

Effects of participant demographics on multimedia ad exposure estimation

Evin Aslan Oguz¹, Gregor Strle², Andrej Košir²

¹Nielsen, Via Cassarinetta 25, 6900 Lugano, Switzerland

²Faculty of Electrical Engineering, University of Ljubljana
email: evin.oguz.consultant@nielsen.com

Abstract

The aim of this research is to observe the effects of participant demographics on the estimation of short-term multimedia ad exposure of young adults (age 18-24). The short-time multimedia ad exposure is estimated by an instrument developed on 360 test participants from USA watching selected videos containing ads. The instrument was later translated and applied to a group of 53 Slovenian participants. We found that the MMAES instrument is reliable and applicable on the Slovenian population but estimated multimedia ad exposure scores are significantly different. No clusters were found in these two populations.

1 Introduction

Multimedia is the predominant form of media in the communications and information industry today. As individuals and groups, we are exposed to a variety of information on different media platforms and from different sources, regardless of time and place [1]. According to the most recent statistics, U.S. adults spend nearly half of their day with media, an estimated 11 hours per day, including traditional and digital media, with younger adults (ages 18-34) spending more than half of their daily intake with digital media [7, 9]. Time spent on ad-supported content is also growing. Globally, ad-supported content accounts for 66.5% of the average daily media usage of 7.3 hours [7]. In the U.S., ad-supported content accounts for 86% of the total media consumption, and a consumer's direct exposure to advertising is estimated at over 90 minutes per day, or about 15% of the total daily media consumption [7, 9]. One multimedia platform where ad-supported content is growing particularly strongly is video streaming, where ad-supported streaming has overtaken video-on-demand streaming [10].

The widespread use of multimedia in daily life means that its use has far-reaching implications for individuals, businesses and industry, and it is the most important currency in the world of advertising [3, 1]. Despite its ubiquity, measuring multimedia exposure remains a challenge. There is a lack of systematic research into evaluating the validity and reliability of various exposure measurements, and little consensus among researchers on how best to measure the exposure [3, 6, 1, 5].

This study uses a construct Multimedia Ad Exposure Scale (MMAES), consisting of 4 subscales and 31-item questionnaire. The MMAES is a construct that has been developed to evaluate the short term ad exposure in a range of settings: ad-supported video streaming, quantitative profiling of a single ad or a group of ads (applicable to multimedia content providers such as YouTube), repeated measures design, as well as within-subject and between-task evaluation and providing a weak ground truth for ad exposure estimation (see [2] for an overview of this work).

The quality of the ad exposure estimation is highly related to measuring homogenous subgroups. Hence, the participant demographics play a crucial role on estimation of ad exposure. The goal of this paper is to compare the two studies conducted in the USA and Slovenia in terms of participant demographics and see if the demographics effect the ad exposure estimation.

The goal of this paper is to test differences among USA and Slovenian populations regarding estimated multimedia exposure on the same video ads. The methodology is statistical hypotheses testing of mean differences and cluster presence.

2 Multimedia ad exposure and exposure estimation

In this section, we present the short-term multimedia exposure and the instrument used to estimate the exposure.

2.1 Short-term multimedia ad exposure

In the literature, media exposure is defined as "the extent to which audience members have encountered specific messages or classes of messages/media content." [8, p. 168]. In the context of multimedia, this means that the individual is exposed to "... seamless integration of data, text, images of all kinds and sound within a single, digital information environment." [4, p. 4].

The short-term multimedia ad exposure is taking account the memory decay of the consumers. Since consumers tend to forget what they have seen, short-term multimedia ad exposure aims to measure the effects of an ad shortly (within about an hour) after seeing the ad.

2.2 Estimation of short-term multimedia exposure

The advertisement exposure estimation is done via a construct named Multimedia Ad Exposure Scale (MMAES) [2]. The scale consists of 4 subscales and 31 questions. The subscales are *Ad Engagement* (AE), *Reactance* (RE), *Awareness and Attitude* (AA), and *Purchase Intention* (PI). The definitions can be seen from Table 1.

Table 1: MMAES subscale definitions.

MMAES Component	Definition
Ad Engagement (AE)	Measures engagement in the advertisement in terms of viewer's attention and emotional experience (amusement, excitement, contentment, interest, aesthetic appeal, surprise).
Reactance (RE)	Measures viewer's subjective disturbance in terms of negative emotional experience (reactance) towards the advertisement, product, or brand.
Awareness and Attitude (AA)	Measures the likability and/or desirability of the advertised brand/product.
Purchase Intention (PI)	Measures willingness to buy the product.

Since MMAES consists of 31 questions, instead of providing all the questions an example question from each subscale is presented. A question from AE subscale is as follows: *I felt interested in this advertisement..* A question from RE subscale is: *I felt frustrated while watching this advertisement..* A question from AA subscale is: *How do you think this product will work for you?.* and a question from PI subscale is: *Would you consider buying it?.*

This instrument was constructed in order to obtain the ground truth of short-term multimedia exposure in technology-based estimation from physiological signals, contextual data, etc.

3 Experimental results

3.1 Experimental Data and participants

The data is gathered from two separate studies. The first study was conducted in the USA via online crowdsourcing and a second study was conducted in Slovenia in the laboratory environment (Lucami lab smart home room).

3.1.1 Participants

The target population of the first study (USA) was young adults (18-24 years old) that are native English speakers living in the United States. To control the technology-related effects of multimedia exposure (e.g., screen size, technology-related usage behavior), the study included only participants who used a personal computer. The study was conducted on 360 participants.

The participants of the second (Slovenia) study were specified by the exclusion and inclusion criteria. The inclusion criteria are the native Slovene-speaking students,

aged 18-24, that have good sight or use contact lenses or glasses to be able to see the TV screen. The exclusion criteria are the participants with hearing problems, diagnosed with chronic heart disease, or any other acute or chronic condition that would limit the ability of the participant to participate in the study or refused to give informed consent. The study was conducted on 53 participants.

3.1.2 Experimental Multimedia Materials

The materials of the first study consisted of the main multimedia content (videos with short movie clips or sketches) and ads from YouTube categorized by the selection criteria. Videos (main MM content) are categorized by view index (lower vs. higher) and engagement level (lower vs. higher). The view index is based on the number of views for a selected YouTube video (videos over one million views are categorized as a higher index). The engagement level was defined by the three media experts by classification into low or high-engaging classes.

The selection criteria for the ads include view index (lower vs. higher), engagement level (lower vs. higher), brand familiarity (known-unknown), and product novelty (daily use vs. novel product). Feedback from three media experts (Nielsen employees with more than 10 years of experience measuring how multimedia reaches people in terms of number and frequency.) was considered in the selection of materials. The duration of the video materials is approximately 5 minutes and 1 minute for the advertisements. All the materials are in English.

The final set is composed of six multimedia contents consisting of several contrasting combinations of multimedia materials and in-video advertisements.

The materials of the second study consisted of four combinations of videos including an advertisement. The videos and ads are selected according to inclusion and exclusion criteria. The initial engagement level is determined based on reported arousal measures of videos and verified by a small online crowdsourcing study. Similarly, the brand familiarity of ads is determined based on another small online crowdsourcing study.

The inclusion-exclusion criteria of the videos are as follows. The inclusion criteria: the videos that are in English and available online, labeled with arousal measures, are between three and seven minutes, have good quality (not distorted, etc.), have more than one scene excluding the start and end 40 seconds (to be able to insert ad in between the scenes). The exclusion criteria: are the videos less than three minutes long and more than seven minutes, having a low resolution or distorted virtual reality when converted to 2D, produced before 1980, involving controversial issues such as religion, human cloning, animal rights, smoking, alcohol, violence, etc.

The inclusion and exclusion criteria of the ads are as follows. The inclusion criteria: the ads that are in English and available online, labeled with arousal measures, promoting a real product (rather than a service or giving social message such as HIV testing, not drinking and driving, etc.), having good quality (not distorted, etc.),

between 30 seconds and 1.5 minutes. The exclusion criteria: the ads promoting baby- or children-specific products, as they are not in the interest of our target population, promoting smoking, alcohol, sex, promoting a service (such as dry cleaning, real-estate companies, etc.), not promoting an actual product but giving the social message, having a low resolution or produced before 1980.

In the first study, each participant saw only one video including an advertisement. In the second study, all the participants saw four combinations in different orders (to cancel the carry-over effect of multimedia).

3.2 Participant clusters

Hopkins statistics are used to detect the presence of clusters within the study on user answers and MMAES scores of users. Regarding the USA-based study, the results show that (see Table 2) all the coefficients are below 0.75, indicating that no clusters are present. Also, the visualization of MMAES scores does not reveal any clusters.

Table 2: Hopkins cluster presence of USA-based study

Data	Hopkins stat.
MMAES Scores	0.74
MMAES Answers	0.63

Similarly, a Slovenia-based study (see Table 3) shows that no clusters are present.

Table 3: Hopkins cluster presence of Slovenia-based study

Data	Hopkins stat.
MMAES Scores	0.73
MMAES Answers	0.61

3.3 Differences in participant MMAES scores

The differences in MMAES mean scores among male and female users have been tested by using the Mann-Whitney U Test. RE scores are not normally distributed (Liliefors test $p < 0.05$), whereas AE, AA, PI scores are normally distributed. Mann-Whitney U Test shows that RE scores are significantly ($p < 0.05$) higher among males, whereas the rest of the scores are statistically insignificant. The cultural context might be the reason for this difference when compared to the study conducted in the USA. However, the true cause remains to be investigated, as the data collected does not allow for further examination.

Independent sample t-tests for both male and female populations and Slovenian versus USA users have been computed (see Table 4). The results indicate that gender does not affect MMAES scores. Mann-Whitney test showed only AA scores are statistically significant for USA users versus Slovenian users. Slovenian users have a lower AA mean score than USA users, while they have higher mean scores for AE, RE and PI than USA users. This means that there are some differences between the groups which might be because of nuisance factors. No further explanation or cause has been identified.

Table 4: T test p values from scores among males and females, and among USA and Slovenian users.

Subscale	Gender t-test	Slovenian versus USA user T Test
AE	0.62	< 0.01
RE	0.94	< 0.01
AA	0.43	0.097
PI	0.12	< 0.01

4 Conclusions

In this study, we investigated the effects of participant demographics on the estimation of short-term multimedia ad exposure of young adults (18-24). The results of two studies have been compared in terms of user answers and ad exposure scores. The first study was conducted in USA (360 users), while the second one was conducted in Slovenia (50 participants). The results show that the instrument used for ad exposure estimation (MMAES) is reliable and applicable to be used on Slovenian population but estimated ad exposure scores are significantly different. Clusters have not been observed both among male versus female populations, and Slovenian versus USA users.

References

- [1] Theo Araujo, Jonathan R. Copulsky, Jameson L. Hayes, Su Jung Kim, and Jaideep Srivastava. From purchasing exposure to fostering engagement: Brand-consumer experiences in the emerging computational advertising landscape. *Journal of Advertising*, 49(4):428–445, 2020.
- [2] Evin Aslan Oğuz, Gregor Strle, and Andrej Košir. Multimedia ad exposure scale: measuring short-term impact of online ad exposure. *Multimedia Tools and Applications*, Mar 2023.
- [3] Claes H. de Vreese and Peter Neijens. Measuring media exposure in a changing communications environment. *Communication Methods and Measures*, 10(2-3):69–80, 2016.
- [4] T. Feldman. *Multimedia*. BRBRF report. Psychology Press, Mortimer Street, London, 1994.
- [5] Seth K. Goldman, Stephen M. Warren, Seth K. Goldman, and Stephen M. Warren. Debating How to Measure Media Exposure in Surveys. In Elizabeth Suhay, Bernard Grofman, and Alexander H. Trechsel, editor, *The Oxford Handbook of Electoral Persuasion*, pages 997–1015. Oxford University Press, USA, 2020.
- [6] Rebekah H. Nagler. Measurement of Media Exposure. *The International Encyclopedia of Communication Research Methods*, 1(2014):1–21, 2017.
- [7] PQ Media. Global Consumer Media Usage & Exposure Forecast 2019-23. Technical report, PQ Media, 2019.
- [8] By Michael D Slater. Operationalizing and Analyzing Exposure: The Foundation Of Media Effects Research. *Journalism and Mass Communication Quarterly*, 81(1):168–183, 2004.
- [9] The Nielsen Company. The Nielsen Total Audience Report, Q1 2019. Technical report, The Nielsen Company, 2019.
- [10] The Nielsen Company. Beyond SVOD, The Nielsen Company. Technical report, The Nielsen Company, 2020.