Musical Accompaniment as a Factor of Psychological Effectiveness of Advertising

Natalia V. Antonova and Vladislav Gorbov

Abstract The purpose is to investigate the influence of three components of the musical accompaniment of advertising (dynamic range (DR), volume, and tempo) on its psychological effectiveness. The psychological effectiveness of advertising is understood according to the AIDA model. The study involved 296 people aged 17–40 years. An intergroup experimental study was conducted. Respondents were shown the advertising, in which the parameters of musical accompaniment were varied: dynamic range of musical accompaniment, volume level, and tempo. To measure the level of psychological effectiveness of advertising, a questionnaire was elaborated. The data were analyzed using ANCOVA covariance analysis and Mann–Whitney U test. The results showed the following relationships: (1) there is an influence of DR on the overall effectiveness of advertising, attention and interest, as well as the desire to purchase advertised goods; (2) there were no influence of volume on attention, but the effect of volume on the emotions was observed, as well as the combined effect of volume and dynamic range; (3) the hypothesis about the influence of the music tempo on the effectiveness of the advertising effect was partially confirmed: the rate only exerts its influence together with other factors; (4) the assumed influence of the side variables (familiar musical composition and familiar advertising) on the indicators of the effectiveness of advertising turned out to be significant. Results can be used in the development of promotional products.

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M.-T. Leung and L.-M. Tan (eds.), *Applied Psychology Readings*,
https://doi.org/10.1007/978-981-10-8034-0_1

Keywords Advertising · Psychological effectiveness of advertising
Musical accompaniment of advertising · Dynamic range (DR) · Loudness
Volume · Tempo

1 Introduction

Advertising was originally created in order to increase sales of any products. The music accompaniment in advertising videos undoubtedly has a powerful impact on people's mental processes, because the information that is delivered through music is perceived affectively, and not critically. Accordingly, music can increase the effectiveness of advertising.

Despite the importance of musical choice in advertising, the research in this area is not sufficiently developed and sometimes contradictory:

- There are contradictions between the research data on the loudness of music in the 1960s, in modern research and objective reality. The influence of the loudness of compositions on the effectiveness of advertising has not been studied in psychology.
- In psychological studies, only the concept of "loudness of music" was used, but this phenomenon can be interpreted in more than 20 different definitions.
- The impact of the tempo of music on cognitive processes is a poorly studied area in the context of both consumer behavior and advertising impact. It is only known that tempo affects the behavioral reactions and the speed of the memory processes.

Mainly, investigations are focused on the influence of the presence or absence of music in advertising on the effectiveness of the advertising, as well as the influence of some specific components of the music (tempo, timbre, loudness, tonality, and genre) on consumer behavior. Some investigations are devoted to the influence of advertising in general (without a musical aspect) on mental processes. Therefore, it is necessary to systematize the data of existing psychological and marketing research on these issues and conduct further empirical verification.

1.1 Psychological Effectiveness of Advertising and Its Measurement

Psychological effectiveness of advertising is determined by the degree of influence on the mental processes of consumers. This type of effectiveness is characterized by the number of consumers involved, the degree of attraction of their attention, as well as the depth of impression that remains in the memory of recipients of advertising.

According to Lebedev, "psychologically effective advertising provides the consumer the opportunity to become an advertiser himself, to use the acquired goods in order to socially stand out, to attract attention, to get approval from others, to have a high social evaluation, to preserve and thereby maintain a sense of personal dignity" (Lebedev-Lubimov, 2002, p. 20).

To analyze the psychological effectiveness of the advertising impact, an attitudes model is usually used that includes the following components:

- the cognitive component: the impact on cognitive processes, including the formation of knowledge about the product, memorizing the product, understanding its advantages;
- the affective component: the impact on the emotional sphere, the excitation of positive emotions, and attracting to the product;
- the behavioral component: the desire to buy the product and purchase; it is related to the actualization of the relevant motives and needs; in connection with this, the motivational component (Kupreychenko, 2008) is often additionally identified.

When advertising is created, cognitive, affective, and behavioral components must be harmonized and balanced to ensure that advertising is effective. For example, if advertising is overloaded with information about the product, it can cause both cognitive and emotional oversaturation in the recipient. If advertising causes too strong emotions, then it negatively affects the consumer's behavior, as he will not have the desire to purchase goods. Suggestive component should not be explicit in advertising. Thus, when creating an effective advertising, it is necessary to take into account all the components and their consistency among themselves, as well as to what mental processes are affected by this advertisement.

In assessing the psychological effectiveness of advertising exposure, different scales and models are used. One of the most popular models of advertising impact is the AIDA (AIMDA) model, in which the impact of advertising is understood as a consistent impact on the cognitive and motivational processes of the individual: attracting attention (A), generating interest (I), arousing desire (D) based on actualization, a certain motivation (M), and finally, the action caused by this desire—purchase (A). On the basis of this model, various scales for assessing psychological effectiveness (5-rank and 6-rank scale) have been developed, but they are intended primarily for marketing research purposes and do not allow to conduct psychological analysis of effectiveness.

1.2 Music and Psychological Effectiveness of Advertising

Effective advertising should be able to attract consumer's attention, and then keep it. Music plays a significant role in this process, as it is able to distinguish the advertised product from a number of competing ones. The impact of music on

emotions has also been studied by researchers. Zajonc (1968) was proved that people like any object more if they have seen it before. People usually tend to interpret this phenomenon with those positive qualities that they endowed with the object. This effect was called the "familiarity effect" (or the Zajonc effect). The Zajonc effect is also observed in music: a person experiences positive emotions if he/she hears a song that he/she has already heard. In addition, when a person hears familiar music, the parts of the brain that are responsible for emotions become more active, regardless of whether they like it or not (Pereira et al., 2011).

However, not only the Zajonc effect affects the emotions caused by music. The emotional impact of music is also achieved through the repeatability of its components. Diana Deutsch in 1995 opened a phenomenon called "Speech-to-song effect." Its meaning lies in the fact that with repeated looping repetition of any part of the text by a speaker, a person begins to perceive speech as singing. This is due to the fact that when repeating the same passage of text a person begins to pay attention not to the meaning of what was said, but to the rhythm and height of the tone of words (Deutsch, Lapidis, & Henthorn, 2008). The so-called semantic saturation effect is similar, when a word repeated many times loses its meaning. Thus, listening to repeating fragments in a song, a person pays attention to the nuances and expressive elements of music.

Further studies have shown that music without repetition is perceived by people worse. Elizabeth Margulis in her study invited students without musical education to listen to the excerpts of composers, notable for the lack of repeating elements in their compositions: Luciano Berio and Elliott Carter. One group of subjects reproduced the original passages and the other group changed, with repeated fragments. The results of this experiment showed that the subjects preferred the fragments with repeating elements; in addition, respondents who listened to the original passages perceived them as unnatural (Margulis, 2013).

The influence of music on memory can be enormous. In the last twenty years, a phenomenon known to many people as the "earworm (brainworm) phenomenon" has become known. It consists in the fact that, regardless of the genre, the song, melody or piece of music, that was recently listened to by a person (willingly or unwillingly) is repeated again and again. It seems to the person that the song is "stuck in the head."

The first to consider the "earworm phenomenon" was the American psychologist James Jay Kellaris. In 2001, he introduced the concept of "cognitive itching," comparing it with the sensation that a person experiences when his skin itches. According to the researcher, itchy skin can motivate a person to scratch and relieve discomfort, but causing a cycle of repeated scratching. In the same way, the only way to eliminate "cognitive itching" is a mental repeating of a stuck melody that only exacerbates the situation by launching a cycle of involuntary repeat of the melody (Kellaris, 2003, p. 66). This process is responsible for the auditory zone of the cerebral cortex, which is activated when listening to music and is reactivated when a person represents in his head the sound of just heard music (Kellaris, 2001, 2003).

Further studies of the effect of music on memory have shown that the brain tends to fill in missing information when a piece of familiar music abruptly and suddenly interrupts. This fact was studied in the experiment of scientists from Dartmouth College. At the moment when the researchers interrupted a familiar song for the respondents, the MRI scanner registered how the auditory zone of the brain continued to "sing along" the missing fragment of the song. If the musical composition was unfamiliar to listeners, this phenomenon was not observed (Kraemer, Macrae, Green, & Kelly, 2005).

Thus, though the "Earworm phenomenon" is currently not sufficiently explored, we see that music can have a powerful effect on human memory. This fact is used by advertising specialists who insert in the TV or radio advertising simple melodies that can cause this phenomenon in the audience. Thus, the memorability of the advertised products increases, and communication between consumers is enhanced, which provides the transmission of a "stuck" song and of an advertising message as well. Also, positive associations with the product are strengthened, and consequently, loyalty to the advertised product is ensured.

Over the past half-century, numerous studies of the influence of music on consumers have been conducted. A classic study in this field is the study of Gerald Horn, conducted in 1982. The researcher studied the influence of background music on the psychological effectiveness of advertising. He found that pleasant and unpleasant background music, which sounds in the commercial, is associated with the advertised product. It was revealed that the product, which is advertised accompanied by unpleasant music, is perceived by consumers as unnecessary and undesirable (Gorn, 1982).

Since the impact on consumer behavior and advertising impact have similar mechanisms, we will review existing research on the influence of specific music components on consumer behavior and advertising impact.

1.3 Loudness of Music

The influence of the loudness of music on purchasing power was studied by scientists from the sixties of the twentieth century. In 1966, Smith and Curnow experimentally revealed the fact that under the influence of loud music playing in the store, buyers were inclined to spend less time choosing a product than under the influence of quiet music. Despite this fact, the decrease in sales of this store did not follow (Smith, & Curnow, 1966).

There is a very interesting phenomenon observed in the music industry as a "loudness war," which affects indirectly both consumer behavior and advertising. The essence of this phenomenon, observed in broadcasting and in digital editions of albums (on CDs, on DVDs and sold on the Internet), is that musicians, producers and record companies tend to increase the volume of their compositions to make the sound louder, than competitors have.

The history of the "war of loudnesses" dates back to the 1960s, when it was revealed that louder music attracted more attention from the audience. From an evolutionary point of view, this can be explained by the fact that louder sounds always received increased attention in order to survive. As a result, music producers have decided to add volume to the released compositions in order to increase competitiveness. However, at that time, the music was produced on vinyl records, which, due to technical features, did not allow increasing the volume of compositions. Later, with the invention of CDs, producers and record companies were able to significantly increase the volume of produced music (Vickers, 2010).The psychological effects of the "war of loudness" have not yet been investigated.

1.4 Genre of Music

A number of studies on consumer behavior have shown a link between the music genre and the decision to purchase. A study of Areni and Kim, conducted in 1993 in a wine shop, showed that when a classical music was playing in the hall, there was a general increase in consumer activity, compared to the period when pop music ("top 40") was playing. It is interesting that under the given conditions, neither the time spent by shoppers in the store nor the sales volume increased, that is, classical music influenced only the decision of consumers to buy more expensive wines (Areni, & Kim, 1993). The results of this study confirm the ideas of McInnis, who argued that conviction is reinforced when the genre of music suits the context in which it plays (MacInnis, & Park, 1991), and the results of Yalch's study, according to which classical music is associated with more expensive goods (Yalch, & Spagenberg, 1990).

1.5 Music Tempo

In 1982, Ronald Milliman explored the impact of the tempo of music on shoppers' behavior in stores. According to the results of this study, the different rate of music played through hands-free communication in the store affects the speed of movement of buyers and the number of purchases made by them. That is, at a slow tempo of music, buyers in the store moved slower, they chose the product significantly longer, buying more units of goods, while when the music was at a rapid tempo, there was a reverse situation (Milliman, 1982).

In 2006, Steve Oakes and Adrian North studied the impact of the tempo and timbre of background music in radio advertising on the affective response of listeners. Two different experiments were conducted, one of which studied the influence of the tempo and the other on the timbre of the background music of radio advertising on the affective response of listeners. According to the results of the first experiment, the use of music at a slow tempo significantly increased the

memorability of the content of the commercial by respondents, in comparison with fast music. The presence of music (both at a fast and at a slow tempo) significantly reduces the level of remembering the content of advertising. According to the results of the second experiment, there is a significant positive relationship between the congruence of the timbre of music with the memorability of the content of advertising and the affective response to it (Oakes, & North, 2006).

1.6 Popularity of Music

Popular music is "all favorite" music for "ordinary people," which has a wide impact and attractiveness, but usually for a certain period of time (Shuker, 1994).

David Allan in 2006 explored the influence of popular music in advertising on the processing of advertising messages. He conducted the experiment on 111 respondents, aged from 18 to 24 years, who were divided into four groups. In the control group, the respondents did not listen to music, and in the experimental groups, the song that sounded in the advertisement was either with the original text, or with a modified text, or instrumental (without text). The study selected four songs from "top 40" and four popular brands (Kodak, Ikea, Heinz, and Sony). Further, the questionnaire measured the attention caused by the advertising message and the memorability of the advertised brand. The results of this study showed that songs in which vocals are present, original or modified, are more effective incentives for advertising impact on attention and memory than instrumental songs or total absence of music. It is worth noting that the original text affects the listener better than the changed text (Allan, 2006).

In turn, Michelle Roehm considered the influence of the version of the popular song (instrumental or with the original vocal) on memorability of the advertisement, with the introduction of such parameter as "acquaintance of the song" for the person. As a result of the research, it was concluded that if a person is familiar with the song, then the instrumental version is more conducive to memorizing the advertisement than the version with the original vocal. Conversely, for people who are not familiar with the song, the more effective for remembering advertising is the original version, not the instrumental one. The author explains this result by the fact that a person familiar with the song, when hearing the instrumental version of it, is inclined to sing along with it and thereby to generate texts that carry an advertising message. And "singing" the text of a well-known song promotes the memorability of the content of the advertisement, in contrast to listening to the song with the original text. At the same time, a person who is not familiar with the song cannot generate the text in his imagination, so he needs a version with vocals to memorize the content of the alleged advertising message (Roehm, 2001).

So, summing up all of the above, we can conclude that the musical accompaniment does influence the effectiveness of the advertising impact. However, research focuses on individual parameters of music accompaniment, such as tempo, genre, and loudness, but not on the impact of different parameters in their

combination. The influence of the dynamic range on the effectiveness of advertising is almost not investigated. Based on the theoretical analysis, we have chosen for our study the following parameters of the musical accompaniment: dynamic range, volume, and tempo.

2 Methodology

The purpose is to investigate the influence of three components of the musical accompaniment of advertising (dynamic range (DR), volume, and tempo) on psychological effectiveness of advertising. The psychological effectiveness of advertising is understood according to the AIDA model: the effectiveness of attracting attention, the interest caused by advertising, the memorability of both the clip itself and the advertised product, the power of emotions after viewing, and the willingness to purchase the advertised product.

Hypotheses:

(1) Advertising with musical accompaniment having high dynamic range is more effective in all components than advertising, which uses music with a low dynamic range.
(2) The higher the volume of the musical composition in the advertising is, the higher is the effectiveness of the advertising impact in terms of "attracting attention" and "emotions."
(3) The higher the tempo of the musical composition is, the higher is the effectiveness of the advertising impact on the indicators "attracting attention," "interest," and "the power of emotions."
(4) Additional hypothesis: the side variables, such as preliminary knowledge of the musical composition and of the advertising itself, increase the psychological effectiveness of the advertising.

Sample: The study involved 296 people aged 17–40 years (mean age 19.7 years, standard deviation = 2.9). All subjects were randomly assigned into 12 experimental groups.

Methods: An intergroup experimental study was conducted. Respondents were shown the advertising, in which the parameters of musical accompaniment were varied: dynamic range of musical accompaniment, volume level, and tempo. To measure the level of psychological effectiveness of advertising, a questionnaire was elaborated.

Data analysis: ANCOVA covariance analysis, Mann–Whitney U test.

The investigation included the following stages:

1. Preparation of demonstration material. As a demonstration material, a promotional video for the men's perfume Dior Homme Fragrance was selected, featuring the famous actor Robert Pattinson, directed by Romain Gavras in 2013. In the original commercial, the song by Led Zeppelin "Whole Lotta Love,"

released in 1969, was used. To reduce the influence of the side variables, instead of extracting the sound track from the video clip, the digital copies of the composition in the original edition of 1969 and in the 2007 edition differing only in the "dynamic range" parameter were found. Then, using the "TT DR Offline Meter 1.1" program, the dynamic range of both copies of the songs was measured. The 2007 version was expected to be "louder" than the 1969 version (less dynamic): the dynamic range was DR8 and DR11, respectively. However, in order to reflect the current musical trends of a too narrow dynamic range, it was necessary to further narrow the dynamic range of the 2007 version. As a "reference," digital CD-copies of a number of tracks were selected, which were similar to the given in terms of genre and mood (with DR3–DR6). As a result, by compressing and limiting the audio track using FL Studio 12 digital sound workstation, this composition was approximated by the characteristics of the dynamic range to the reference ones. The dynamic range of the "loud version" of the composition for the commercial was DR4.

Further, two versions of the song by Led Zeppelin "Whole Lotta Love" with DR11 and DR4 bands varied in volume with the help of FL Studio 12. The volume of the composition with a narrow dynamic range was adjusted based on the decibel meter's "peaks" of the composition with a wide dynamic range. This procedure was carried out in order to reach the effect when subjectively to the listener, at the loudest moments of the song, both versions sounded equally loud. As a result, the volume of the composition with the DR4 band was reduced by 25%, and then, the version with the DR11 range was lowered by 25%. It turned out four versions of the same composition:

- Loud, low dynamic (range DR4, volume 100%)
- Quiet, low dynamic (range DR4, volume 75%)
- Loud, highly dynamic (range DR11, volume 100%)
- Quiet, highly dynamic (range DR11, volume 75%).

Subjectively for the listener, the first version is very loud throughout the composition; the second is quieter than the first and equally loud throughout the composition; the third is quiet in the intro, louder to the chorus; and the fourth is the quietest.

Next, using the tempo change tools in the FL Studio 12 program, the data for the four versions varied in tempo. The tone, volume, and dynamic range of all versions were preserved. As a result, all versions were accelerated by 5% and slowed by 5%. As a result, the same composition was presented in 12 variations (see Table 1).

Next, the audio tracks were superimposed on the commercial video using Sony Vegas Pro 13 software. As a result, 12 types of commercials were compiled for the pilot study.

2. Developing a questionnaire for assessing the psychological effectiveness of advertising. This technique is based on a seven-point six-rank scale measuring the effectiveness of advertising: attention, interest, memorability of the

Table 1 Experimental groups

No. of group	DR	Volume (%)	Tempo (%)
1	DR4	100	100
2	DR4	75	100
3	DR11	100	100
4	DR11	75	100
5	DR4	100	95
6	DR4	75	95
7	DR11	100	95
8	DR11	75	95
9	DR4	100	105
10	DR4	75	105
11	DR11	100	105
12	DR11	75	105

commercial, memorability of its content (advertised goods), emotional attitude to advertising, and the desire to buy the advertised product. Respondents are encouraged to answer questions that measure these video clip indicators by placing their response on a scale of −3 to +3.

3. Carrying out a pilot survey and an expert interview.
4. Carrying out the basic research. The entire sample was divided into 12 experimental groups. Immediately before the experimental test, the researcher read out the instructions for the test subjects. Further, depending on the group, the subjects were presented with one of 12 videos on the screen. Variations of music in the commercial for DR, volume and tempo, and group numbers are shown in Table 1.

3 Results

Since an intergroup multifactor experiment was conducted (there are several levels in each factor), in this case, it is expedient to apply the one-dimensional generalized linear ANCOVA model for each dependent variable.

However, the use of the ANCOVA model imposes two restrictions on the use: firstly, all dependent variables should be normally distributed in the study groups, and secondly, the variances in these groups should be equal. In order to check the normality of the sample distribution in each of the groups, as well as the equality of group variances, the values of asymmetry and excesses, as well as the standard deviation of each variable in each of the groups, were counted.

We can see that the values of asymmetry and excesses of each variable do not exceed 2 modulo; in addition, the standard deviations differ not more than twice. Consequently, we can assume that the distribution of each of the variables for each factor is normal. The hypothesis of the equality of the variances of each of the groups

is also confirmed, since in these groups the difference between the lowest and the highest values of the variance does not exceed five times. The above facts give us the reason to believe that the ANCOVA method is applicable for this sample.

Further, an ANCOVA covariance analysis with DR, volume, and tempo factors was performed sequentially with each dependent variable: "attention," "interest," "clip memory," "memorability," "emotions," desire to purchase/recommend the product, and the general effectiveness of the advertising. As the covariant, the following variables were chosen: "attitude to the actor from the commercial," "attitude to the advertised brand," "frequency of buying the brand," and "relation to the song from advertising." The answers to the question "To what extent do you think the song suits the commercial?" were referred to as covariates "congruence of the song to advertising." The results of this analysis of each of the dependent variables are shown in Table 2.

As we see in the table, taking into account all the covariates, the following factors were significant:

(1) The impact of the dynamic range of the musical composition (DR) on attention attracted to the video, interest in the video, the desire to purchase/recommend the product, and accordingly, the overall effectiveness of advertising;
(2) The impact of the volume of the musical composition on the emotions caused by the video;
(3) The combined effect of DR and the tempo of the musical composition on the memorability of the products;
(4) The combined effect of the volume and tempo of the musical composition on the emotions caused by the video;
(5) The combined effect of all three factors (DR, volume, and tempo of the musical composition) on the memorability of the products.

The following covariates were also significant:

(1) The attitude to the actor from the commercial affects the attention attracted to the video, the interest to the video, the emotions caused by the video, and the overall effectiveness of advertising;
(2) Attitude to the advertised brand significantly affects the attention attracted to the video, interest to the video, memorability of the video, memorability of the goods, the desire to purchase/recommend the product, as well as the overall effectiveness of advertising;
(3) The frequency of buying a brand affects the memorability of the goods and the desire to purchase/recommend a product;
(4) The attitude to the musical composition of the commercial influences the memorability of the video and the emotions caused by advertising;
(5) The congruence of the song to the advertisement influenced the attention attracted to the video, the interest to the video, the emotions caused by the video, the desire to purchase/recommend the product, as well as the overall effectiveness of advertising.

Table 2 Results of the ANCOVA analysis of the effect of three factors and covariates on each of the dependent variables (significance of the F-test)

	Attention	Interest	Memorability of advertising	Memorability of product	Emotions	Desire to purchase	Efficiency of advertising
DR	0.011**	0.005**	0.066	0.691	0.203	0.028**	0.004**
Volume	0.191	0.750	0.137	0.832	0.012**	0.526	0.155
Tempo	0.924	0.933	0.732	0.762	0.257	0.362	0.836
DR + volume	0.862	0.594	0.906	0.976	0.169	0.341	0.750
DR + tempo	0.457	0.438	0.893	0.011**	0.678	0.526	0.535
Volume + tempo	0.243	0.141	0.071	0.714	0.003**	0.454	0.070
DR + volume + tempo	0.954	0.114	0.466	0.026**	0.748	0.268	0.198
Attitude to the actor	0.001**	0.000**	0.155	0.337	0.006**	0.138	0.000**
Attitude to the brand	0.025**	0.040**	0.005**	0.002**	0.612	0.006**	0.000**
Frequency of purchase	0.768	0.720	0.879	0.051**	0.247	0.032**	0.133
Attitude to the song	0.075	0.055	0.009**	0.230	0.013**	0.528	0.082
Congruency of song and advertising	0.000**	0.000**	0.116	0.271	0.000**	0.022**	0.000**

**$p \leq 0.05$

Let us consider in more detail the effect of each factor on independent variables. The covariates appearing in the model were estimated at the following values: the ratio to the actor from the commercial = 4.21; attitude to the advertised brand = 5.11; frequency of buying a brand = 3.09; the relation to a song from advertising = 5.48; congruency between song and advertising = 5.57.

The significance of each of the variables that differ significantly in the dynamic range turned out to be higher in the groups with a high dynamic range. Thus, it can be concluded that more dynamic music in advertising attracts more attention to the commercial, increases interest, increases the intensity of the desire to purchase the advertised product (or recommend it to friends), and increases the effectiveness of advertising in general. The marginal averages (the adjusted averages obtained after removing all covariant estimates) and the values of the standard variable error by the "dynamic range" factor are presented in Table 3.

Increasing the volume of music in advertising positively influenced the emotions caused by the commercial. In groups with standard volume of advertising music in 100%, the marginal mean on the "emotions caused by the video" scale was 5.386 (std error = 0.074), and in groups with volume reduced to 75%, the value was 5.105 (std. error = 0.083).

To analyze interactions between factors, taking covariates into account, we plot the graphs of the marginal means of the dependent variables (Fig. 1).

In Fig. 1, one can see that with a slowed-down 95% tempo of music used in advertising, memorability of the product is more pronounced when the dynamic range of music is small. However, at a standard tempo, the memorability of the goods drops sharply when the dynamic range of music in advertising is small, and it increases dramatically when the music is highly dynamic in range. With a further increase in the tempo up to 105%, the memorability of the goods gradually decreases for any dynamic range. Thus, the most powerful on the memorability of the goods was a commercial with a slow tempo and low dynamic range of music (compare = 5.445), and the least powerful was a video with a fast tempo and a low DR value (compare = 4.670). The adjusted average values of the variable "memorability of product" and the standard error are presented in Table 4.

Table 3 Estimated marginal means and standard errors of advertising effectiveness variables by group

		DR4	DR11
Attention	Mean	5.312	5.652
	Standard error	0.094	0.094
Interest	Mean	4.544	5.011
	Standard error	0.118	0.117
Desire to purchase	Mean	3.973	4.231
	Standard error	0.082	0.082
Effectiveness of advertising	Mean	4.801	5.064
	Standard error	0.064	0.064

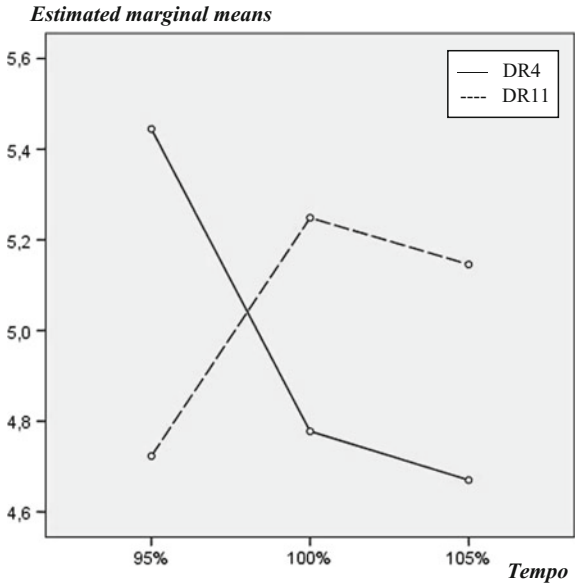

Fig. 1 Graph of estimated marginal means for the variable "memorability of products" according to DR and tempo

Table 4 Estimated marginal averages and the standard error values of the variable "recallability of goods" according to DR and the tempo

DR	Tempo (%)	Mean	Standard error
DR4	95	5.445	0.241
	100	4.778	0.219
	105	4.670	0.235
DR11	95	4.723	0.213
	100	5.249	0.221
	105	5.146	0.258

From the graph of the estimated marginal means of the variable "emotions caused by the video" for the "volume" and "tempo" factors (see Fig. 2), it follows that the expression of positive emotions decreases with the increase in the tempo of the musical composition in the advertisement if the volume of music is 100%. When the volume of music is reduced to 75%, then there is a different trend: the expression of positive emotions caused by the video smoothly decreases with the increase in tempo from 95 to 100%, but rises sharply with an increase in the rate from 100 to 105%. It is worth noting that the emotions caused by the clip at 95 and 100% are significantly worse when the volume is reduced to 75% than at a standard volume of 100%. As soon as the tempo rises to 105%, emotions become more positive with a volume level of 75% than at 100% volume. In this case, the most positive were the emotions when watching a commercial with slow music tempo and with a standard 100% volume (mean = 5.653), and the least positive emotions were when watching a video with music, in which the volume is reduced to 75%, and the tempo is standard (mean = 4.892).

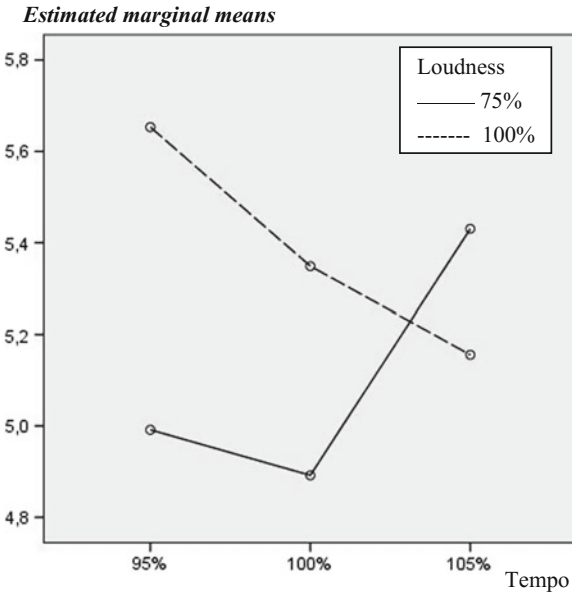

Fig. 2 Graph of estimated marginal means for the variable "emotions caused by the roller" by volume and tempo

The adjusted average values of the variable "emotions caused by the video" and the standard error are presented in Table 5.

The next question for the consideration was the impact of all three factors on the dependent variable "memorability of product."

As for the memorability of the product with the standard volume of advertising music (100%), the graph of the adjusted averages of this variable has, in this case, a different view (see Fig. 3). At a slower tempo of music (95%), memorability of the goods is higher when the dynamic range is lower; at a standard tempo, the memorability of the goods is much higher with a high dynamic range of music; and at an accelerated tempo (105%) of music, the value of memorability is again higher with a low dynamic range.

On the graph of the marginal means of the variable "memorability of goods," varied by factors "DR" and "rate" at a volume of 75% (Fig. 4), the following dependencies are observed: for a narrow dynamic range of a composition, the memorability of the product decreases with increasing tempo, and for a wide

Table 5 Estimated marginal means and standard errors for the variable "emotions" by volume and tempo

Volume (%)	Tempo (%)	Means	Standard error
75	95	4.992	0.141
	100	4.892	0.136
	105	5.431	0.155
100	95	5.653	0.127
	100	5.349	0.123
	105	5.156	0.136

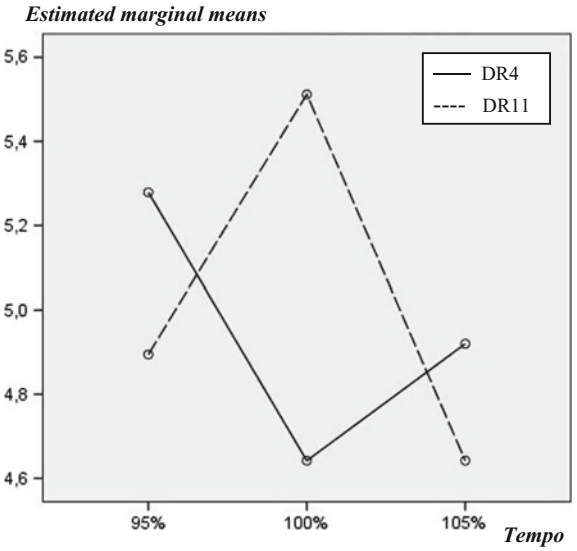

Fig. 3 Graphs of the estimated marginal means for the variable "memorability of product" according to DR, volume, and tempo (Volume = 100%)

dynamic range with increasing tempo, the memorability of the product increases. In addition, at a rate of 95%, the memorability of the goods is higher with a low dynamic range, and with the other two values of the tempo, the memorability of the goods is higher with a high dynamic range.

Thus, the greatest memorability of the goods was in the case when the advertisement was accompanied by accelerated high-dynamic music with a volume reduced to 75% (mean = 5.650), and the smallest—with accelerated low-dynamic music with a volume of 75% (mean = 4.420). The estimated marginal means of the variable "memorability of the product" and the standard error for the interacting these three factors are presented in Table 6.

Now we would like to consider the possible influence of random factors on the variables of advertising effectiveness. In this study, random factors were not included in the one-dimensional generalized linear model of ANCOVA, since the sample size is insufficient for adequate analysis: the sample is segmented into a large number of small groups.

The following variables were considered as random factors: "knowledge of the actor" (the question in the questionnaire: "Do you know the actor who appeared in the commercial?"), "knowledge of the song" (question in the questionnaire: "Have you heard the song sounded in the commercial before?"), and "knowledge of advertising" (question in the questionnaire: "Have you seen this advertisement before?"). The descriptive statistics for each of the groups are as follows: the greatest variation was observed in the factor "knowledge of the actor": from the 296 subjects, 272 people know the actor (91.9%) and only 24 people (8.1%) do not know.

A significant influence was exerted only by two factors: "knowledge of the song" and "knowledge of advertising." The factor "knowledge of the song" affects

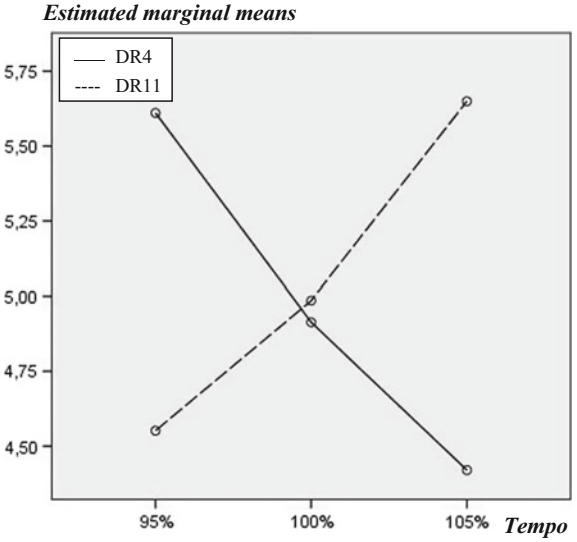

Fig. 4 Graph of the estimated marginal means for the variable "memorability of goods" according to DR, volume, and tempo (Volume = 75%)

Table 6 Estimated marginal means and standard errors for the variable "memorability of product" according to DR, volume, and tempo

DR	Volume (%)	Tempo (%)	Mean	Standard error
DR4	75	95	5.611	0.386
		100	4.914	0.330
		105	4.420	0.376
	100	95	5.279	0.291
		100	4.642	0.288
		105	4.920	0.282
DR11	75	95	4.551	0.285
		100	4.986	0.323
		105	5.650	0.365
	100	95	4.895	0.318
		100	5.512	0.301
		105	4.642	0.367

the variable "memorability of the goods," and the factor "knowledge of advertising" influences the variables "attention," "interest," "memorability of the clip," and the general variable "advertising effectiveness." In addition, the "knowledge of the actor" factor tends to affect the "interest caused by the video" variable ($p = 0.05$).

After comparing the average values, we can conclude that those who have already heard the song, that sounds in the commercial, remembered the advertised product worse (av.v. = 4.84, std. dev. = 1.652) than those who heard song for the first time (av.v. = 5.24, std. dev. = 1.686).

Table 7 Average values of advertising effectiveness variables and standard deviations, grouped by the factor "knowledge of advertising"

		Did not see the advertising before	Saw the advertising before
Attention	Mean	5.26	5.69
	Standard deviation	1.324	1.131
Interest	Mean	4.49	5.06
	Standard deviation	1.596	1.468
Memorability of advertising	Mean	4.74	5.23
	Standard deviation	1.421	1.354
Effectiveness of advertising	Mean	4.7920	5.0556
	Standard deviation	0.88487	0.89275

Knowledge of the commercial has a direct impact on the variables "attention," "interest," "memorability of the video," and "advertising effectiveness." The average values of these variables were higher for those subjects who had previously seen this video before. These means and standard deviations are presented in Table 7.

4 Conclusions

1. The hypothesis about the positive impact of the dynamic range (DR) of music on the effectiveness of the advertising impact and its three indicators were partially confirmed: there is an influence of DR on the overall effectiveness of advertising, attention and interest, as well as the desire to purchase advertised goods. The influence of DR on emotions caused by advertising has not been revealed.
2. The hypothesis of the influence of music volume on the effectiveness of advertising was also partially confirmed: there was no influence on attention, but the effect of volume on the emotions was observed, as well as the combined effect of volume and dynamic range.
3. The hypothesis about the influence of the music tempo on the effectiveness of the advertising effect was partially confirmed: the rate only exerts its influence together with other factors (tempo and DR affect the memorability of the goods; all three factors together also affect the memorability of the goods; tempo and volume affect emotions).

4. The assumed influence of the side variables (familiar musical composition and familiar advertising) on the indicators of the effectiveness of advertising turned out to be significant.

Results can be used in the development of promotional products.

References

Allan, D. (2006). Effects of popular music in advertising on attention and memory. *Journal of Advertising Research, 46*(4), 434–444.

Areni, C. S., & Kim, D. (1993). The influence of background music on shopping behavior: Classical versus top-40 music in a wine store. *Advances in Consumer Research, 20,* 336–340.

Deutsch, D., Lapidis, R., & Henthorn, T. (2008). The speech-to-song illusion. *Journal of the Acoustical Society of America, 124,* 589–597.

Gorn, G. J. (1982). The effects of music in advertising on choice behavior: A classical conditioning approach. *Journal of Marketing, 46,* 94–101.

Kellaris, J. J. (2001). Identifying properties of tunes that get "stuck in your head": Toward a theory of cognitive itch. In: S. E. Heckler & S. Shapiro (Eds.). *Proceedings of the Society for Consumer Psychology, Winter, Conference*, Scottsdale, AZ, American Psychological Society.

Kellaris, J. J. (2003). Dissecting earworms: Further evidence on the "song-stuck-in-your-head" phenomenon. In C. Page & S. Posavac (Eds.). *Proceedings of the Society for Consumer Psychology, Winter, Conference* (pp. 220–222).

Kraemer, D. J. M., Macrae, C. N., Green, A. E., & Kelly, W. M. (2005). Sound of silence activates auditory cortex. *Nature, 434,* 158.

Kupreichenko, A. B. (2008). *Psychology of trust and distrust*. Moscow, (Russian Edition).

Lebedev-Lubimov, A. N. (2002). *Psychology of advertising*. S.-Petersburg, Piter (Russian Edition).

MacInnis, D. J., & Park, C. (1991). The differential role of characteristics of music on high- and low-involvement consumers' processing of ads. *Journal of Consumer Research, 18,* 161–173.

Margulis, E. H. (2013). Aesthetic responses to repetition in unfamiliar music. *Empirical Studies of the Arts,* 31(1), 45–57.

Milliman, R. E. (1982). Using background music to affect the behavior of supermarket shoppers. *Journal of Marketing, 46,* 86–91.

Oakes, S., & North, A. C. (2006). The impact of background musical tempo and timbre congruity upon ad content recall and affective response. *Applied Cognitive Psychology, 20*(4), 505–520.

Pereira, C. S, Teixeira, J., Figueiredo, P., Xavier, J., Castro, S. L., & Brattico E. (2011). Music and emotions in the brain: Familiarity matters. *PloS One, 6*(11). https://doi.org/10.1371/journal.pone.0027241.

Roehm, M. L. (2001). Instrumental vs. vocal versions of popular music in advertising. *Journal of Advertising Research, 41*(3), 49–58.

Shuker, R. (1994). *Understanding popular music*. New York: Routledge.

Smith, P. C., & Curnow, R. (1966). Arousal hypotheses and the effects of music on purchasing behavior. *Journal of Applied Psychology, 50*(3), 255–256.

Vickers, E. (2010). The loudness war: Background, speculation and recommendations. *129th Audio Engineering Society Convention, 1*, 135–161.

Yalch, R., & Spangenberg, E. (1990). Effects of store music on shopping behavior. *Journal of Services Marketing, 4,* 31–39.

Zajonc, R. (1968). Attitudinal effects of mere exposure. *Journal of Personality and Social Psychology, 9*(2, Pt. 2), 1–27.