


Graph 3. ***Estimated marginal means of pleasure (PAD)***

Arousal. There were two significant main effects of density and music conditions, $F(2, 811) = 11.93$, $p = .00$ and $F(2, 811) = 38.13$, $p = .00$ respectively.

Arousal increased when density increased, which is consistent with our hypothesis. Pairwise comparison of density conditions was significant on all levels at the confidence interval 99%, the exception was the pairwise comparison between medium and high-density, which appeared to be insignificant.

Arousal was higher when the music tempo was fast, which is consistent with our hypothesis. Furthermore, it looked like the slow tempo music even "kills" arousal, which resulted in the lowest mean score. Pairwise comparison of music conditions was significant at the confidence interval 99% for slow vs. fast, and no music vs. fast tempo music conditions, where $p = .00$ (see Appendix 14).



Graph 4. ***Estimated marginal means of arousal (PAD)***

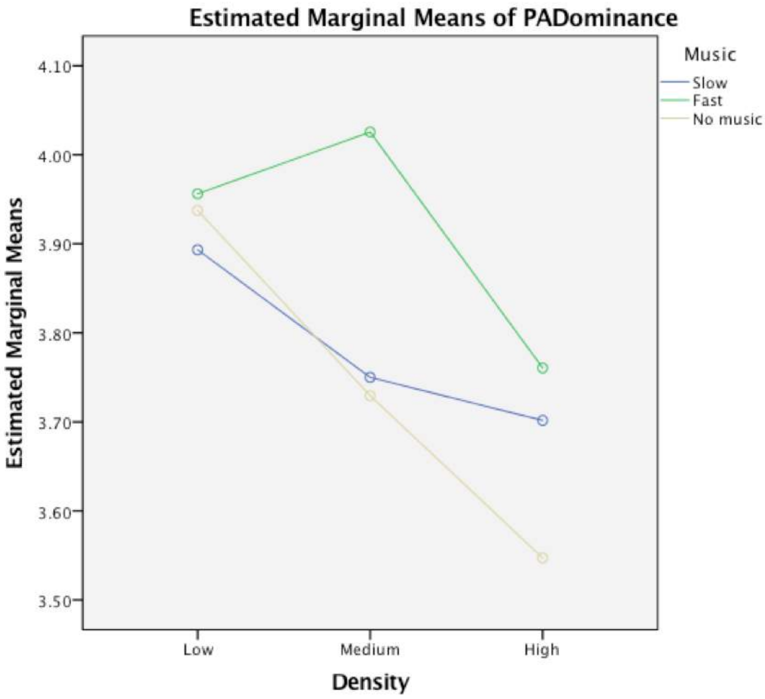
Bonferroni post hoc analysis gave us the following results (see Graph 4):

- In the low-density condition, there were significant differences for fast vs. slow music, and fast vs. no music conditions at the confidence interval 99%, where $p = .00$.
- In the medium and high-density conditions, there were significant differences for fast vs. slow music, and fast vs. no music conditions at the confidence interval 99%, where $p = .00$.

Dominance. There were two significant main effects of density and music conditions, $F(2, 811) = 7.87$, $p = .00$ and $F(2, 811) = 3.91$, p = .02 respectively.

Dominance tended to decrease when the density increased, which is consistent with our hypothesis, however, music tempo increased dominance on all levels of density. Pairwise comparison of density conditions was significant on all levels at the confidence interval 95%, the exception was a pairwise comparison between medium and low-density, which appeared to be insignificant.

Dominance was higher when the music tempo was fast, which is consistent with our hypothesis. Furthermore, the mean score of dominance in slow tempo music condition got almost the same as one in no music condition. Pairwise comparison of music conditions was significant at the confidence interval 95% only for fast vs. no music conditions, where $p = .02$. The rest of pairwise comparisons had no significant difference at the confidence interval 95% (see Appendix 15).



Graph 5. ***Estimated marginal means of dominance (PAD)***

Bonferroni post hoc analysis gave us the following results (see Graph 5): in medium-density condition, there were significant differences for fast vs. slow, and fast vs. no music conditions, where p = .04, and p = .03 respectively.

5. Study 2

5.1 Method

Design

Design in the study 2 was the same as in the study 1.

Sample

The type and structure of the participants' responses were the same as in the study 1. In study 2, the age of the participants ranged from 19 to 74 and the mean was 35 years old, and people from 22 to 37 contributed mostly. The vast majority of the respondents were from the USA 84%; the second biggest group was from India around 7%. Almost 60 percent of the participants were females and 40% of them were males in the study 2 as well (see Appendix 6).

Procedure

Trying to get more significant results, and seeking for the pure relationship between music tempo and perceived crowding, we have added more independent variables to the study 2. Same as in the study 1, participants would see the picture with or without sound. After imagining themselves in the given shopping environment for minimum 10 seconds, the participants were asked to answer the questions about approach/avoidance behavior. After that, participants were asked to write down how much time they would like to stay in that shopping environment. Same as in the study 1, shopping environment was evaluated with seven-points likert scale and PAD showed up after the evaluation. Respondents who heard the music were asked to evaluate the tempo and pleasantness of it, while other participants did not have those questions. The next step was to check how personally involved and how attentive were the participants, in addition to checking whether they understood the purpose of the experiment. At the last stage, personal information was collected.

To control independent variables and make sure people were only influenced by pictures and music, participants were asked to answer questions about approach-avoidance behaviour (Donovan, and Rossiter 1982). Approach-avoidance (APAV) behavior was measured with the following seven items:

1. Would you enjoy shopping in this store?
2. Would you avoid ever having to return to this store?

3. Is this a place where you might try to avoid other people, and avoid having to talk to them?
4. Would you want to avoid looking around or exploring this environment?
5. Do you like this environment?
6. Is this a place where you might try to avoid other people, and avoid having to talk to them?
7. Is this the sort of place where you might end up spending more money than you originally set out to spend?

All responses were recorded by seven-point scale scale from “strongly disagree” to “strongly agree”. In addition, participants were asked to write down how much time they would like to spend in the store.

Attention and purpose check were used in the study 2, as one of the basement to filter data when we get participants’ replies. Attention check was measured by seven-point scale from “very little” to “very much” by asking “How much effort did you put into imaging yourself in the picture?” and “How personally involved did you feel with the shopping scenario you read about?” Participants were asked to answer the question “What do you think is the purpose of this study?” to ensure that our purpose of the study was ambiguous.

5.2 Results

Same as in the study 1, we received nine hundred respondents altogether. However, to make sure our participants were not interrupted and influenced by too many external factors, we removed participants from the database if:

- they spent seeing the given picture more than 180 seconds and less than 10 seconds;
- they had an average score of following the instructions and attention less than “5”;
- they spent on the assignment question over 200 seconds.

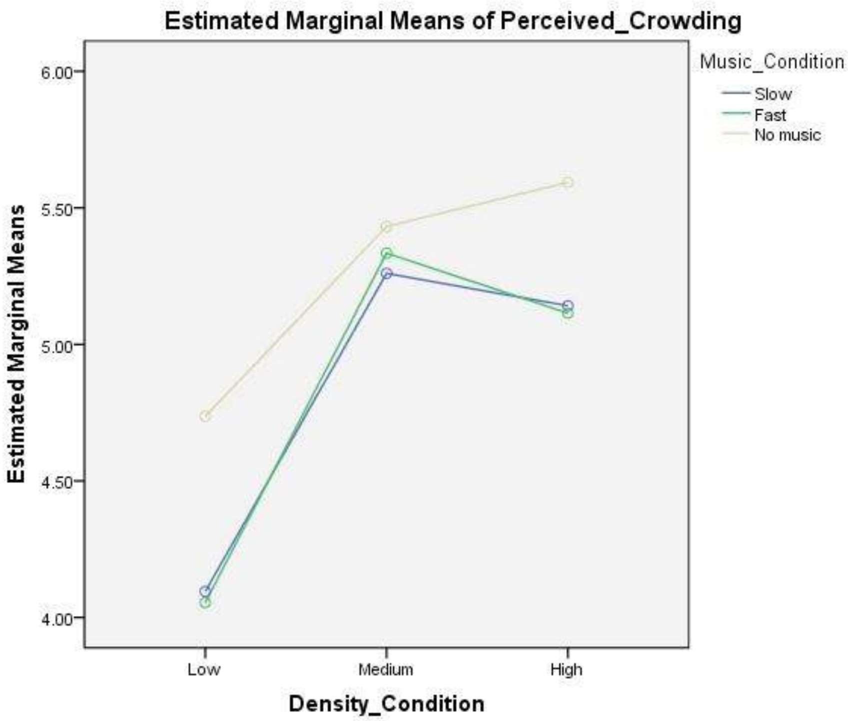
Therefore, the total amount of respondents was 846, which was almost equally divided between three density conditions: 276 for low-density, 296 for medium-density and 283 for high-density respectively (see Appendix 5).

Following the same path of the statistical analysis, we have run in SPSS different ANOVAs, which were used to test whether the mean difference on perceived crowding among no music, fast or slow tempo music groups is statistically significant. In the study 2, we have run an OLS regression analysis to investigate the effect of music tempo, and other variables on our dependent variable – perceived crowding. In order to analyze the influence of the music tempo and density condition on PAD, we ran three separate Univariate ANOVAs for *pleasure, arousal,* and *dominance*.

Music and Crowding

Same as study 1, we ran Two-way ANOVA and there were two significant main effects of music and density conditions, $F(2, 846) = 10.43$, $p = .00$ and $F(2, 846) = 59.75$, $p = .00$ respectively. The results showed, that the difference between music and no music condition is statistically significant, hence, people perceived pictures of the store differently, depending whether they had music or not (see Graph 6). However, participants did not perceive any difference between fast and slow music tempo itself.

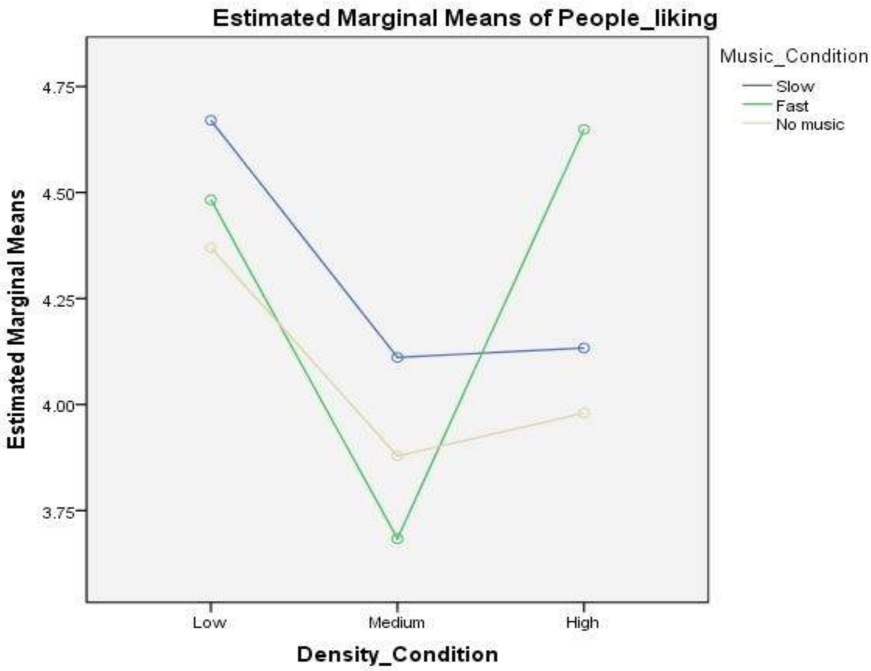
Low-density was perceived differently from medium and high, where $p = .00$ while medium and high-density were the same ($p = 1.00$). The overall results were significant only in low-density condition, for no music vs. slow, and no music vs. fast, where $p = .00$ and $p = .00$ respectively (see Appendix 16).



Graph 6. ***Estimated marginal means of perceived crowding***

People liking

We also ran Two-way ANOVA to explore the relationship between music tempo and people liking (see Graph 7). There was only one significant main effect of density condition, F (2, 846) = 13.80, p = .00. In high-density condition, there were significant differences in fast vs. slow, and fast vs. no music conditions, where p = .04, and p = .00 respectively (see Appendix 17).



Graph 7. ***Estimated marginal means of people liking***

Approach/avoidance

From the results of between-subjects effects, density condition and music condition were both significant, $F(2, 846) = 19.67$, p = .00 and $F(2, 846) = 11.46$, p = .00 respectively.

Pairwise comparisons suggested that in the low-density condition, fast music and no music had the trend of getting a significant effect, where p = .06. In medium-density condition, slow and no music had a significant difference (p = .05). In high-density condition, there were significant differences between slow tempo music and no music, and fast music and no music, where p = .02 and p = .00 respectively (see Appendix 18).

There were seven questions to calculate approach/avoidance score, the following four got significant results (see Graph 8).

1. "Would you enjoy shopping in the store?" Participants who listened to fast music in the high-density level would be more enjoyable in the shopping environment.

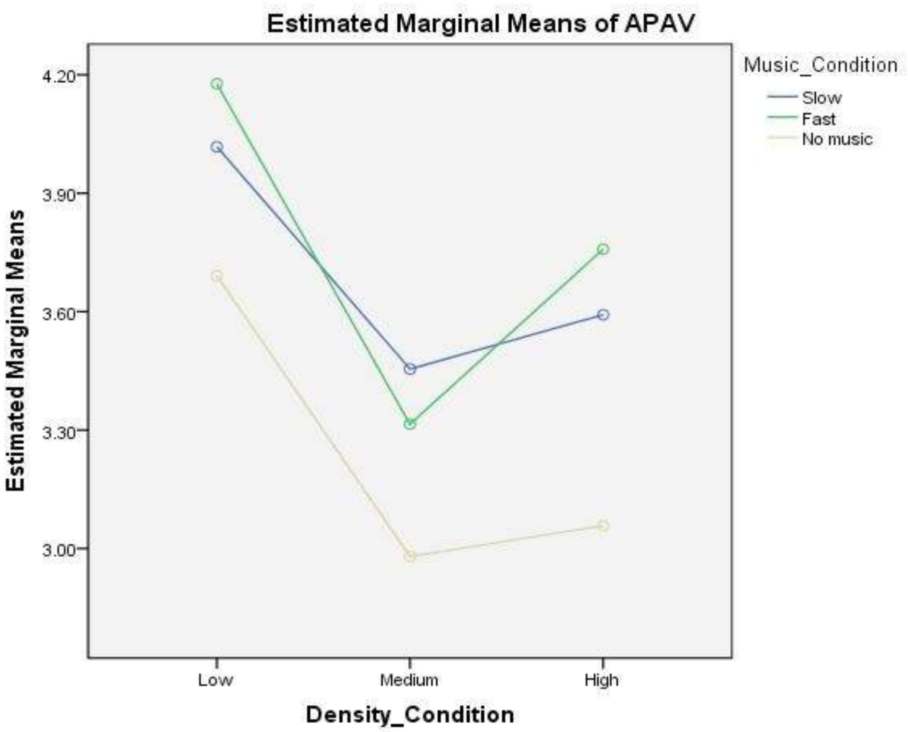
2. "Would you avoid ever having to return to this store?" Participants who listened to music in the high-density level would like to avoid ever having to return to the store.

3. "Would feel friendly and talkative to a stranger who happens to be near you?" Participants who listened to slow music would be more friendly to other people in both medium and high-density level.

4. "Would you want to avoid looking around or exploring this environment?" Participants who listened to music would like to avoid looking around in the high-density level.

5. "Do you like this environment?" Participants who listened to slow music would have more liking to the shopping environment in high-density than people who listened to fast or no music.

6. "Is this a place where you might try to avoid other people, and avoid having to talk to them?" Participants who listened to slow music in high-density would spend less than people who listened to fast or no music.



Graph 8. ***Estimated marginal means of approach-avoidance***

Pleasure Arousal Dominance (PAD)

We have run three separate Two-way ANOVAs to analyze three dimensions of PAD model. Density condition and music conditions were two factors that we used in the analysis to see whether there are any main or/and interactive effect between them. All main effects for *pleasure, arousal,* and *dominance* were significant. However, all interaction effects between density condition and music condition were insignificant.

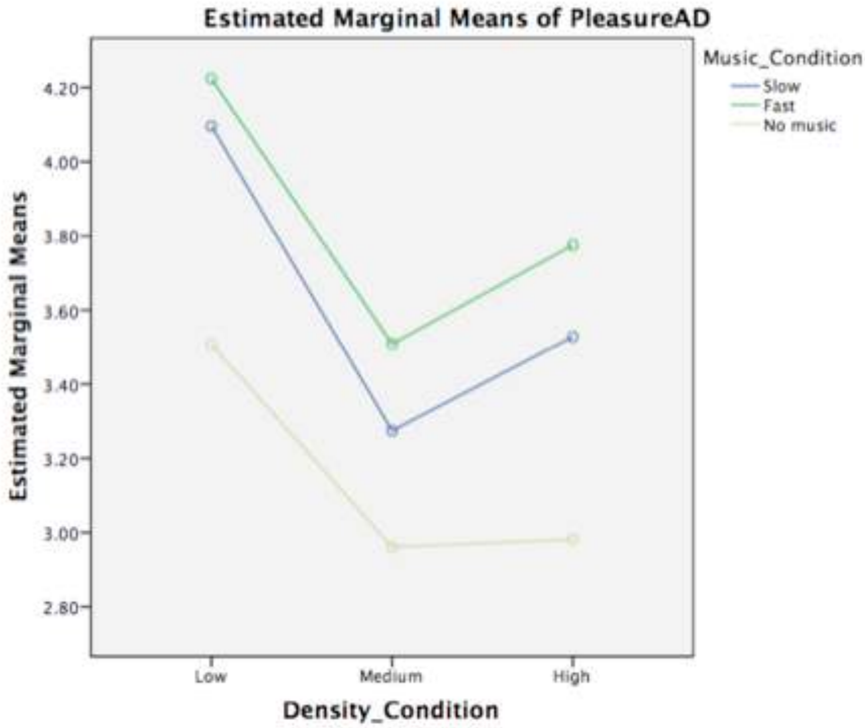
Pleasure. There were two significant main effects of density and music conditions, $F(2, 846) = 19.04$, p = .00 and $F(2, 846) = 18.39$, $p = .00$ respectively.

Pleasure tended to decrease when the density increased to the medium level and increase in high-density condition, which is partially consistent with our hypothesis. This may be explained by switching shopping activity to more hedonic, which may be caused by high social density. Pairwise comparison of density conditions was significant on all levels at the confidence interval 99% except medium vs. high-density levels.

Pleasure tended to increase when the music tempo increased, which is consistent with our hypothesis. The pairwise comparison of music conditions was significant for slow vs. no music and for fast vs. no music conditions at the confidence interval 99%. Hence, it implies the following, that music tempo does not affect pleasantness a lot, it matters whether there is any music or not (see Appendix 19).

Bonferroni post hoc analysis gave us the following results (see Graph 9):

- In the low-density condition, there were significant differences for no music vs. slow tempo and no music vs. fast tempo, where $p = .01$ and $p = .00$ respectively.
- In the medium-density condition, there was a significant difference only between fast and no music conditions ($p = .02$).
- And in the last, high-density condition, there were significant effects for no music vs. slow tempo, and no music vs. fast tempo, where $p = .02$ and $p = .00$ respectively.

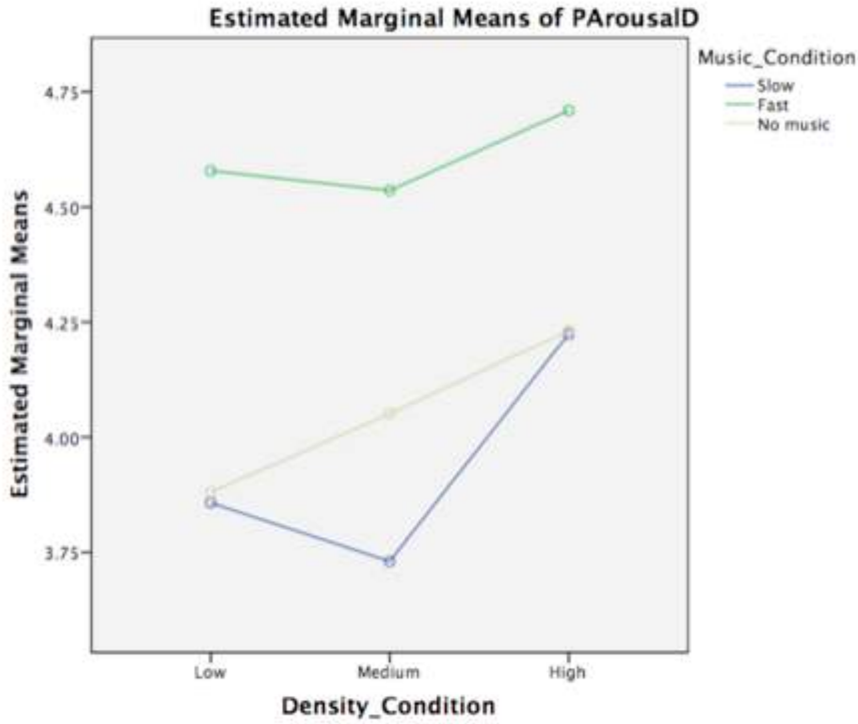


Graph 9. ***Estimated marginal means of pleasure (PAD)***

Arousal. There were two significant main effects of density and music conditions, $F(2, 846) = 8.91$, $p = .00$ and $F(2, 846) = 42.60$, $p = .00$ respectively.

Arousal partially tended to increase when the density increased, which is consistent with our hypothesis. The pairwise comparison of density levels was significant only for high vs. low and high vs. medium-density levels at the confidence interval 99% ($p = .00$).

Arousal was higher when the music tempo was fast, which is consistent with our hypothesis. Furthermore, it looks like the slow tempo music even "kills" arousal, which resulted in the lowest mean score. The pairwise comparisons of music conditions were significant at the confidence interval 99% for slow vs. fast, and no music vs. fast tempo music conditions, where $p = .00$ (see Appendix 20).



Graph 10. ***Estimated marginal means of arousal (PAD)***

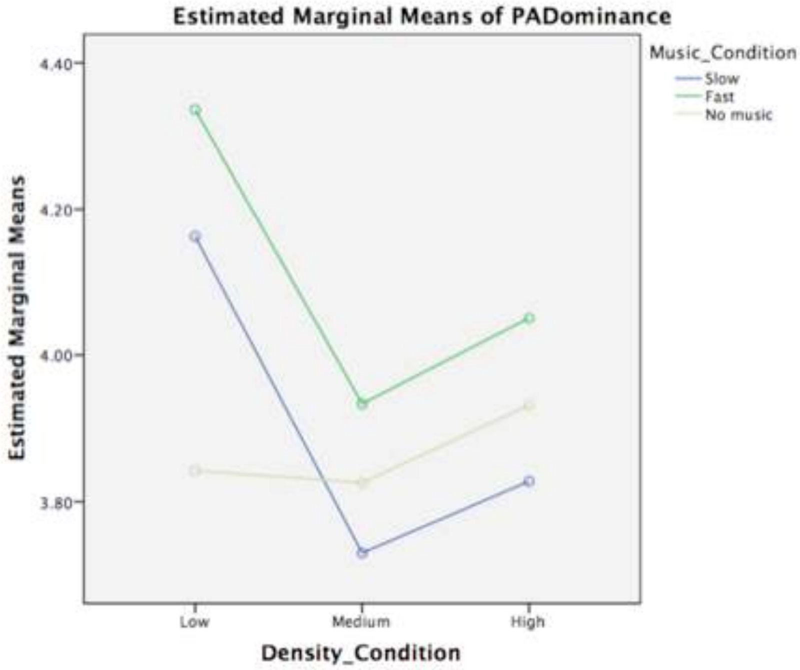
Bonferroni post hoc analysis gave us the following results (see Graph 10):

- In the low and high-density conditions, there were significant differences in fast vs. no music condition, and fast vs. slow music condition where $p = .00$.
- In medium-density condition, there were significant differences between all music conditions ($p < .05$).

Dominance. There were two significant main effects of density and music conditions, $F(2, 846) = 7.51$, $p = .00$ and $F(2, 846) = 6.01$, $p = .00$ respectively.

Dominance tended to decrease when the density increased to the medium level and then increased in the high-density level, which is partially consistent with our hypothesis. The pairwise comparison of density conditions was significant only for low vs. medium and low vs. high-density levels at the confidence interval 95% ($p = .00$ and $p = .05$).

Dominance is higher on all levels when the music tempo is fast, which is consistent with our hypothesis. The pairwise comparison of music conditions was significant at the confidence interval 95% only in fast vs. no music and fast vs. slow music conditions, where $p = .00$ and $p = .02$ (see Appendix 21).



Graph 11. ***Estimated marginal means of dominance (PAD)***

Bonferroni post hoc analysis gave us the following results (see Graph 11): in low-density condition, there were significant differences for no music vs. slow, and no music vs. fast tempo conditions, where $p = .04$, and $p = .00$ respectively.

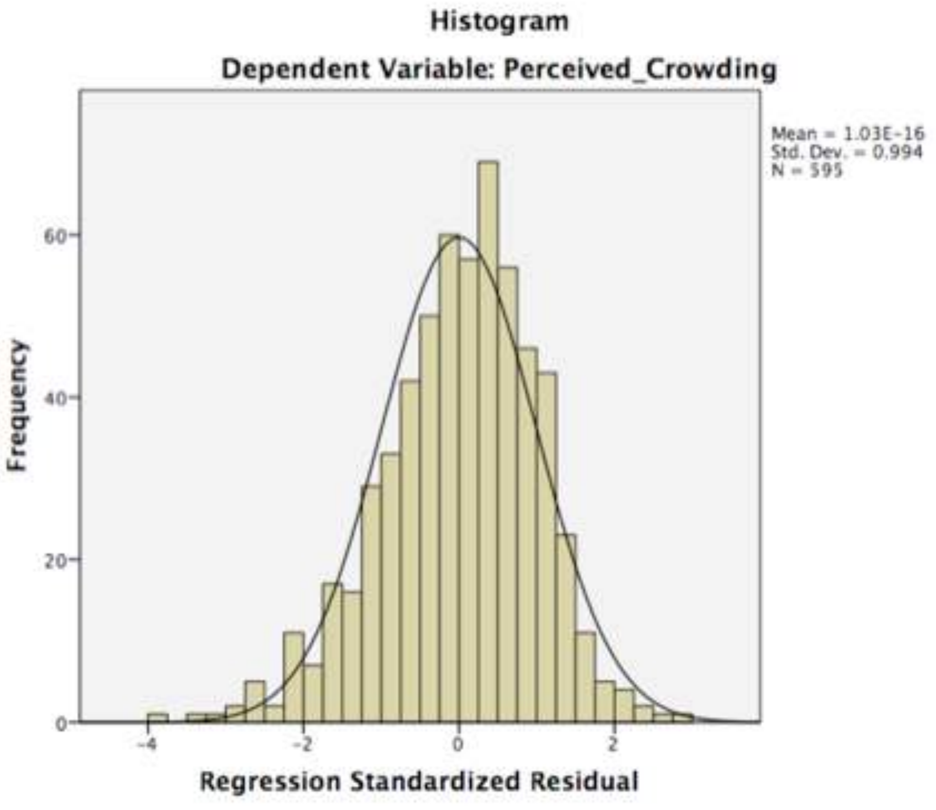
Regression

A simple linear regression was calculated to predict dependent variable *perceived crowding* based on *APAV*, *PI*, *density condition*, *music pleasantness*, *PleasureAD*, *PArousalD* and *age* (see Histogram 1, and Scatter plot 1). A significant regression equation was found ($F(7,587) = 106.77$, $p = .00$) with an R^2 of .56. Durbin-Watson coefficient was 2.02 which showed the absence of autocorrelation. Participants' predicted *perceived crowding* is equal to $4.572 + (-.365)X_1 + .161X_2 +.321X_3 + .067X_4 + (-.351)X_5 + .146X_6 + .011X_7$ (see Table 2).

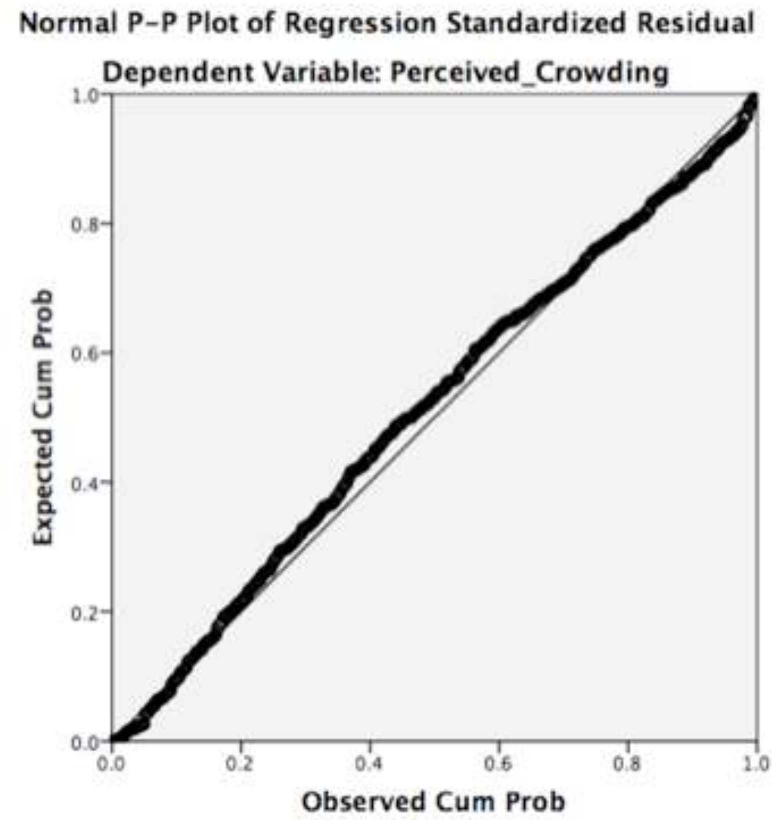
Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	4.572	.365		12.537	.000
	APAV	-.365	.051	-.390	-7.199	.000
	PI	.161	.053	.086	3.050	.002
	Density_Condition	.321	.049	.189	6.590	.000
	Music_pleas	.067	.025	.092	2.688	.007
	PleasureAD	-.351	.055	-.375	-6.413	.000
	PArousalD	.146	.044	.103	3.288	.001
	Age	.011	.003	.091	3.172	.002

Table 2. ***Coefficients of the regression analysis.***



Histogram 1. ***Standardized residuals distribution***



Scatter plot 1. ***Plot of standardized residuals***

6. Study 3

6.1 Method

Design

The design was the same as in previous studies, an online questionnaire was conducted to measure the relationship between music tempo and perceived crowding. To make the participants feel more immersive, we used videos in the study three (see Appendix 3). There were two videos, lasting approximately 25 seconds, which represented low and high-density conditions. One video was randomly selected, either with fast, slow, or no background music, to check whether the music tempo has an influence on the perceived crowding in the shopping environment. We maintained the original soundtrack of the video and added music, the ones played by Coldplay as in the previous studies. The participants could follow the camera and it was like a real shopping experience. The experiment was a 2 (low and high-density) x 3 (no, slow and fast music) randomized between-subjects factorial design with *perceived crowding* as the dependent variable (see Table 2).

		Music tempo condition		
		No music	Slow tempo	Fast tempo
Crowding density condition	Low-density	1	2	3
	High-density	4	5	6

Table 3. ***Overview of conditions***

Sample

The type and structure of the participants are the same as in previous two studies. In the study 3, the age of participants was ranging from 18 to 75 and the mean of the age of them was 35 years old and people from 22 to 38 contributed mostly. Same as in the study 2, the majority of the participants were from the United States. The proportion of female participants was almost equal to the one of the male participants in this study, 49% and 51% respectively.

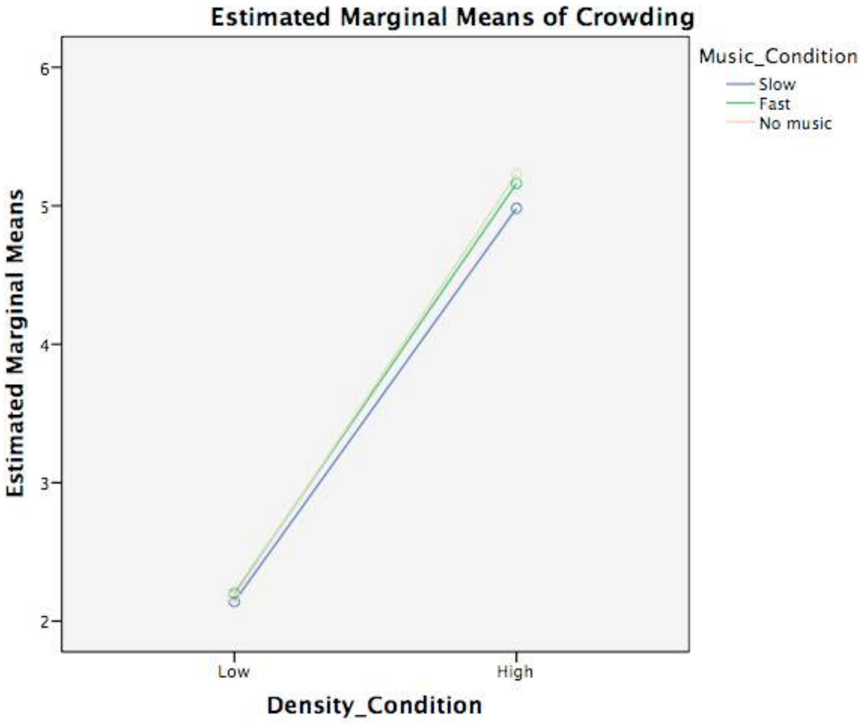
Procedure

The experiment procedure was almost the same as in study 2 except that videos were used instead of photos. To make the survey more comprehensive and easier to complete, we deleted several questions while the main structure of questions was the same as in study 2. In the study 3 we have asked all participants whether they heard any sounds first, and if they answered "yes" the next question appeared "did you hear any music?". If the answer was "yes" again, then questions about music tempo and pleasantness. This was done in case to control the attention of the participants and whether they followed the instructions.

6.2 Results

Music and Crowding

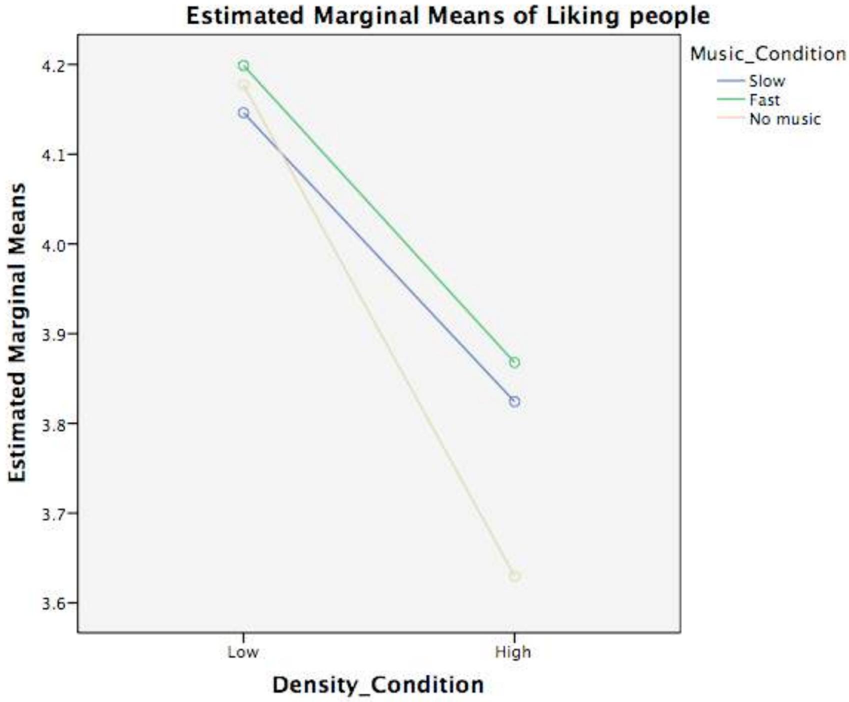
Two-way ANOVA was used to evaluate the influence of music tempo on perceived crowding in study 3 as well. Same as study 2, participants did not perceive that fast music and slow music have a significant difference between each other, while they considered low and high-density have a significant difference, where $F(1,992)= 751.91$, $p = .00$ (see Appendix 22). Results from the pairwise comparisons were insignificant in all conditions (see Graph 12).



Graph 12. ***Estimated marginal means of perceived crowding***

People liking

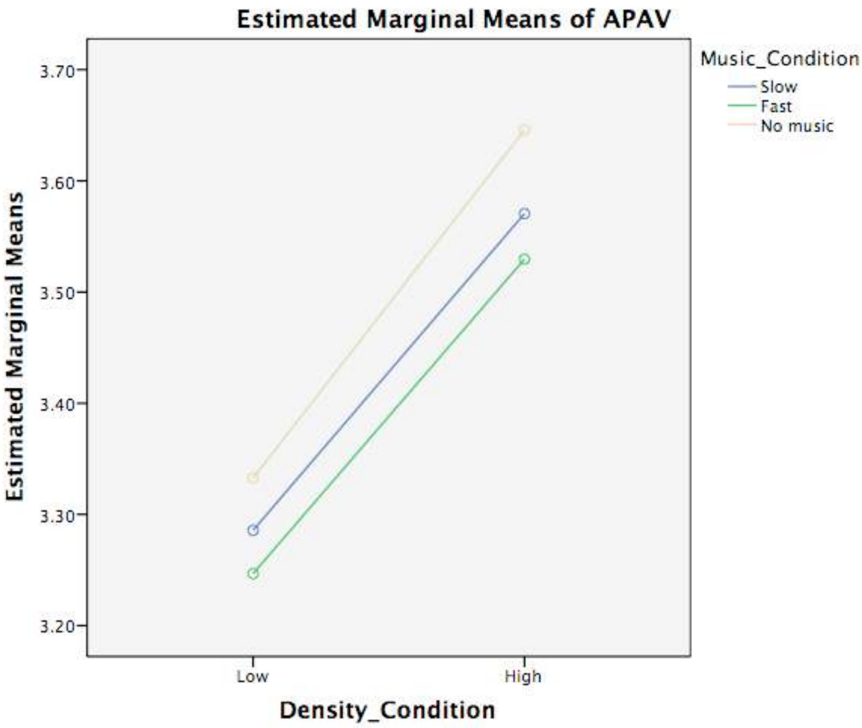
Same as study two, we ran the Two-way ANOVA to explore the relationship between music tempo and people liking, and the results appeared to be insignificant (see Graph 13, Appendix 23).



Graph 13. ***Estimated marginal means of people liking***

Approach avoidance

From the results of between-subjects effects, density condition was significant, where $F(1, 992) = 58.45$, $p = .00$ while music condition was insignificant ($p = .10$) (see Appendix 24). Pairwise comparisons suggested that, in both low and high-density condition, there were no significant differences among three music conditions (see Graph 14).



Graph 14. ***Estimated marginal means of APAV***

There were seven statements to calculate approach-avoidance score, the following two got significant results.

1. "I would want to avoid looking around or exploring this environment." Participants who listened to fast music would be more willing to explore the shopping environment in a high-density store.
2. "This is a place where I might try to avoid other people, and avoid having to talk to them." Participants who listened to fast music in low-density have fewer intentions to avoid people.

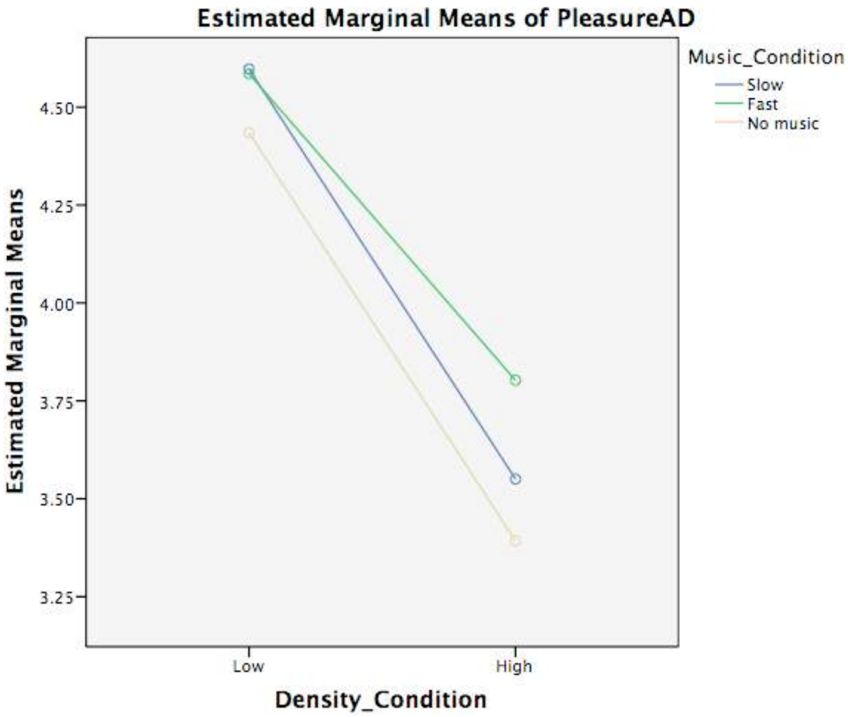
Pleasure Arousal Dominance (PAD)

We have run three separate Two-way ANOVAs to analyze three dimensions of PAD model. Density condition and music conditions were two factors that we used in the analysis to see whether there are any main or/and interactive effect between them. All main effects for *pleasure, arousal,* and *dominance* were significant. However, all interaction effects between density condition and music condition were insignificant.

Pleasure. There were two significant main effects of density and music conditions, F (1, 992) = 134.11, p = .00 and F (2, 992) = 3.82, p = .02 respectively. Pleasure tended to decrease in high-density level, which is consistent with our hypothesis. The pairwise comparison of density conditions was significant on all levels at the confidence interval 99% (see Graph 15).

Pleasure tended to be constant within all music tempos, and it was lower in no music condition, which is consistent with our hypothesis. Pairwise comparison of music conditions was significant only for fast vs. no music comparison. Hence, it implies the following, that the music tempo does not matter for pleasantness that much, it matters whether there is any music or not, preferably fast tempo (see Appendix 25).

Bonferroni post hoc analysis gave us the following results, that in the low-density condition all results were insignificant, and in high-density condition, there was a significant effect for fast vs. no music conditions, where p = .02.



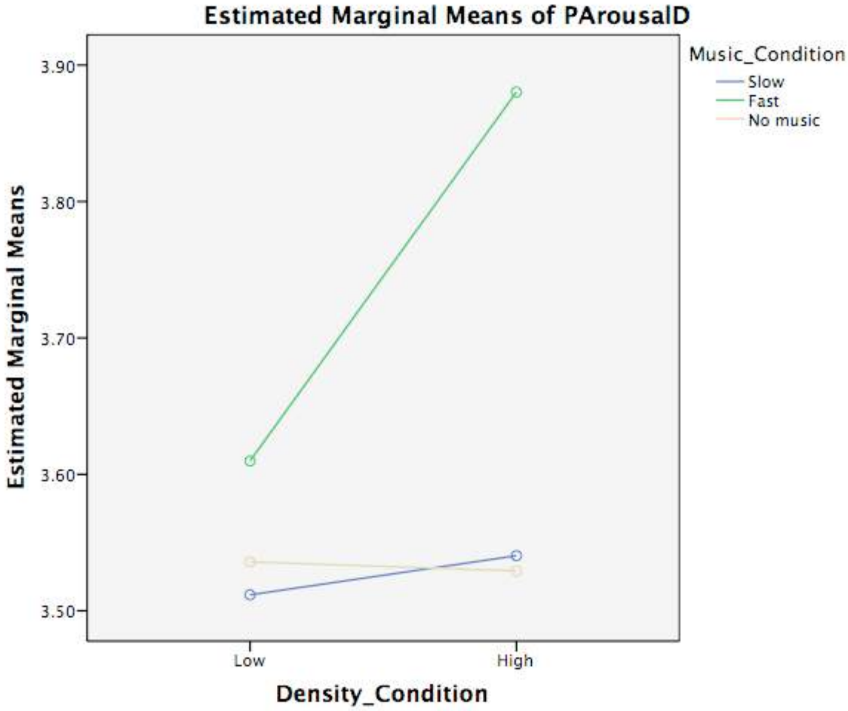
Graph 15. ***Estimated marginal means of pleasure (PAD)***

Arousal. There was only one significant main effect of music conditions, $F(2, 992) = 6.81$, $p = .00$. However, there was an insignificant main effect of the music condition and interaction effect between density conditions and music conditions.

Arousal partially tended to increase when the density increased, which is consistent with our hypothesis. The pairwise comparison of density conditions was insignificant on all levels at the confidence interval 95% (see Graph 16).

Arousal was a bit higher when the music tempo was fast, which is consistent with our hypothesis. Overall, the mean score appeared to be pretty the same along all two conditions. The pairwise comparison of music conditions was significant for fast vs. slow, and fast vs. no music condition at the confidence interval 95% (see Appendix 26).

Bonferroni post hoc analysis gave us the following results, that in the low-density condition all results were insignificant, and in high-density condition, there were significant effects for fast vs. slow music, and fast vs. no music conditions, where $p = .00$.



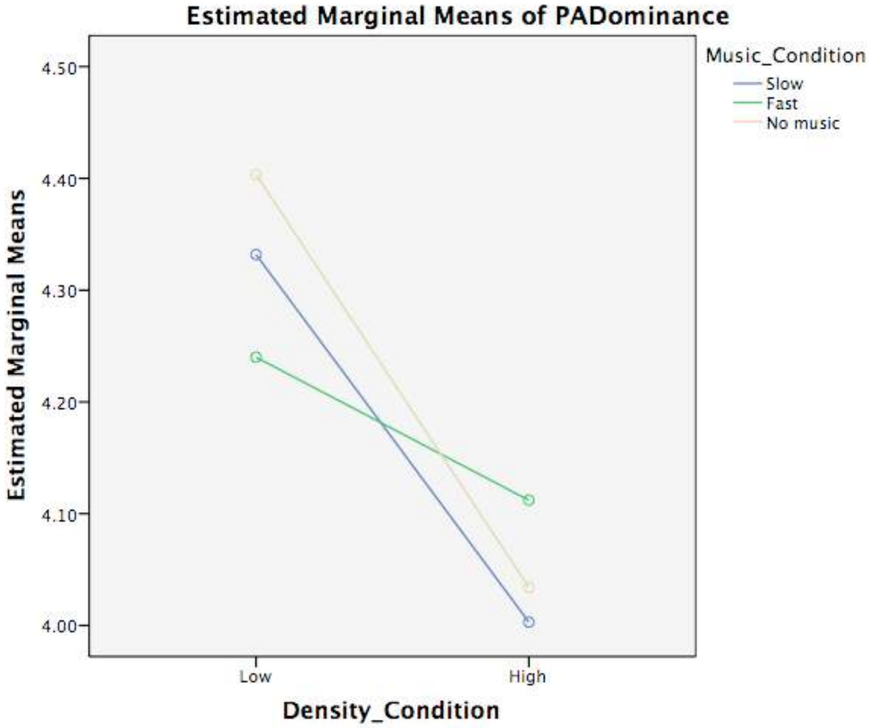
Graph 16. ***Estimated marginal means of arousal (PAD)***

Dominance. There was only one significant main effect of density conditions in the experiment on the Arousal of the participants, $F(1, 992) = 33.15$, $p = .00$. However, there was an insignificant main effect of music condition and the interaction effect between density and music conditions.

Dominance tended to decrease in high-density level, which is consistent with our hypothesis. The pairwise comparison of density levels was significant on all levels at the confidence interval 99%.

Dominance was constant across all music conditions, consequently, the pairwise comparison of music conditions was insignificant (see Appendix 27).

Bonferroni post hoc analysis gave us insignificant results for all comparisons (see Graph 17).



Graph 17. ***Estimated marginal means of dominance (PAD)***

7. Discussion

This paper highlights the role of human crowding and ambient musical stimuli in the retail environment. Our studies evaluate the effects of music tempo on perceived crowding. In addition, we explore how pleasure, arousal, and dominance, which are dimensions of PAD model, mediate the effect of music tempo on perceived crowding across two/three crowding conditions.

In terms of methodology, this paper makes a contribution to the current state of research through using photos and videos of real-life situations, making simulation easier for the participants, as opposed to what previous laboratory studies have done (O'Guinn, Tanner, and Maeng 2015).

In study 1 and study 2, we got significant main effects of music and density conditions. In study 3, where we used videos as a stimulus material, all main effects of music condition were insignificant. This may be explained, by the following arguments: 1) music was not loud enough to influence the participants; 2) there were too many different factors and stimulus in the video so that participants got cognitive overload.

Furthermore, it was found that, in general, there is no difference between slow and fast music tempo while it matters whether there is any music, or not. Hence, in most cases across all studies, there was the statistical difference for no music vs. fast/slow music conditions, seldom for fast vs. slow music conditions.

Speaking about APAV model, we got somewhat significant results, although, they were inconsistent between study 2 and study 3, and no interaction effect between music and density conditions.

The results for people liking analysis opened some questions and possibilities that could be explored. The results of study 3 were insignificant, however, we got an interesting pattern in study 2, where respondents perceived people on the pictures as more likable in high-density condition with fast tempo music than in other conditions. Thus, the question is, why high-density condition and fast music made people more likable? The potential answers could be the following:

1. The more people, the less time you spent on analyzing every person separately on the photo, which made your brain finish the ‘unseen’ parts automatically, thus, they become more likable for you.
2. Fast tempo music increases our arousal and heartbeat, hence, makes other people more likable.

This study partially supported the findings of Mehrabian and Russell (1974) that three dimensions of PAD model are significant determinants of the shopper's behavior in the retail environment. The findings of this study also suggested that pleasure was most influenced by perceived crowding and music itself, rather than by music tempo. It was found that human crowding, the feeling of restricted physical body movement due to high social density, negatively affected respondents' pleasure.

Additionally, we got significant results, that high tempo music increases arousal and partially mitigates the negative effects of increased social density. Dominance was somewhat higher in fast tempo music condition, however, it was not significant across all studies. Unfortunately, we did not find any interaction effect between music tempo and human crowding in our studies.

Previous studies, (Machleit et al., 2000, Eroglu, Machleit, and Chebat 2005, source) same as ours, got significant results, that human crowding affects negatively satisfaction and positive emotions (pleasure). However, the method of our research is different from above mentioned studies. Many studies explore the retrospective results of the survey responses, implying that respondents were asked to fill in the survey after the shopping activity. Human crowding was not controlled in those studies. In addition, when people are stopped to complete a survey on the street or in the store, it brings a lot of inconvenience to them, because it was not planned, thus, respondents are trying either to omit to answer, or finish it as soon as possible. This can bring some response and self-selection biases.

Some future research ideas and improvements have arisen from the results and findings of these studies. **Firstly**, in the given research, we have taken only human crowding into consideration, hence, we think, it would be reasonable to use both dimensions of crowding (social and spatial density). So that, it will be possible to see the whole picture how each type of crowding influences perceived crowding of shoppers in the grocery store, pleasure-arousal-dominance, and shopping behavioral outcomes. For example, how the layout of the given store contributes to perceived crowding. **Secondly**, we think, there is a space for experiments with the music itself. We have used Coldplay songs only, maybe other artists are more likable or charismatic, thus, the music effects transfer more easily, and have the stronger effect on the respondents. **Thirdly**, to support the results of the online survey, it would be noteworthy to replicate the study as a laboratory experiment, and to control a number of participants as density conditions. By doing so, we may increase ecological validity of the research, and also it is possible to be more discreet with the purpose of study and conceal it with some task oriented activity. **Fourthly**, since the stimulus material is made in Norway, it would be interesting to check it with Norwegian respondents, and compare with obtained results from the US. The logic behind is that the familiarity of the shopping environment may strongly affect the outcomes of the perceived crowding.

7.1 Managerial implications

Although we consider the empirical research of music in a retail environment to be in an early stage of development, our findings would seem to suggest some preliminary implications in managerial practice.

Consumers' reactions to the retail environment are not consistent or universal. It depends on the huge amount of external and internal factors, thus, people respond differently to the same stimuli. Consequently, grocery stores should meet the requirements of target customers, which implies, the more specialized the store is, the more consistent customer behavior it will be.

On the other side, there may be another interesting managerial implication, that shoppers may not be aware of all ambient stimulus in the shopping environment, nevertheless, it is affecting their behavior (Milliman, 1982; Gulas and Schewe, 1994). This implies, that specific stimulus does not need to be obvious, notable and visible to affect customers.

7.2 Limitations and Conclusions

The present study has several limitations that should be acknowledged. **First**, by conducting a web based study, ecological validity drops down, same as overall control over participants during the study, which may engage them into freeriding and not fulfilling survey in a proper way. **Second**, responses may change due to the familiarity of the music piece that has been used as stimuli. **Third**, using photographs as a stimulus implies low dynamics, which does not really represent the crowding situations in the grocery stores. **Fourth**, our subjects received only one exposure to musical stimuli, which was relatively short, if we compare to exposure in the stores or restaurants. **Fifth**, photos, and videos made in Norwegian grocery stores were used as a stimulus material and used for the respondents from the US. There are some differences in the layout of grocery stores between these two countries.

The current study is based on the research by Klemens Knöferle et al. (2012). Both studies were built on the analysis of the effects of music tempo on perceived crowding. However, our research was based on web surveys and above mentioned paper - on field experiment. Our study consists solely of the participants from the US, and some minor groups of immigrants who live in the US, which implies some limitations of generalizability.

Despite these limitations, the results of our research contribute to the understanding of how background music influences perceived crowding. During last decades, the use of background music in the retail environment has been taking an important role. Consumers' behavior may be to some extent manipulated by ambient musical stimuli, but still, a lot of decisions are made on a random basis, which can not be easily explained. Our results may help to understand some parts of consumer behavior in the high social density, and provide some insights how different music may influence customers, thus help managers to improve their potential sales. However, it does not mitigate the challenge of physical reduction of human crowding in the grocery stores, which is becoming more and more critical issue currently.

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Appendices

Appendix 1. Stimulus material for the pretest

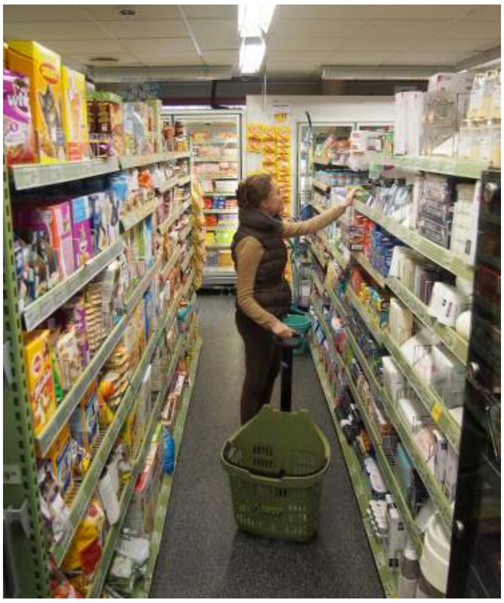


Photo #1 Photo #2 Photo #3



Photo #4 Photo #5 Photo #6

Appendix 2. Stimulus material for study 1 and study 2

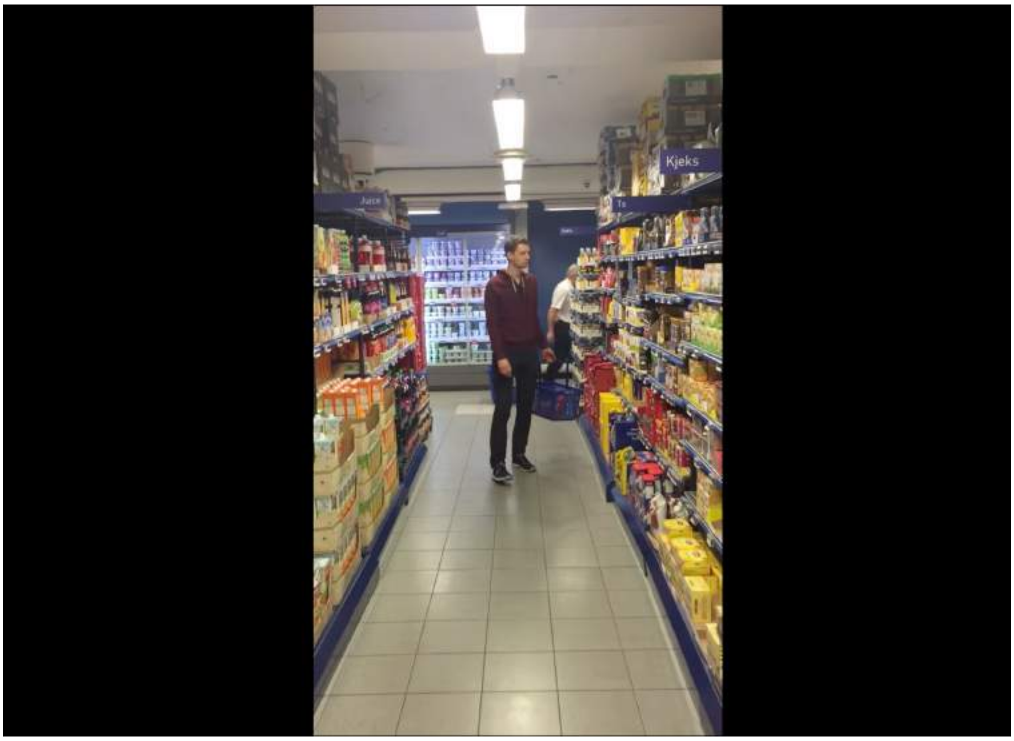


Low density level

Medium density level

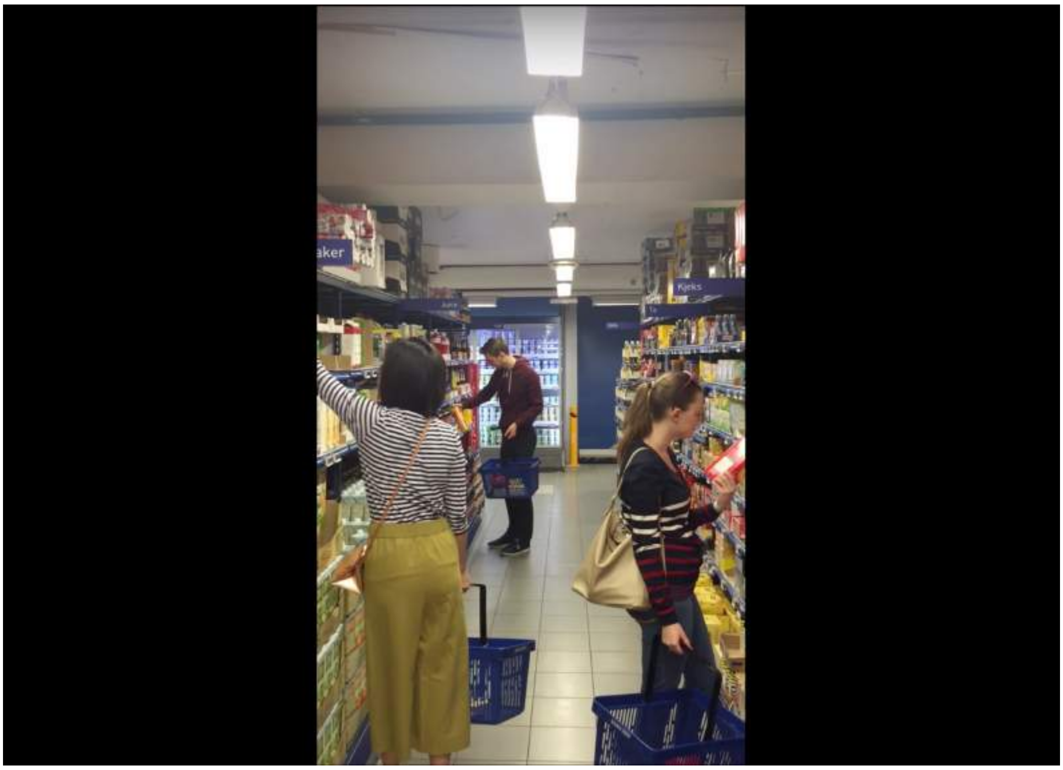
High density level

Appendix 3. Stimulus material for study 3 (screenshots of the videos)

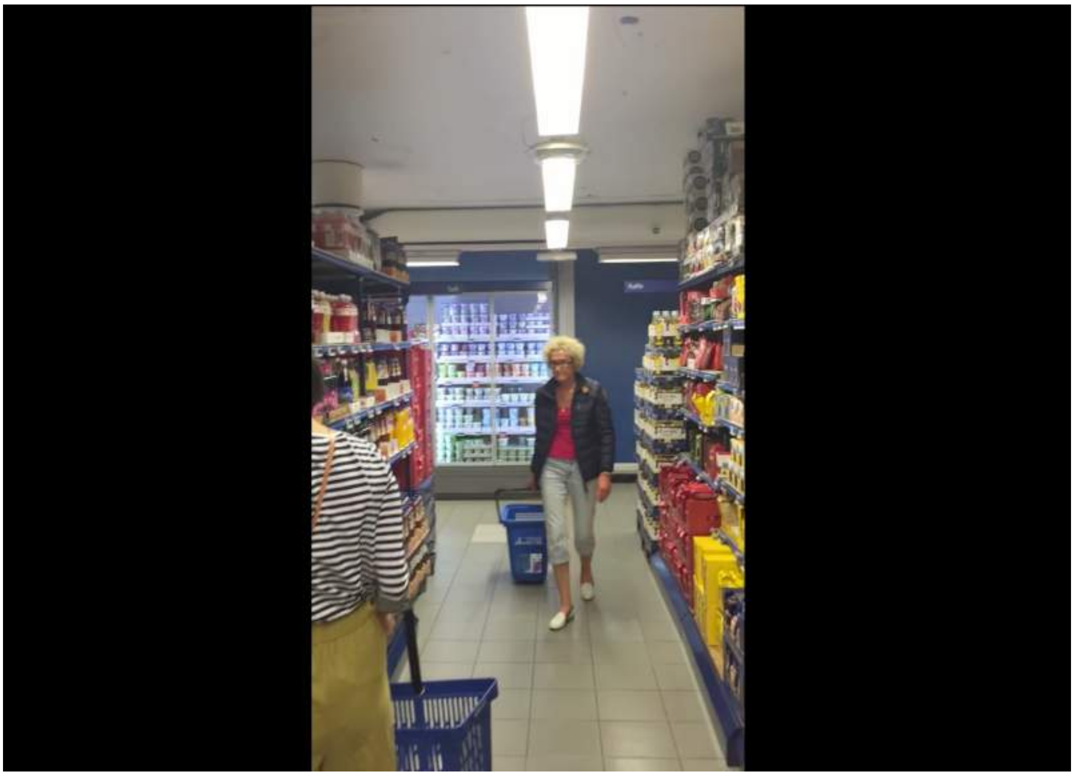


Screenshot 1. Low-density condition

Screenshot 2. Low-density condition



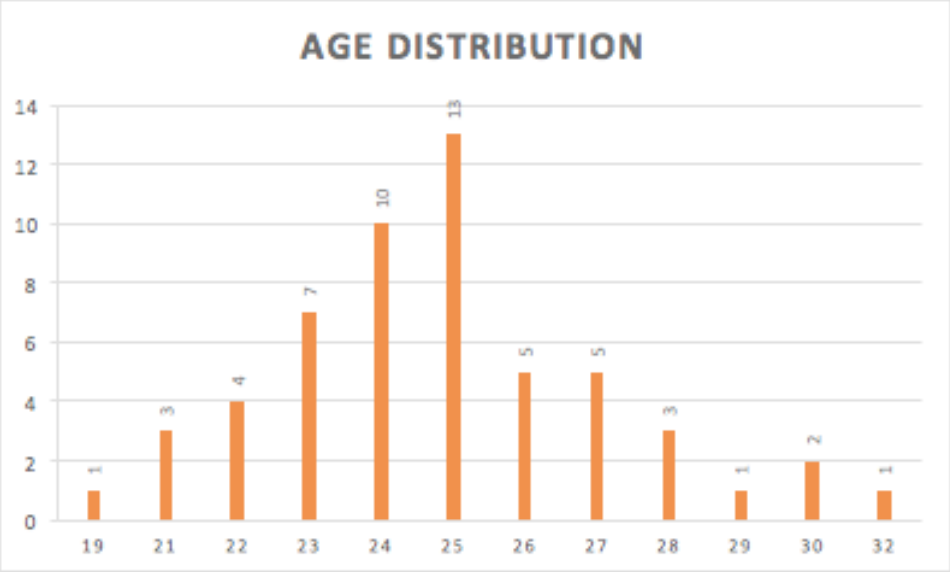
Screenshot 3. Low density condition



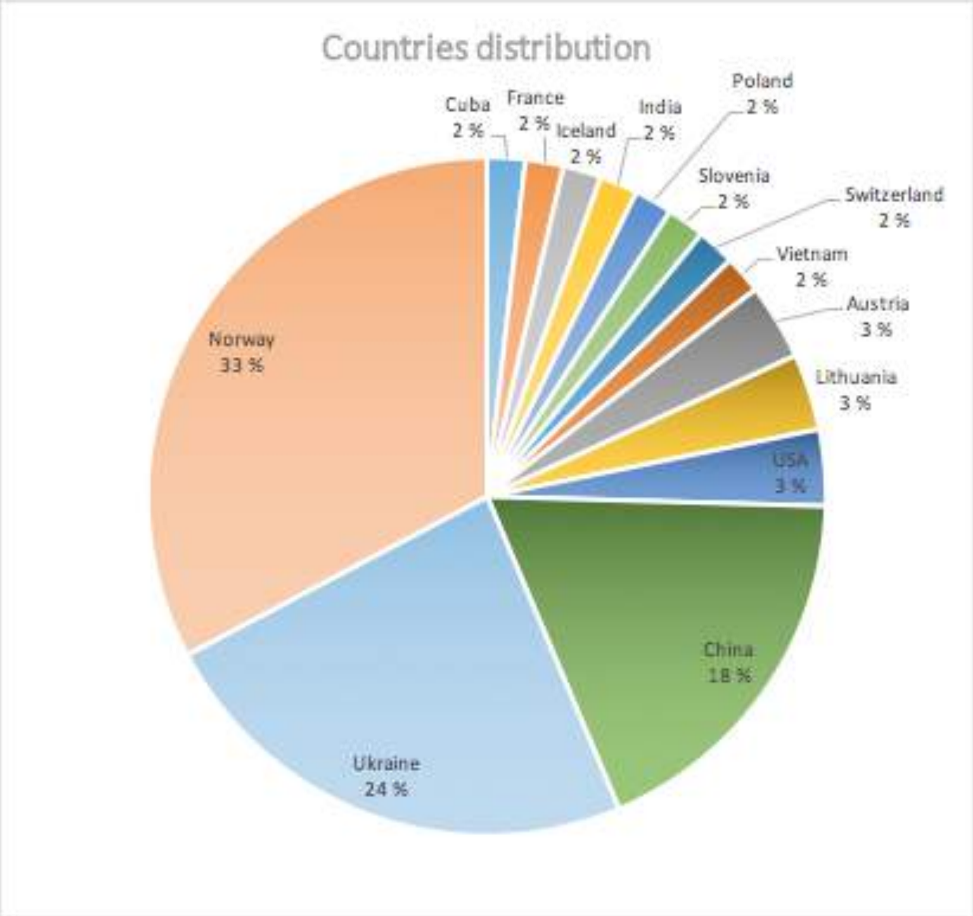
Screenshot 4. Low density condition

Appendix 4. Overview of the participants in the pretest

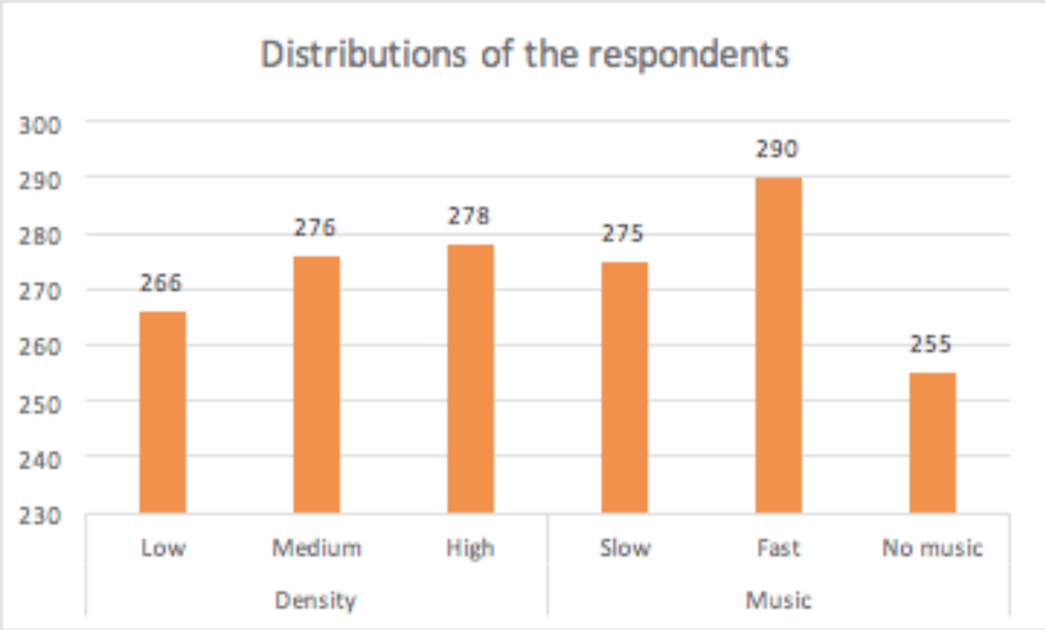
Appendix 4.1. Age distribution of the participants for the pretest



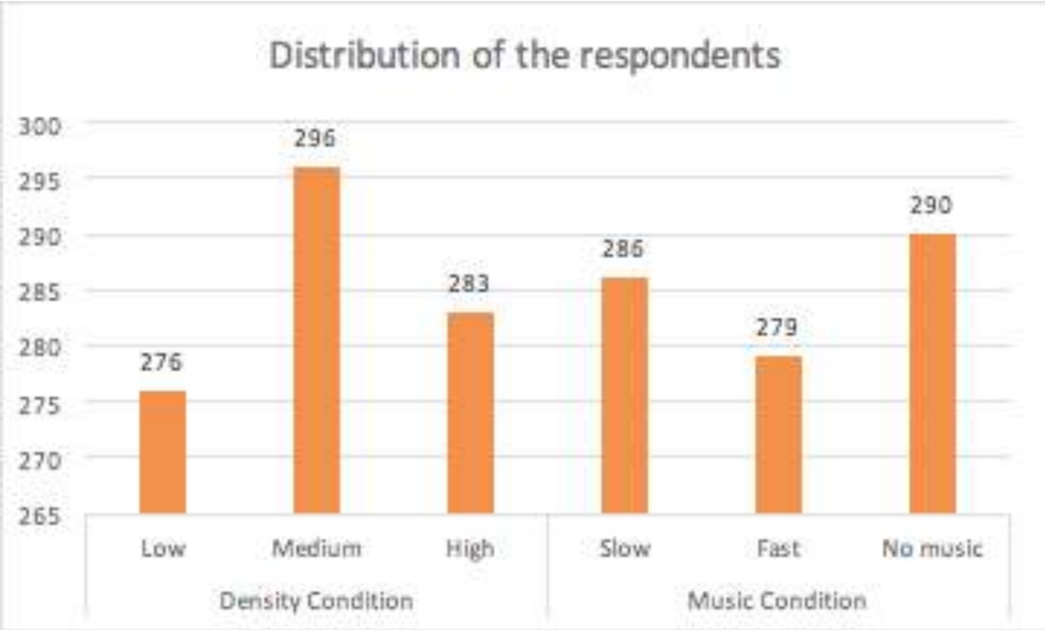
Appendix 4.2. Countries distribution of the participants for the pretest



Appendix 5. Distribution of the respondents in study 1



Appendix 6. Distribution of the respondents in study 2



Appendix 7. PAD Emotional state model

Dominant	○	○	○	○	○	○	○	Submissive
Satisfied	○	○	○	○	○	○	○	Unsatisfied
Contented	○	○	○	○	○	○	○	Melancholic
Jittery	○	○	○	○	○	○	○	Dull
Hopefull	○	○	○	○	○	○	○	Desparing
Happy	○	○	○	○	○	○	○	Unhappy
Pleased	○	○	○	○	○	○	○	Annoyed
In control	○	○	○	○	○	○	○	Cared for
Wide awake	○	○	○	○	○	○	○	Sleepy
Frenzied	○	○	○	○	○	○	○	Sluggish
Excited	○	○	○	○	○	○	○	Calm
Relaxed	○	○	○	○	○	○	○	Bored
Autonomous	○	○	○	○	○	○	○	Guided
Influential	○	○	○	○	○	○	○	Influenced
Aroused	○	○	○	○	○	○	○	Not aroused
Important	○	○	○	○	○	○	○	Awed

Appendix 8. Pretest

Tests of Between-Subjects Effects

Dependent Variable: FirstPicRating

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	15.538[a]	5	3.108	2.351	.048	.127	11.756	.725
Intercept	1512.177	1	1512.177	1144.121	.000	.934	1144.121	1.000
P1	15.538	5	3.108	2.351	.048	.127	11.756	.725
Error	107.057	81	1.322					
Total	1778.000	87						
Corrected Total	122.595	86						

a. R Squared = .127 (Adjusted R Squared = .073)
b. Computed using alpha =

Estimates

Dependent Variable: FirstPicRating

P1	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1	4.075	.364	3.352	4.798
2	4.125	.364	3.402	4.848
3	3.679	.307	3.067	4.290
4	4.337	.257	3.826	4.849
5	4.706	.279	4.151	5.261
6	4.953	.287	4.381	5.525

Pairwise Comparisons

Dependent Variable: FirstPicRating

(I) P1	(J) P1	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b] Lower Bound	95% Confidence Interval for Difference[b] Upper Bound
1	2	-.050	.514	1.000	-1.605	1.505
	3	.396	.476	1.000	-1.043	1.836
	4	-.263	.445	1.000	-1.609	1.084
	5	-.631	.458	1.000	-2.017	.755
	6	-.878	.463	.925	-2.280	.524
2	1	.050	.514	1.000	-1.505	1.605
	3	.446	.476	1.000	-.993	1.886
	4	-.212	.445	1.000	-1.559	1.134
	5	-.581	.458	1.000	-1.967	.805
	6	-.828	.463	1.000	-2.230	.574
3	1	-.396	.476	1.000	-1.836	1.043
	2	-.446	.476	1.000	-1.886	.993
	4	-.659	.401	1.000	-1.871	.553
	5	-1.027	.415	.231	-2.282	.228
	6	-1.275*	.421	.049	-2.547	-.002
4	1	.263	.445	1.000	-1.084	1.609
	2	.212	.445	1.000	-1.134	1.559
	3	.659	.401	1.000	-.553	1.871
	5	-.368	.379	1.000	-1.516	.779
	6	-.616	.386	1.000	-1.782	.551
5	1	.631	.458	1.000	-.755	2.017
	2	.581	.458	1.000	-.805	1.967
	3	1.027	.415	.231	-.228	2.282
	4	.368	.379	1.000	-.779	1.516
	6	-.247	.400	1.000	-1.458	.964
6	1	.878	.463	.925	-.524	2.280
	2	.828	.463	1.000	-.574	2.230
	3	1.275*	.421	.049	.002	2.547
	4	.616	.386	1.000	-.551	1.782
	5	.247	.400	1.000	-.964	1.458

Based on estimated marginal means: *. The mean difference is significant at the
b. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests

Dependent Variable: FirstPicRating

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[a]
Contrast	15.538	5	3.108	2.351	.048	.127	11.756	.725
Error	107.057	81	1.322					

The F tests the effect of P1. This test is based on the linearly independent pairwise comparisons among the estimated marginal means. a. Computed using alpha

Appendix 9

Descriptive Statistics

	Mean	Std. Deviation	N
PQ1	3.2568	1.10569	74
PQ2	3.7973	1.06684	74
PQ3	3.4392	1.13537	74
PQ4	4.2230	1.14569	74
PQ5	4.6858	1.14382	74
PQ6	5.0777	1.20780	74

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[c]
Crowding	Pillai's Trace	.595	20.312[b]	5.000	69.000	.000	.595	101.562	1.000
	Wilks' Lambda	.405	20.312[b]	5.000	69.000	.000	.595	101.562	1.000
	Hotelling's Trace	1.472	20.312[b]	5.000	69.000	.000	.595	101.562	1.000
	Roy's Largest Root	1.472	20.312[b]	5.000	69.000	.000	.595	101.562	1.000

a. Design: Intercept Within Subjects Design: Crowding
b. Exact statistic
c. Computed using alpha =

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Crowding	.182	121.065	14	.000	.523	.544	.200

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept Within Subjects Design: Crowding
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Between-Subjects Effects

Measure: MEASURE_1
Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[a]
Intercept	7390.838	1	7390.838	1636.208	.000	.957	1636.208	1.000
Error	329.745	73	4.517					

a. Computed using alpha =

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta^2	Noncent. Parameter	Observed Power[a]
Crowding	Sphericity Assumed	188.785	5	37.757	58.767	.000	.446	293.836	1.000
	Greenhouse-Geisser	188.785	2.613	72.250	58.767	.000	.446	153.555	1.000
	Huynh-Feldt	188.785	2.719	69.441	58.767	.000	.446	159.767	1.000
	Lower-bound	188.785	1.000	188.785	58.767	.000	.446	58.767	1.000
Error (Crowding)	Sphericity Assumed	234.507	365	.642					
	Greenhouse-Geisser	234.507	190.75	1.229					
	Huynh-Feldt	234.507	198.46	1.182					
	Lower-bound	234.507	73.000	3.212					

a. Computed using alpha =

Multivariate Tests

	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Pillai's trace	.595	20.312[a]	5.000	69.000	.000	.595	101.562	1.000
Wilks' lambda	.405	20.312[a]	5.000	69.000	.000	.595	101.562	1.000
Hotelling's trace	1.472	20.312[a]	5.000	69.000	.000	.595	101.562	1.000
Roy's largest root	1.472	20.312[a]	5.000	69.000	.000	.595	101.562	1.000

Each F tests the multivariate effect of Crowding. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

b. Computed using alpha =

Pairwise Comparisons

Measure: MEASURE_1

(I) Crowding	(J) Crowding	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b] Lower Bound	Upper Bound
1	2	-.541*	.101	.000	-.849	-.233
	3	-.182	.106	1.000	-.503	.138
	4	-.966*	.123	.000	-1.340	-.592
	5	-1.429*	.160	.000	-1.914	-.944
	6	-1.821*	.184	.000	-2.378	-1.264
2	1	.541*	.101	.000	.233	.849
	3	.358*	.111	.029	.021	.695
	4	-.426*	.090	.000	-.698	-.153
	5	-.889*	.120	.000	-1.254	-.524
	6	-1.280*	.146	.000	-1.722	-.838
3	1	.182	.106	1.000	-.138	.503
	2	-.358*	.111	.029	-.695	-.021
	4	-.784*	.127	.000	-1.170	-.398
	5	-1.247*	.156	.000	-1.721	-.772
	6	-1.639*	.176	.000	-2.171	-1.106
4	1	.966*	.123	.000	.592	1.340
	2	.426*	.090	.000	.153	.698
	3	.784*	.127	.000	.398	1.170
	5	-.463*	.113	.002	-.805	-.121
	6	-.855*	.132	.000	-1.256	-.454
5	1	1.429*	.160	.000	.944	1.914
	2	.889*	.120	.000	.524	1.254
	3	1.247*	.156	.000	.772	1.721
	4	.463*	.113	.002	.121	.805
	6	-.392*	.083	.000	-.645	-.139
6	1	1.821*	.184	.000	1.264	2.378
	2	1.280*	.146	.000	.838	1.722
	3	1.639*	.176	.000	1.106	2.171
	4	.855*	.132	.000	.454	1.256
	5	.392*	.083	.000	.139	.645

Based on estimated marginal means

*. The mean difference is significant at the

b. Adjustment for multiple comparisons: Bonferroni.

Appendix 10

Tests of Between-Subjects Effects

Dependent Variable: Tempo1

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	77.091[a]	1	77.091	74.262	.000	.584	74.262	1.000
Intercept	1230.691	1	1230.691	1185.538	.000	.957	1185.538	1.000
M1	77.091	1	77.091	74.262	.000	.584	74.262	1.000
Error	55.019	53	1.038					
Total	1333.000	55						
Corrected Total	132.109	54						

a. R Squared = .584 (Adjusted R Squared = .576)

b. Computed using alpha =

Appendix 11. Study 1

Tests of Between-Subjects Effects

Dependent Variable: Perceived_tempo

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1226.926[a]	1	1226.926	980.880	.000
Intercept	11302.148	1	11302.148	9035.630	.000
Music_Condition	1226.926	1	1226.926	980.880	.000
Error	704.224	563	1.251		
Total	13440.000	565			
Corrected Total	1931.150	564			

a. R Squared = .635 (Adjusted R Squared = .635)

Appendix 12

Tests of Between-Subjects Effects

Dependent Variable: Perceived_Crowding

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	300.262[a]	8	37.533	29.742	.000
Intercept	21717.788	1	21717.788	17209.810	.000
Density_Condition	274.748	2	137.374	108.859	.000
Music_Condition	18.711	2	9.355	7.413	.001
Density_Condition * Music_Condition	2.596	4	.649	.514	.725
Error	1023.435	811	1.262		
Total	23154.625	820			
Corrected Total	1323.697	819			

a. R Squared = .227 (Adjusted R Squared = .219)

Pairwise Comparisons

Dependent Variable: Perceived_Crowding

Density_Condition	(I) Music_Condition	(J) Music_Condition	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
						Lower Bound	Upper Bound
Low	Slow	Fast	.081	.165	1.000	-.315	.476
		No music	-.280	.173	.319	-.695	.135
	Fast	Slow	-.081	.165	1.000	-.476	.315
		No music	-.361	.170	.102	-.768	.046
	No music	Slow	.280	.173	.319	-.135	.695
		Fast	.361	.170	.102	-.046	.768
Medium	Slow	Fast	.302	.163	.192	-.088	.692
		No music	-.026	.169	1.000	-.431	.378
	Fast	Slow	-.302	.163	.192	-.692	.088
		No music	-.328	.167	.148	-.727	.072
	No music	Slow	.026	.169	1.000	-.378	.431
		Fast	.328	.167	.148	-.072	.727
High	Slow	Fast	.103	.164	1.000	-.290	.497
		No music	-.322	.166	.158	-.721	.076
	Fast	Slow	-.103	.164	1.000	-.497	.290
		No music	-.426*	.165	.031	-.822	-.029
	No music	Slow	.322	.166	.158	-.076	.721
		Fast	.426*	.165	.031	.029	.822

Based on estimated marginal means

*. The mean difference is significant at the

b. Adjustment for multiple comparisons: Bonferroni.

Appendix 13

Tests of Between-Subjects Effects

Dependent Variable: PleasureAD

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	165.533[a]	8	20.692	15.060	.000	.129
Intercept	9278.070	1	9278.070	6752.755	.000	.893
Density	129.088	2	64.544	46.976	.000	.104
Music	29.934	2	14.967	10.893	.000	.026
Density * Music	4.052	4	1.013	.737	.567	.004
Error	1114.288	811	1.374			
Total	10606.639	820				
Corrected Total	1279.822	819				

a. R Squared = .129 (Adjusted R Squared = .121)

Pairwise Comparisons

Dependent Variable: PleasureAD

Density	(I) Music	(J) Music	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
						Lower Bound	Upper Bound
Low	Slow	Fast	-.093	.172	1.000	-.506	.320
		No music	.276	.181	.381	-.157	.709
	Fast	Slow	.093	.172	1.000	-.320	.506
		No music	.369	.177	.112	-.056	.794
	No music	Slow	-.276	.181	.381	-.709	.157
		Fast	-.369	.177	.112	-.794	.056
Medium	Slow	Fast	-.364	.170	.097	-.771	.043
		No music	.260	.176	.421	-.162	.681
	Fast	Slow	.364	.170	.097	-.043	.771
		No music	.623*	.174	.001	.207	1.040
	No music	Slow	-.260	.176	.421	-.681	.162
		Fast	-.623*	.174	.001	-1.040	-.207
High	Slow	Fast	.014	.171	1.000	-.396	.425
		No music	.411	.173	.054	-.004	.827
	Fast	Slow	-.014	.171	1.000	-.425	.396
		No music	.397	.172	.065	-.017	.811
	No music	Slow	-.411	.173	.054	-.827	.004
		Fast	-.397	.172	.065	-.811	.017

Based on estimated marginal means

*. The mean difference is significant at the

b. Adjustment for multiple comparisons: Bonferroni.

Appendix 14

Tests of Between-Subjects Effects

Dependent Variable: PArousalD

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	74.553[a]	8	9.319	12.734	.000	.112
Intercept	14624.371	1	14624.371	19983.772	.000	.961
Density	17.461	2	8.731	11.930	.000	.029
Music	55.807	2	27.903	38.129	.000	.086
Density * Music	2.541	4	.635	.868	.483	.004
Error	593.500	811	.732			
Total	15436.833	820				
Corrected Total	668.053	819				

a. R Squared = .112 (Adjusted R Squared = .103)

Pairwise Comparisons

Dependent Variable: PArousalD

Density	(I) Music	(J) Music	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
						Lower Bound	Upper Bound
Low	Slow	Fast	-.749*	.126	.000	-1.050	-.448
		No music	-.218	.132	.298	-.534	.099
	Fast	Slow	.749*	.126	.000	.448	1.050
		No music	.531*	.129	.000	.221	.841
	No music	Slow	.218	.132	.298	-.099	.534
		Fast	-.531*	.129	.000	-.841	-.221
Medium	Slow	Fast	-.430*	.124	.002	-.727	-.133
		No music	.013	.128	1.000	-.295	.321
	Fast	Slow	.430*	.124	.002	.133	.727
		No music	.443*	.127	.002	.139	.747
	No music	Slow	-.013	.128	1.000	-.321	.295
		Fast	-.443*	.127	.002	-.747	-.139
High	Slow	Fast	-.574*	.125	.000	-.873	-.274
		No music	-.069	.126	1.000	-.372	.235
	Fast	Slow	.574*	.125	.000	.274	.873
		No music	.505*	.126	.000	.203	.807
	No music	Slow	.069	.126	1.000	-.235	.372
		Fast	-.505*	.126	.000	-.807	-.203

Based on estimated marginal means

*. The mean difference is significant at the

b. Adjustment for multiple comparisons: Bonferroni.

Appendix 15

Tests of Between-Subjects Effects

Dependent Variable: PADominance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	16.963[a]	8	2.120	3.557	.000	.034
Intercept	11865.792	1	11865.792	19907.400	.000	.961
Density	9.376	2	4.688	7.865	.000	.019
Music	4.659	2	2.329	3.908	.020	.010
Density * Music	2.794	4	.699	1.172	.322	.006
Error	483.396	811	.596			
Total	12419.188	820				
Corrected Total	500.359	819				

a. R Squared = .034 (Adjusted R Squared = .024)

Pairwise Comparisons

Dependent Variable: PADominance

Density	(I) Music	(J) Music	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
						Lower Bound	Upper Bound
Low	Slow	Fast	-.063	.113	1.000	-.335	.209
		No music	-.044	.119	1.000	-.330	.241
	Fast	Slow	.063	.113	1.000	-.209	.335
		No music	.019	.117	1.000	-.261	.298
	No music	Slow	.044	.119	1.000	-.241	.330
		Fast	-.019	.117	1.000	-.298	.261
Medium	Slow	Fast	-.276*	.112	.042	-.544	-.007
		No music	.021	.116	1.000	-.257	.299
	Fast	Slow	.276*	.112	.042	.007	.544
		No music	.296*	.114	.030	.022	.571
	No music	Slow	-.021	.116	1.000	-.299	.257
		Fast	-.296*	.114	.030	-.571	-.022
High	Slow	Fast	-.059	.113	1.000	-.329	.211
		No music	.154	.114	.530	-.119	.428
	Fast	Slow	.059	.113	1.000	-.211	.329
		No music	.213	.114	.182	-.059	.486
	No music	Slow	-.154	.114	.530	-.428	.119
		Fast	-.213	.114	.182	-.486	.059

Based on estimated marginal means

*. The mean difference is significant at the

b. Adjustment for multiple comparisons: Bonferroni.

Appendix 16. Study 2

Tests of Between-Subjects Effects

Dependent Variable: Perceived_Crowding

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	237.400[a]	8	29.675	18.294	.000
Intercept	21106.490	1	21106.490	13012.018	.000
Density_Condition	193.822	2	96.911	59.745	.000
Music_Condition	33.839	2	16.920	10.431	.000
Density_Condition * Music_Condition	9.403	4	2.351	1.449	.216
Error	1372.277	846	1.622		
Total	22877.313	855			
Corrected Total	1609.677	854			

a. R Squared = .147 (Adjusted R Squared = .139)

Pairwise Comparisons

Dependent Variable: Perceived_Crowding

Density_Condition	(I) Music_Condition	(J) Music_Condition	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b] Lower Bound	Upper Bound
Low	Slow	Fast	.041	.188	1.000	-.410	.492
		No music	-.641[*]	.185	.002	-1.086	-.196
	Fast	Slow	-.041	.188	1.000	-.492	.410
		No music	-.682[*]	.190	.001	-1.139	-.225
	No music	Slow	.641[*]	.185	.002	.196	1.086
		Fast	.682[*]	.190	.001	.225	1.139
Medium	Slow	Fast	-.074	.181	1.000	-.509	.361
		No music	-.172	.181	1.000	-.606	.263
	Fast	Slow	.074	.181	1.000	-.361	.509
		No music	-.098	.181	1.000	-.533	.338
	No music	Slow	.172	.181	1.000	-.263	.606
		Fast	.098	.181	1.000	-.338	.533
High	Slow	Fast	.027	.188	1.000	-.423	.478
		No music	-.452[*]	.185	.045	-.897	-.007
	Fast	Slow	-.027	.188	1.000	-.478	.423
		No music	-.479[*]	.183	.027	-.919	-.039
	No music	Slow	.452[*]	.185	.045	.007	.897
		Fast	.479[*]	.183	.027	.039	.919

Based on estimated marginal means

*. The mean difference is significant at the

b. Adjustment for multiple comparisons: Bonferroni.

Appendix 17

Tests of Between-Subjects Effects

Dependent Variable: People_liking

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	92.211[a]	8	11.526	5.784	.000
Intercept	15177.717	1	15177.717	7616.345	.000
Density_Condition	55.008	2	27.504	13.802	.000
Music_Condition	8.793	2	4.397	2.206	.111
Density_Condition * Music_Condition	27.735	4	6.934	3.479	.008
Error	1685.894	846	1.993		
Total	16936.000	855			
Corrected Total	1778.105	854			

a. R Squared = .052 (Adjusted R Squared = .043)

Pairwise Comparisons

Dependent Variable: People_liking

Density_Condition	(I) Music_Condition	(J) Music_Condition	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b] Lower Bound	Upper Bound
Low	Slow	Fast	.187	.208	1.000	-.313	.687
		No music	.301	.205	.432	-.192	.793
	Fast	Slow	-.187	.208	1.000	-.687	.313
		No music	.113	.211	1.000	-.393	.620
	No music	Slow	-.301	.205	.432	-.793	.192
		Fast	-.113	.211	1.000	-.620	.393
Medium	Slow	Fast	.427	.201	.102	-.055	.910
		No music	.232	.201	.742	-.249	.714
	Fast	Slow	-.427	.201	.102	-.910	.055
		No music	-.195	.201	.997	-.678	.287
	No music	Slow	-.232	.201	.742	-.714	.249
		Fast	.195	.201	.997	-.287	.678
High	Slow	Fast	-.516*	.208	.040	-1.015	-.016
		No music	.154	.206	1.000	-.340	.647
	Fast	Slow	.516*	.208	.040	.016	1.015
		No music	.669*	.203	.003	.181	1.157
	No music	Slow	-.154	.206	1.000	-.647	.340
		Fast	-.669*	.203	.003	-1.157	-.181

Based on estimated marginal means

*. The mean difference is significant at the

b. Adjustment for multiple comparisons: Bonferroni.

Appendix 18

Tests of Between-Subjects Effects

Dependent Variable: APAV

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	124.021[a]	8	15.503	8.099	.000
Intercept	10816.192	1	10816.192	5650.685	.000
Density_Condition	75.276	2	37.638	19.663	.000
Music_Condition	43.883	2	21.941	11.463	.000
Density_Condition * Music_Condition	4.896	4	1.224	.639	.634
Error	1619.361	846	1.914		
Total	12508.633	855			
Corrected Total	1743.382	854			

a. R Squared = .071 (Adjusted R Squared = .062)

Pairwise Comparisons

Dependent Variable: APAV

Density_Condition	(I) Music_Condition	(J) Music_Condition	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
						Lower Bound	Upper Bound
Low	Slow	Fast	-.160	.204	1.000	-.650	.330
		No music	.327	.201	.315	-.156	.810
	Fast	Slow	.160	.204	1.000	-.330	.650
		No music	.486	.207	.057	-.010	.983
	No music	Slow	-.327	.201	.315	-.810	.156
		Fast	-.486	.207	.057	-.983	.010
Medium	Slow	Fast	.140	.197	1.000	-.333	.613
		No music	.475*	.197	.048	.003	.946
	Fast	Slow	-.140	.197	1.000	-.613	.333
		No music	.335	.197	.269	-.138	.808
	No music	Slow	-.475*	.197	.048	-.946	-.003
		Fast	-.335	.197	.269	-.808	.138
High	Slow	Fast	-.166	.204	1.000	-.656	.323
		No music	.534*	.202	.024	.051	1.018
	Fast	Slow	.166	.204	1.000	-.323	.656
		No music	.701*	.199	.001	.223	1.179
	No music	Slow	-.534*	.202	.024	-1.018	-.051
		Fast	-.701*	.199	.001	-1.179	-.223

Based on estimated marginal means

*. The mean difference is significant at the

b. Adjustment for multiple comparisons: Bonferroni.

Appendix 19

Tests of Between-Subjects Effects

Dependent Variable: PleasureAD

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	147.015[a]	8	18.377	9.540	.000
Intercept	10689.994	1	10689.994	5549.451	.000
Music_Condition	70.851	2	35.425	18.390	.000
Density_Condition	73.342	2	36.671	19.037	.000
Music_Condition * Density_Condition	2.744	4	.686	.356	.840
Error	1629.663	846	1.926		
Total	12416.750	855			
Corrected Total	1776.678	854			

a. R Squared = .083 (Adjusted R Squared = .074)

Pairwise Comparisons

Dependent Variable: PleasureAD

Density_Condition	(I) Music_Condition	(J) Music_Condition	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b] Lower Bound	Upper Bound
Low	Slow	Fast	-.128	.205	1.000	-.620	.364
		No music	.589*	.202	.011	.104	1.073
	Fast	Slow	.128	.205	1.000	-.364	.620
		No music	.717*	.208	.002	.219	1.215
	No music	Slow	-.589*	.202	.011	-1.073	-.104
		Fast	-.717*	.208	.002	-1.215	-.219
Medium	Slow	Fast	-.234	.198	.711	-.708	.240
		No music	.313	.197	.338	-.160	.786
	Fast	Slow	.234	.198	.711	-.240	.708
		No music	.547*	.198	.017	.073	1.022
	No music	Slow	-.313	.197	.338	-.786	.160
		Fast	-.547*	.198	.017	-1.022	-.073
High	Slow	Fast	-.247	.205	.683	-.738	.244
		No music	.546*	.202	.021	.061	1.031
	Fast	Slow	.247	.205	.683	-.244	.738
		No music	.793*	.200	.000	.314	1.273
	No music	Slow	-.546*	.202	.021	-1.031	-.061
		Fast	-.793*	.200	.000	-1.273	-.314

Based on estimated marginal means

*. The mean difference is significant at the

b. Adjustment for multiple comparisons: Bonferroni.

Appendix 20

Tests of Between-Subjects Effects

Dependent Variable: PArousalD

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	92.806[a]	8	11.601	13.699	.000
Intercept	15049.311	1	15049.311	17771.564	.000
Music_Condition	72.154	2	36.077	42.603	.000
Density_Condition	15.083	2	7.541	8.906	.000
Music_Condition * Density_Condition	4.672	4	1.168	1.379	.239
Error	716.409	846	.847		
Total	15849.444	855			
Corrected Total	809.215	854			

a. R Squared = .115 (Adjusted R Squared = .106)

Pairwise Comparisons

Dependent Variable: PArousalD

Density_Condition	(I) Music_Condition	(J) Music_Condition	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b] Lower Bound	Upper Bound
Low	Slow	Fast	-.721*	.136	.000	-1.047	-.395
		No music	-.023	.134	1.000	-.344	.298
	Fast	Slow	.721*	.136	.000	.395	1.047
		No music	.698*	.138	.000	.368	1.028
	No music	Slow	.023	.134	1.000	-.298	.344
		Fast	-.698*	.138	.000	-1.028	-.368
Medium	Slow	Fast	-.805*	.131	.000	-1.120	-.491
		No music	-.320*	.131	.044	-.634	-.006
	Fast	Slow	.805*	.131	.000	.491	1.120
		No music	.485*	.131	.001	.171	.800
	No music	Slow	.320*	.131	.044	.006	.634
		Fast	-.485*	.131	.001	-.800	-.171
High	Slow	Fast	-.485*	.136	.001	-.811	-.160
		No music	-.007	.134	1.000	-.328	.315
	Fast	Slow	.485*	.136	.001	.160	.811
		No music	.479*	.133	.001	.161	.796
	No music	Slow	.007	.134	1.000	-.315	.328
		Fast	-.479*	.133	.001	-.796	-.161

Based on estimated marginal means

*. The mean difference is significant at the

b. Adjustment for multiple comparisons: Bonferroni.

Appendix 21

Tests of Between-Subjects Effects

Dependent Variable: PADominance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	27.066[a]	8	3.383	4.355	.000
Intercept	13380.786	1	13380.786	17225.756	.000
Music_Condition	9.332	2	4.666	6.007	.003
Density_Condition	11.670	2	5.835	7.512	.001
Music_Condition * Density_Condition	6.754	4	1.689	2.174	.070
Error	657.164	846	.777		
Total	14065.875	855			
Corrected Total	684.230	854			

a. R Squared = .040 (Adjusted R Squared = .030)

Pairwise Comparisons

Dependent Variable: PADominance

Density_Condition	(I) Music_Condition	(J) Music_Condition	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b] Lower Bound	Upper Bound
Low	Slow	Fast	-.174	.130	.546	-.486	.138
		No music	.320*	.128	.038	.012	.628
	Fast	Slow	.174	.130	.546	-.138	.486
		No music	.494*	.132	.001	.178	.810
	No music	Slow	-.320*	.128	.038	-.628	-.012
		Fast	-.494*	.132	.001	-.810	-.178
Medium	Slow	Fast	-.204	.126	.315	-.505	.097
		No music	-.096	.125	1.000	-.396	.205
	Fast	Slow	.204	.126	.315	-.097	.505
		No music	.108	.126	1.000	-.193	.409
	No music	Slow	.096	.125	1.000	-.205	.396
		Fast	-.108	.126	1.000	-.409	.193
High	Slow	Fast	-.223	.130	.261	-.535	.089
		No music	-.104	.128	1.000	-.412	.204
	Fast	Slow	.223	.130	.261	-.089	.535
		No music	.119	.127	1.000	-.186	.423
	No music	Slow	.104	.128	1.000	-.204	.412
		Fast	-.119	.127	1.000	-.423	.186

Based on estimated marginal means

*. The mean difference is significant at the

b. Adjustment for multiple comparisons: Bonferroni.

Appendix 22. Study 3

Tests of Between-Subjects Effects

Dependent Variable: Crowding

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2172.732[a]	5	434.546	150.944	.000
Intercept	13254.748	1	13254.748	4604.158	.000
Density_Condition	2164.646	1	2164.646	751.910	.000
Music_Condition	3.921	2	1.961	.681	.506
Density_Condition * Music_Condition	1.685	2	.842	.293	.746
Error	2855.834	992	2.879		
Total	18181.000	998			
Corrected Total	5028.566	997			

a. R Squared = .432 (Adjusted R Squared = .429)

Pairwise Comparisons

Dependent Variable: Crowding

Density_Condition	(I) Music_Condition	(J) Music_Condition	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a] Lower Bound	Upper Bound
Low	Slow	Fast	-.059	.182	1.000	-.495	.378
		No music	-.043	.187	1.000	-.492	.406
	Fast	Slow	.059	.182	1.000	-.378	.495
		No music	.015	.186	1.000	-.431	.461
	No music	Slow	.043	.187	1.000	-.406	.492
		Fast	-.015	.186	1.000	-.461	.431
High	Slow	Fast	-.179	.184	.995	-.621	.263
		No music	-.245	.190	.591	-.701	.210
	Fast	Slow	.179	.184	.995	-.263	.621
		No music	-.066	.188	1.000	-.517	.384
	No music	Slow	.245	.190	.591	-.210	.701
		Fast	.066	.188	1.000	-.384	.517

Based on estimated marginal means
a. Adjustment for multiple comparisons: Bonferroni.

Appendix 23

Tests of Between-Subjects Effects

Dependent Variable: Liking people

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	44.370[a]	5	8.874	5.508	.000
Intercept	15723.015	1	15723.015	9759.321	.000
Density_Condition	39.846	1	39.846	24.733	.000
Music_Condition	2.817	2	1.408	.874	.418
Density_Condition * Music_Condition	2.616	2	1.308	.812	.444
Error	1598.188	992	1.611		
Total	17443.000	998			
Corrected Total	1642.558	997			

a. R Squared = .027 (Adjusted R Squared = .022)

Pairwise Comparisons

Dependent Variable: Liking people

Density_Condition	(I) Music_Condition	(J) Music_Condition	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a] Lower Bound	Upper Bound
Low	Slow	Fast	-.053	.136	1.000	-.379	.274
		No music	-.031	.140	1.000	-.367	.305
	Fast	Slow	.053	.136	1.000	-.274	.379
		No music	.022	.139	1.000	-.312	.355
	No music	Slow	.031	.140	1.000	-.305	.367
		Fast	-.022	.139	1.000	-.355	.312
High	Slow	Fast	-.044	.138	1.000	-.374	.287
		No music	.194	.142	.516	-.147	.535
	Fast	Slow	.044	.138	1.000	-.287	.374
		No music	.238	.140	.272	-.099	.575
	No music	Slow	-.194	.142	.516	-.535	.147
		Fast	-.238	.140	.272	-.575	.099

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

Appendix 24

Tests of Between-Subjects Effects

Dependent Variable: APAV

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	23.109[a]	5	4.622	12.599	.000
Intercept	11748.067	1	11748.067	32025.181	.000
Density_Condition	21.443	1	21.443	58.454	.000
Music_Condition	1.697	2	.848	2.312	.100
Density_Condition * Music_Condition	.046	2	.023	.062	.940
Error	363.904	992	.367		
Total	12138.204	998			
Corrected Total	387.012	997			

a. R Squared = .060 (Adjusted R Squared = .055)

Pairwise Comparisons

Dependent Variable: APAV

Density_Condition	(I) Music_Condition	(J) Music_Condition	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a] Lower Bound	Upper Bound
Low	Slow	Fast	.039	.065	1.000	-.117	.195
		No music	-.047	.067	1.000	-.207	.113
	Fast	Slow	-.039	.065	1.000	-.195	.117
		No music	-.086	.066	.587	-.245	.073
	No music	Slow	.047	.067	1.000	-.113	.207
		Fast	.086	.066	.587	-.073	.245
High	Slow	Fast	.041	.066	1.000	-.117	.199
		No music	-.075	.068	.807	-.238	.088
	Fast	Slow	-.041	.066	1.000	-.199	.117
		No music	-.116	.067	.251	-.277	.045
	No music	Slow	.075	.068	.807	-.088	.238
		Fast	.116	.067	.251	-.045	.277

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

Appendix 25

Tests of Between-Subjects Effects

Dependent Variable: PleasureAD

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	242.872[a]	5	48.574	28.573	.000
Intercept	16415.103	1	16415.103	9655.770	.000
Music_Condition	12.985	2	6.492	3.819	.022
Density_Condition	227.988	1	227.988	134.108	.000
Music_Condition * Density_Condition	3.898	2	1.949	1.146	.318
Error	1686.430	992	1.700		
Total	18477.139	998			
Corrected Total	1929.302	997			

a. R Squared = .126 (Adjusted R Squared = .121)

Pairwise Comparisons

Dependent Variable: PleasureAD

Density_Condition	(I) Music_Condition	(J) Music_Condition	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b] Lower Bound	Upper Bound
Low	Slow	Fast	.012	.140	1.000	-.323	.348
		No music	.163	.144	.774	-.182	.508
	Fast	Slow	-.012	.140	1.000	-.348	.323
		No music	.151	.143	.876	-.192	.493
	No music	Slow	-.163	.144	.774	-.508	.182
		Fast	-.151	.143	.876	-.493	.192
High	Slow	Fast	-.252	.142	.226	-.592	.088
		No music	.158	.146	.842	-.193	.508
	Fast	Slow	.252	.142	.226	-.088	.592
		No music	.410*	.144	.014	.064	.756
	No music	Slow	-.158	.146	.842	-.508	.193
		Fast	-.410*	.144	.014	-.756	-.064

Based on estimated marginal means

*. The mean difference is significant at the

b. Adjustment for multiple comparisons: Bonferroni.

Appendix 26

Tests of Between-Subjects Effects

Dependent Variable: PArousalD

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	17.005[a]	5	3.401	4.374	.001
Intercept	12911.336	1	12911.336	16604.380	.000
Music_Condition	10.597	2	5.298	6.814	.001
Density_Condition	2.366	1	2.366	3.042	.081
Music_Condition * Density_Condition	3.853	2	1.927	2.478	.084
Error	771.365	992	.778		
Total	13755.111	998			
Corrected Total	788.371	997			

a. R Squared = .022 (Adjusted R Squared = .017)

Pairwise Comparisons

Dependent Variable: PArousalD

Density_Condition	(I) Music_Condition	(J) Music_Condition	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b] Lower Bound	Upper Bound
Low	Slow	Fast	-.098	.095	.901	-.325	.129
		No music	-.024	.097	1.000	-.258	.209
	Fast	Slow	.098	.095	.901	-.129	.325
		No music	.074	.097	1.000	-.158	.306
	No music	Slow	.024	.097	1.000	-.209	.258
		Fast	-.074	.097	1.000	-.306	.158
High	Slow	Fast	-.340*	.096	.001	-.570	-.110
		No music	.011	.099	1.000	-.226	.248
	Fast	Slow	.340*	.096	.001	.110	.570
		No music	.351*	.098	.001	.117	.585
	No music	Slow	-.011	.099	1.000	-.248	.226
		Fast	-.351*	.098	.001	-.585	-.117

Based on estimated marginal means: *. The mean difference is significant at the
b. Adjustment for multiple comparisons: Bonferroni.

Appendix 27

Tests of Between-Subjects Effects

Dependent Variable: PADominance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	21.649[a]	5	4.330	7.603	.000
Intercept	17456.950	1	17456.950	30653.543	.000
Music_Condition	.485	2	.243	.426	.653
Density_Condition	18.878	1	18.878	33.149	.000
Music_Condition * Density_Condition	2.825	2	1.413	2.481	.084
Error	564.936	992	.569		
Total	18094.000	998			
Corrected Total	586.585	997			

a. R Squared = .037 (Adjusted R Squared = .032)

Pairwise Comparisons

Dependent Variable: PADominance

Density_Condition	(I) Music_Condition	(J) Music_Condition	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a] Lower Bound	Upper Bound
Low	Slow	Fast	.092	.081	.772	-.103	.286
		No music	-.072	.083	1.000	-.271	.128
	Fast	Slow	-.092	.081	.772	-.286	.103
		No music	-.163	.083	.145	-.362	.035
	No music	Slow	.072	.083	1.000	-.128	.271
		Fast	.163	.083	.145	-.035	.362
High	Slow	Fast	-.109	.082	.552	-.306	.088
		No music	-.031	.085	1.000	-.234	.172
	Fast	Slow	.109	.082	.552	-.088	.306
		No music	.078	.083	1.000	-.122	.278
	No music	Slow	.031	.085	1.000	-.172	.234
		Fast	-.078	.083	1.000	-.278	.122

Based on estimated marginal means: a. Adjustment for multiple comparisons: Bonferroni.

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Preliminary report

- The effect of music tempo on perceived crowding in retailing -

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Content

Summary

The influence of in-store atmospherics on consumers shopping behavior is widely accepted in the marketing field. We seek to understand the effects of in-store music tempo on perceived crowding and how music tempo can affect emotions, arousal and perceived control occurring in retail stores. Hence, our research question is:

How do arousal, positive and negative emotions, and perceived control mediate influence of music tempo on perceived crowding?

Perceived crowding is a subjective evaluation of the individual. ***Emotions (positive and negative)*** are regarded as a general state of arousal, which is analyzed through a cognitive appraisal process. ***Arousal*** is the reflection of increased activities of a sympathetic branch by physiological definition. ***Music tempo*** is the rate or speed at which rhythm progresses. ***Perceived control*** is a crucial mediating factor can determine one's own internal states and behavior. The main contribution of this research is to understand the influence of music tempo on perceived crowding and how this affects emotions. Three hypotheses are stated. The expected results from these are: (1) fast tempo music will increase arousal, (2.a) fast tempo music will decrease negative and (2.b) increase positive emotions, (3) fast music will increase perceived control.

The laboratory experiment is designed as a 3 (low-density: medium-density: high-density) x 3 (no music: slow music: fast music) randomized between-subject factorial design with ***perceived crowding*** as the dependent variable. Students will serve as participants.

1. Introduction

The influence of in-store atmospherics on consumers shopping behavior is widely accepted in the marketing field. The ambiance of retail stores has been recognized as an increasingly important element during the last three decades (Areni and Kim 1994; Baum and Valins 1977; Eroglu and Machleit 1990; Herrington 1996; Kotler 1973; Turley and Milliman 2000; Van Rompay et al. 2008). Nowadays, many marketers, who work with retail stores, consider the store atmosphere as a significant instrument to influence customer satisfaction, improving the overall shopping experience and use it as a communication tool between the company and customers (de Farias et al. 2014). They try to catch buyers attention, to make them spend more money, stay in the store longer, persuade them into unplanned purchases etc.

Many different factors are measured and examined, however, the phenomenon of social crowding gets a lot of attention in research on retail stores. The phenomenon is also studied in other spheres of our life, like public transport (Kim et al. 2015), sales (van Rompay et al. 2012), concerts and festivals (Hoon et al. 1997), mass social events (Hani and Drury 2014) and restaurants (Milliman 1986). The phenomenon of crowding consists of spatial and social crowding, in this research we will concentrate on non-hedonic settings where social crowding is the relevant part.

There also has been made a significant research effort on background music, especially in the retail and advertising industry, to cater target customers (Dube and Morin 1999). Background music has been studied as a major element to influence store environment, one of the dimensions of atmosphere, which has a significant impact on customer behavior since purchasers avoid unpleasant environments (Spangenberg and Henderson 1996). Moreover, various dimensions of music, for instance, music timbre, rhythm and music cognition have different effects on customer arousal, satisfaction and sales volume et al. However, in contrast to sufficient academic studies, limited real-life store context experiments have been conducted.

1.1 Research question

In this paper, we seek to understand the effects of in-store music tempo on perceived crowding and how music tempo can affect emotions, arousal and perceived control occurring in retail stores. In non-hedonic settings like grocery stores density usually causes negative, stressful feelings and lack of control (Frank Pons, Eroglu, and Machleit 1990; Grewal et al. 2003; Machleit et al. 1994; Michon et al. 2005). Previous studies have shown that music can influence arousal (Andersson et. al. 2012), a dimension of emotions, in such a way that it levels out negative emotions. Hence, our research question is:

How do arousal, positive and negative emotions, and perceived control mediate influence of music tempo on perceived crowding?

1.2 Dependent and explanatory variables

1.2.1 Dependent variable

Perceived crowding is a subjective evaluation of the individual usually accompanied by discomfort, aggression, and stress that arises from a situation of scarce space (Stokols 1972). According to stimulus overload theory, crowding is experienced when stimulation of the environment exceeds individual's capacity to process it (Desor 1972; Milgram 1970). This psychological state can occur as the result of physical, social, or personal factors that sensitize individuals to the potential constraint of limited space. According to Rapoport (1975), perceived crowding is a subjective experience of certain density levels.

1.2.2 Independent variables

Music tempo is the rate or speed at which rhythm progresses. Studies, illustrating a positive relationship between musical tempo and customer purchasing behavior, shows a U-shape of music preference and that the range of 70 to 110 BPM (Beats Per Minute) is the favored tempo (Dowling and Harwood 1986; Fraisse 1982; Holbrook and Anand 1988). Moreover, Berlyne claimed that quick tempo music is more arousing than slow tempo music and a pretest by Milliman (1986) proved that fast and slow music stimulate different levels of customers' arousal.

Arousal is the reflection of increased activities of a sympathetic branch by physiological definition (Damasio 1999). Several dimensions of music can influence customers' arousal, for instance, timbre, rhythm, and highly arousing music is considered to be fast tempo. More specifically, fast tempo music increases customers' arousal (Husain et al. 2002). In the process of purchasing, the tempo of background music affects customers' arousal since increased arousal will lead to a increased purchasing behavior (Smith &Cunow 1966). In addition, a large amount of evidence illustrates that customers prefer music with moderate arousal rather than high arousal (Yalch&Spangenberg 1990).

Emotions are regarded as a general state of arousal, which is analyzed through a cognitive appraisal process (Schachter and Singer 1962), thus music, as an atmospheric variable, plays an important role in influencing customers' emotions during the purchasing. Frijida (1993) also claimed that emotions are not only the reactions to appraisal, but the tendency of humans' actions. Therefore, customers' emotions can influence purchasing behaviors, which can increase sales volume customer satisfaction. In addition, ample evidence suggests emotions can be classified into negative and positive. ***Negative emotion*** expresses an intention to exclude and people would like to hold controls by themselves to avoid being harmed. While ***positive emotion*** expresses an attempt to involve and people would like to have more interaction with others (Schachter and Singer 1962). Both emotions can happen at the same time of feeling intruded and a loss of control or getting excited when customers are placed in a crowded area (Hui and Bateson 1991).

Perceived control is a crucial mediating factor (Van Rompay et al. 2008). "It is defined as the belief that one can determine one's own internal states and behavior, influence one's environment, and/or bring about desired outcomes." (Wallston et al. 1987). Previous studies have shown that the higher social density is the lower perceived control people experience over their social surrounding, because high social density contains an element of social interference and related perceptions that circumstances are more influenced by others (Hui and Bateson 1991; Machleit, Eroglu, and Mantel 2000; Van Rompay et al. 2008). Hence, social density affects the degree of social power customers experience, or the perceived control they feel. (Rucker, Galinsky, and Dubois 2012).

1.3 Contribution to the current state of research

The influence of music on emotions has been studied for several years. Different dimensions of music, such as music mode and context, affect customers` behavior differently through their emotions. The main contribution of the paper to the field of research is to investigate how music tempo can level out the negative effects of perceived crowding on emotions in-store. To our knowledge, this has not been investigated previously in this manner. This study complements the forthcoming field experiment conducted by Knöferle et al.

2. Theoretical background and previous research

2.1 Theories to explain the phenomenon of crowding and density

Crowding is a significant environmental factor in consumers' valuations of service experiences (Eroglu and Harrell 1986; Eroglu and Machleit 1990; Harrell et al. 1980; Machleit et al. 2000; Rollo et al. 2009). The majority of the abovementioned studies emphasize negative outcomes for customers elicited by crowded settings (Pons, Eroglu, and Machleit 1990; Grewal et al. 2003; Machleit et al. 1994). Previous research has shown that the level of in-store crowding perceived by customers can influence their decision-making process and outcome in addition to overall satisfaction with shopping activities (Eroglu and Machleit 1990). Generally, crowding is considered as an unpleasant experience in a shopping situation (Michon et al. 2005).

The cognitive overload of the dependent variable is associated with the **density**, where crowding is an outcome of the dysfunctionally dense environment (Stokols et al. 1973; Sundstrom 1975). Density is strictly related to the number of people and/or objects in space. Based on the definition of density, researchers distinguish between social density and spatial density. We use **density** in terms of social (human) density, which refers to a high number of individuals in a physical setting. And we do not take spatial density into consideration, which refers to the lack of space (Dion 2004; Pons et al. 2006). When the number of people in a limited space restricts or interferes with individuals' activities and goal achievement, the individual will perceive that the environment is crowded (Machleit, Eroglu, and Mantel 2000).

Limited personal space and reduced privacy usually associated with **high-density** settings, where individuals cannot move freely, hence, one’s freedom of movement is limited and the feeling of failure to own any territory occurs (Sinha and Nayyar 2000). Shoppers perceive retail crowding when density restricts individual’s goals and activities (Eroglu et al. 2005b). Consequently, crowding is inclined to trigger psychological anxiety on shoppers who experience a lack of personal space and a freedom restriction (Michon et al. 2005).

2.2 Theories to explain the phenomenon of music influence

Over the last two decades, a number of researches on effects of music on customers’ behavior in the retailing industry has witnessed a steady increase. Customers’ evaluations for the retailing industry are highly relevant to the extent of liking of atmosphere, such as background music (Bitner 1992), and one of the main domains where the effect of music explored is service environment (Herrington 1996).

Numerous articles suggest that background music can have a significant effect on sales, perceptions of and actual spent time in the shopping environment (Smith and Curnow 1966) and in-store traffic flow in the retailing store (Yalch and Spangenberg 1988, 1990, 1993). In addition, except those studies illustrating that background music can influence consumers in a non-behavioral way, such as moods and purchase intentions, product selection, shopping time and sales volume can be influenced by different kinds of background music (Chebat 1997).

When more researches looked deeper into the effect of music on customer behavior, Milliman (1982) demonstrated that music tempo affected the speed with which consumers moved around a store. He also revealed that the tempo of music can affect the time spent in restaurants, for instance, individuals spend less time when exposed to fast tempo music in contrast to slow tempo music. However, according to the study of Clare and Sally (1986), no significant evidence shows that music tempo can influence the time spent (actual and perceived time) and money spent comparing to the valid explanation of the relationship between music preference and behavior (time and money spent).

2.3 Theories to explain the phenomenon of emotions and arousal

Positive emotions, where optimistic feelings are leading emotions, improve the cognitive function. In contrast, negative states induce people to underestimate their ability and analytical thinking (Isen 2000).Amounts of articles verify music tempo has a significant influence on customers' emotions and Berlyne (1967) claimed an inverted U relationship between arousal and pleasure caused by the music tempo. The valence-arousal model is a well-grounded model that assesses and gives a specific description of emotions in music research as well. However, one notable limitation of the valence-arousal model is that music enables to convey mixed emotions, both sadness, and happiness, which is unclear and hard to measure (Eerola and Vuoskoski 2011). For example, fast music increases arousal and tension, music tempo is considered to influence both positive and negative emotions, such as surprise, happiness, fear and anger (Husain, Thompson, &Schellenberg 2002).

2.4 Theories to explain the phenomenon of perceived control

Control is usually recognized as an individual driving force and is defined as the necessity to express one's proficiency, dominance, and superiority over the environment (White 1959). In line with Averill (1973), the concept of control is operationalized in three different ways: cognitive, behavioral, and decisional controls.

Cognitive control is divided into predictability and cognitive reinterpretation of a situation. *Behavioral control* refers to the "availability of a response which may directly influence or modify the objective characteristics of an event" (Averill 1973, p. 293). And, *decisional control* means the "choice in the selection of outcomes or goal" (Averill 1973, p. 289).

Previous studies have shown that, when perceived control increases it begins to exert a significant, positive effect on individual psychological and physical prosperity, which includes task performance (Burger 1987), physiological responses (Szpiler and Epstein 1976), tolerance of pain and frustration (Sherrod et al. 1977), physiological well-being (Langer and Rodin 1977), and self-report of distress and anxiety (Staub, Tursky, and Schwartz 1971).

2.5 Hypotheses

The emotional visual stimuli differ from emotional sound stimuli because sounds are dynamic and involve different parameters that change with time. The specific experimental manipulations of these parameters, help to identify the sources of temporal distortions in response to these sounds. For example, musical pieces played in a major key at a fast tempo are judged happier than those played in a minor key at a slow tempo (Peretz et al., 1998; Fritz et al., 2009). Specifically, with the perception of time, the tempo affects the pace of the internal clock autonomously of emotional effects. However, the use of music provides a sophisticated technique of manipulating two dimensions while keeping a number of other parameters constant. The study by Droit-Volet et. al. (2013) focused on this issue by manipulating two different dimensions of arousal (tempo and timbre) as well as a parameter associated with emotional valence (backward vs. forward music). The results revealed that tempo variations are certainly associated with different subjective levels of arousal, with music played at a faster tempo being judged as more arousing in comparison to another one, that played at a slow tempo. Hence, our first hypothesis is:

H1: Fast tempo music increases arousal.

Researchers point out the critical and important role of music's emotional qualities, Juslin and Sloboda (2001) findings supported the outstanding power of music to influence listeners’ emotions. Following the Knöferle et al. (2012) research scenario and obtained results, hypothetically, we can plot two setups of how fast tempo music in the grocery store may affect the negative effects of perceived crowding: *Firstly*, fast music might reduce the negative emotions induced by crowding. Studies conducted during the last decade showed the consistency of emotional responses to music (Peretz et al., 1998;Bigand et al., 2005). Actually, a part of music in a major key that is evaluated as happy is usually associated with a fast tempo. *Secondly*, fast music might increase positive emotions in high-density level setups, when high emotional arousal matches with perceived crowding arousal. This was supported by Mattila&Wirtz (2001), where consumers’ self-reported satisfaction and behavioral intentions were increased when the levels of arousal in ambient music and smell were congruent. Hence, the third hypothesis is as follows:

H2:

a) Fast tempo music decreases negative emotions.

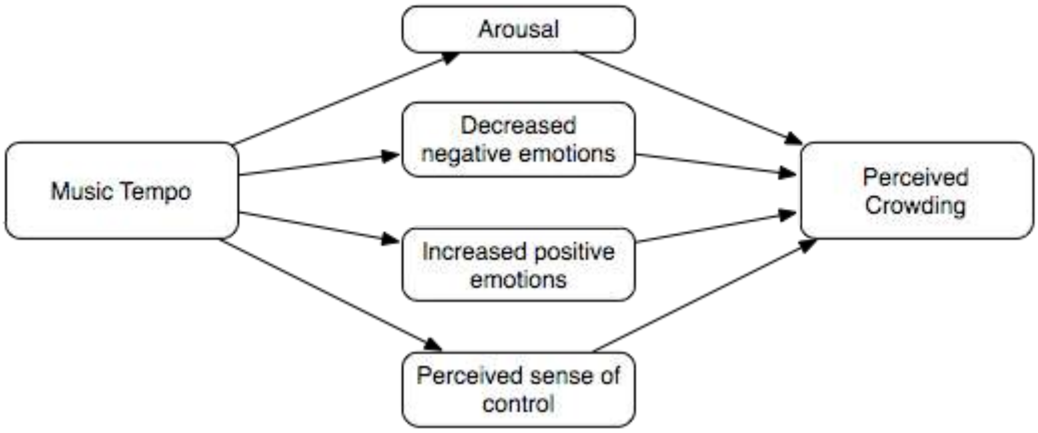
b) Fast tempo music increases positive emotions.

According to Drury R. Sherrod’s (1974) third proposition, if crowding produces negative aftereffects, they may be reduced by providing some means of perceived control over crowding. It is a direct extension of Glass and Singer’s study on noise and also takes into considerationLefcourt’s (1973) review of the perceived control positive effects in studies utilizingdiverse species, control devices, and aversive stimuli. Several discussions about crowding have suggested that perceived constraints on freedom contribute significantly to the effects of crowding. Additionally, Madzharov (2015) study has shown that warm ambient scent leads to power- compensatory customer preferences and purchase behavior, thus we would like to check in our study whether the music tempo can mitigate the negative aftereffects and increase the sense of perceived control as a scent does it in Madzharov’s (2015) experiment. Thus, our third hypothesis is:

H3: Fast music increases perceived control.

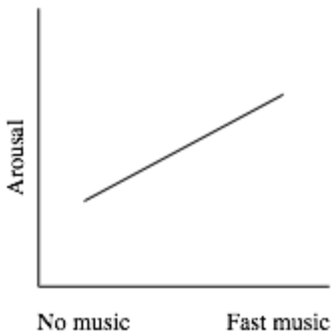
2.6 Theoretical framework

The theoretical framework displays the mediating effects of arousal, emotions, and perceived control between music tempo and perceived crowding.



Theoretical framework: *Showing the roles of variables and hypotheses in the research.*

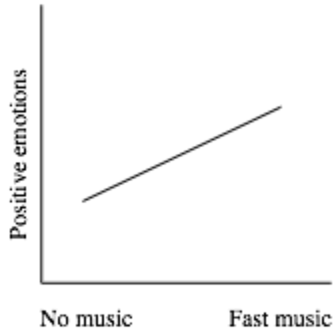
2.7 Graphs of expected results



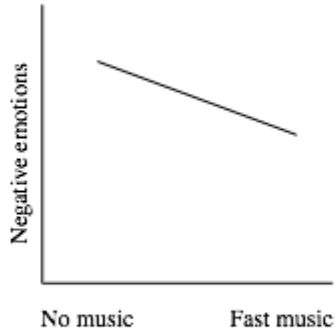
In this chapter, we will go through graphs illustrating our expected results of the research based on the literature review. According to the theory outlined above, we expect fast tempo music to positively affect arousal. Graph 1 shows the expected main effect we refer to in hypothesis 1.

Graph 1. Expected results for H1

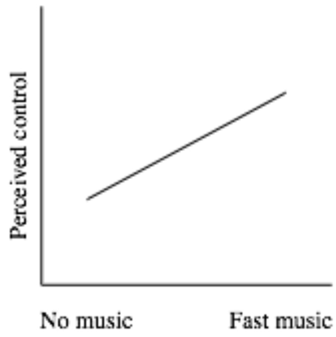
Hypothesis 2.a states that fast tempo music will increase positive emotions that an individual has. This is illustrated in graph 2 with participants having more positive emotions in the fast tempo music condition than no music condition. Additionally, Hypothesis 2.b states that fast tempo music will decrease the negative effects of perceived crowding. This is illustrated in graph 3 with participants having less negative emotions in the fast tempo music condition than no music condition.



Graph 2. Expected results for H2.a



Graph 3. Expected results for H2.b



Hypothesis 3 states that fast music increases perceived control. This expected result is shown in the graph 4, where participants feel more in control when the fast tempo music is played.

Graph 4. Expected results for H3

3. Method

In terms of methodology, this paper makes a contribution to the current state of research through using photos of real-life situations, making simulation easier for the participants, as opposed to what previous laboratory studies have done (O'Guinn, Tanner, and Maeng 2015). As we are doing a pretest to validate that the three levels of density are perceived as low, medium and high this will also be a contribution to the state of research as this validation have not been conducted previously (O'Guinn, Tanner, and Maeng 2015; Machleit, Eroglu, and Mantel 2000; Eroglu, Machleit, and Chebat 2005).

According to Hevner (1937) and Juslin (1997) tempo is seen as the most important feature of the modulating effect, hence, Gabrielsson and Lindström (2010) showed that tempo may affect a specter of emotions: from positive (surprise, happiness) to negative (anger, fear). However, according to the phenomenon illustrated by Kaltcheva and Weitz (2006) about the task oriented businesswomen who has a motivational orientation to fulfill her plan of gift purchasing. Since this activity is not completely satisfying, she will try to perform it as efficient as possible. And any kind of high-arousal ambient stimuli (bright light, loud music, screens with animation) will be unpleasant, due to the requirement of extra energy for completing the shopping task. By choosing a laboratory experiment, we confront the challenge of fast music possibly increasing negative emotions under stressful conditions. This is tackled through people participating in the experiment being informed about and accepting the time it will take to conduct the experiment.

3.1 Design

We will conduct a laboratory experiment where participants are exposed to pictures of a grocery store aisle with low density (See appendix 1.1), medium density (See appendix 1.2) and high density (See appendix 1.3). The pictures will be pretested to control for which level of density they are perceived to display. There will also be conducted a pretest to control for perceived tempo of the music. There will be different participants in the pretests and the experiment. For the experiment, we will use a between-subjects design with three groups. The control group will have no music playing while rating perceived crowding of the photos while the manipulation group will have slow and fast music playing while rating.

A limitation by doing a laboratory experiment as opposed to a field-study is that the ecological validity gets lower. However, by doing a laboratory experiment, we can to a larger degree have control of our manipulations. The experiment is a 3 (low-density: medium-density: high-density) x 3 (no music: slow music: fast music) randomized between-subjects factorial design with ***perceived crowding*** as the dependent variable.

3.2 Participants

As participants, we will recruit students. The sample will consist of 150 people. The pros of our recruitment method are that it is convenient, a large sample can be effectively recruited and that we get to research people moving into a high-consuming phase of their lives. The con is that a sample of students will not allow us to generalize the findings to other groups of society.

3.3 Procedure

Recruitment of participants will happen through emailing students asking them to participate in our study. There will be promised a reward of 100 NOK for participating in the experiment. This reward will be financed through sponsorship by BI Norwegian Business School (Marketing Department). Students who sign up for the experiment will be randomly assigned to the three groups (no music: slow music: fast music) through plotting them into Microsoft Excel and applying the random number generator.

In the experiment, participants will be taken to a computer laboratory where they will be seated at a computer with headphones on their ears. The earphones are attached to enable us to play music for the manipulation group, while they are attached to participants in the control group in order to make sure that music is the only manipulated variable, and not whether one have earphones attached to the ears or not. First participants will receive information on-screen about the project stating that we are investigating crowdedness in Norwegian retail stores. In the information part, it will be stated that we are interested in the participant's subjective opinion and that there are no right or wrong answers. The participant's anonymity will be underlined. First, participants will be asked to rate their emotions on the Positive and Negative Affect Schedule (PANAS). Then the experimental group will have slow or fast music coming from the earphones, while the control group will not. All groups will be exposed to pictures of an aisle with low, medium and high density and asked to rate how crowded they perceive the pictures to be. The rating of perceived crowding will be done on a seven-point Likert scale from 0 to 6. Then the music will stop and the rating of Locus of control will be counted. There will also be asked a question to rate how they perceived the tempo of the music on a Likert scale from 0 to 6. Next participants will be asked to rate their emotions again on the PANAS. This is done to control and measure the change and directions of the arousal and emotions they experienced during the experiment.

In the last section, participants will be asked to state their gender, age, country of origin, income, and whether they have any extracurricular activities, and if they do how much time do they spend on it. This information is necessary for the study to be able to assess the spreading of our sample and differences in our dependent variable being explained by demographic factors. In the end, participants will be thanked for their participation and be told to go to the contact person in the laboratory to receive their reward.

3.4 Measurement of independent variables and pretests

The experiment has five independent variables. These are music tempo, positive emotions, negative emotions, arousal, and perceived control. Two pretests will be conducted. *The first pretest* is conducted to make sure that the three pictures used in the experiment display low, medium and high density. We have a number of pictures with one to six people in a small store aisle. These pictures are taken in a Norwegian retail store. All these pictures will be pretested in a laboratory setting with no music asking participants how crowded they perceive the different pictures to be. The pretest is done on the online web-base. See appendix 1 to assess the three pictures which we believe will satisfy the conditions of low-density, medium-density, and high-density. However, when the research is to be conducted the pictures may be changed according to the findings of the pretest. The recruitment of participants to the pretests will be conducted in the same manner as for the experiment, additionally, the link to the survey will be published in the student society group on Facebook, so that it will become more accessible.

In the music condition, we will use the classical music piece: Brandenburg Concerto No. 3 in G Major. Classical music is chosen due to it not containing any words which can bias the process. Brandenburg Concerto No. 3 in G Major has 143 Beats Per Minute (BPM) something which is consistent with what Balch and Lewis (1996) and Oakes (2003) classified as fast tempo of music. Milliman (1982) defined slow music is less than 72 BPM and Brandenburg Concerto No. 3 in G Major will also be changed into a slow version with 60 BPM. Choosing a non-modern, non-pop song increases the likelihood of participants having equal familiarity to the song. *The second pretest* is conducted to ensure that people perceive the selected song as fast. It will simply include an online survey asking people to listen to the song and then rate how fast they perceive it to be on a seven-point scale. If the song is not perceived as fast or slow enough, we will revise the choice of song.

When measuring our independent variables, positive emotions, negative emotions, and arousal, we will use the Positive and Negative Affect Schedule (PANAS) (Watson D., Clark L.A., and Tellegen A., 1988) which includes 20 emotion words (items) (Watson D. and Clark L.A. 1999) to analyze whether there is any change in positive or negative emotions. PANAS will be used in the beginning and the end of the experiment. It functions by people rating how they feel at the specific point of time on the five-point scale (figure 1).

To measure perceived control, Locus of control (LOC) will be tested, which is an important construct in the area of personality (Rotter 1990). It is a generalized expectancy pertaining to the relationship between the personality and experienced outcomes. When individual perceive that the event is contingent upon his or her own behaviors, it is believed as internal control. In contrast, if the person perceive as the result of chance, luck or fate, it is a belief in external control (Lefcourt, Von Baeyer, Ware, & Cox, 1979). We will use LOC after showing picture to participants and higher grade indicates more external control.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

______ cheerful	______ sad	______ active	______ angry at self
______ disgusted	______ calm	______ guilty	______ enthusiastic
______ attentive	______ afraid	______ joyful	______ downhearted
______ bashful	______ tired	______ nervous	______ sheepish
______ sluggish	______ amazed	______ lonely	______ distressed
______ daring	______ shaky	______ sleepy	______ blameworthy
______ surprised	______ happy	______ excited	______ determined
______ strong	______ timid	______ hostile	______ frightened
______ scornful	______ alone	______ proud	______ astonished
______ relaxed	______ alert	______ jittery	______ interested
______ irritable	______ upset	______ lively	______ loathing
______ delighted	______ angry	______ ashamed	______ confident
______ inspired	______ bold	______ at ease	______ energetic
______ fearless	______ blue	______ scared	______ concentrating
______ disgusted	______ shy	______ drowsy	______ dissatisfied with self

Figure 1: *Positive and Negative Affect Schedule*

3.5 Measurement of dependent variable

To measure perceived crowding, we will use the Likert scale validated by Machleit, Kellaris, and Eroglu (1994) and later used by Machleit, Eroglu, and Mantel (2000). The scale includes the two dimensions of perceived crowding: Human crowding and spatial crowding. We will only investigate human crowding in our research which is measured through the participant's rating of the following items: "The store seems very crowded to me", "the store is a little busy", "there is not much traffic in the store" and "there are a lot of shoppers in the store."

3.6 Manipulation checks

In order to check our manipulation of the music, we ask participants in the manipulated group how they perceived the tempo of the music. Participants will be asked to rate the tempo of the music on a seven-point scale (1-7) from slow to fast. This is done to control if the slow or fast tempo music actually is perceived as slow or fast tempo music. There is no natural point of zero on music tempo, therefore, we start the scale at 1. This is done in addition to the pretest to check if the manipulation actually worked as it should during the experiment.

To control the density levels, we will ask in the pre-test how participants perceive stimulus material (different photos will be shown with different amount of people).

Previous studies have shown that participants in high-density conditions reported the space to be substantially more crowded, than those in low-density conditions did (O'Guinn et al. 2015). However, this study represents only two states (low/high) of density. We want to prove it additionally for the medium-density level.

3.7 Statistical analyses

For statistical analyses, we will run an ANOVA in SPSS. The ANOVA will be used to test if the mean difference on perceived crowding between the no music, slow music and fast music groups is statistically significant. This will enable us to detect a possible main effect between music and perceived crowding. A Cronbach`s alpha test will be conducted to control for the reliability of answers on perceived crowding. We will run an OLS regression analysis to account for the effects of the independent variables on the dependent variable. The regression analysis will also be used to investigate the effect of music tempo on perceived crowding, where mediating variables will explain its nature.

$$Perceived\ crowding = \beta_0 + \beta_1 {*} Tempo + \beta_2 {*} Arousal + \beta_3 {*} Negative + \beta_4 {*} Positive + \beta_5 {*} Control$$

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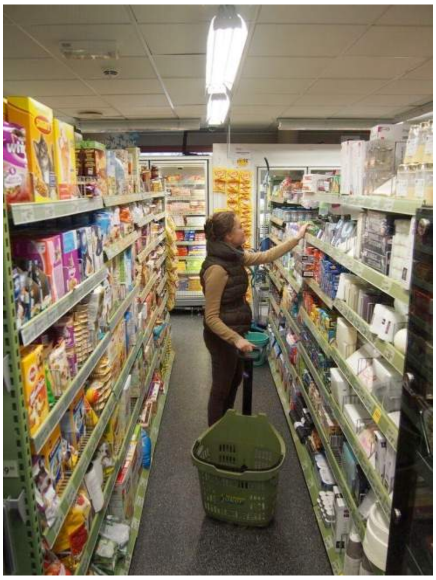
Appendix

Appendix 1: Pretest photos



Appendix 1.1: Low density level

Appendix 1.2: Medium density level

Appendix 1.3: High density level