Virtual Reality Advertising:

The Effects of Presence and Object Interactivity on Purchase Intent

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Declaration

This Thesis is entirely my own work, and has not been previously submitted to this or any other third level institution.

Word count: 8.680

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15.04.2018

Acknowledgements

I would like to thank my supervisor Prof. Robert Griffin for his support and encouragement during this project. At many stages of this research project I benefited from his advice, particularly so when exploring new ideas around the virtual reality environment. His positive outlook in my research inspired me and gave me confidence. His careful editing contributed enormously to the production of this thesis.

Special thanks to all my lecturers at IADT who took great care in explaining unfamiliar ideas and thus leading the way in my search for knowledge.

Finally, I must express my very profound gratitude to my partner for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this thesis. This accomplishment would not have been possible without you. Thank you.

Sincerely,

Andrei Sozanschi

Abstract

Advertising constantly adapts to any emerging on or offline platform where it can engage with consumers. Looking at the past 20 years, advertising has moved from focusing on television to focusing on computers, and from computers to smartphones with more than 50% of the revenue coming in from the latter in 2016 (IAB, 2017).

Given this trend of advertising to migrate towards emerging technologies the purpose of this research is to investigate if head mounted displays and virtual reality environments are suited for advertising purposes based on key psychological concepts such as object interactivity, mental image creation ease and vividness, and presence. An experiment was carried out comparing the level of purchase intent achieved by being exposed to advertising in three different conditions: a virtual reality environment, a 2D video ad and an in-store experience.

The experiment was undertaken in the Dún Laoghaire Institute of Art, Design and Technology, Dublin, Ireland where participants (N = 74, 32 male and 42 female, ages 20-44) were recruited and distributed randomly to one of the three conditions. The results suggest that there are several significant correlations between object interactivity, presence and purchase intent and that VR can be an effective advertising platform.

Introduction

Advertising as defined by Adams and Stanton (1984) is a sponsored message which promotes a service or product. It is considered an essential part of the customer lifecycle as it informs customers about new products, services, sales or limited time offers. In order for advertising to be effective and cost efficient, in other terms profitable, it has to engage with as many potential customers as possible and therefore needs to adapt to emerging technologies. The invention of ARPANET in the late 1960s (Schneider, Evans & Pinard, 2009) which lead to the birth of the World Wide Web in 1990 (McPherson, 2009) gives companies the possibility to engage with a larger share of the mass consumers than previously possible.

According to Adams (1995), online advertising started in 1994 when the Hotwire website added the first commercial web banner (rectangular picture with text which advertises a product) to its online platform. From this point onward the online advertising industry evolved to the multi-billion dollar business it is today (IAB, 2017). On the 11th of May 2016, the Interactive Advertising Bureau (IAB) Europe announced that for the first time since its invention in 1994, online advertising spend has surpassed the television spend in Europe, marking a new stage of development in the advertising world (IAB Europe, 2016). The IAB's internet advertising revenue report for 2016 (IAB, 2017) in the figure below (Figure. 1) shows the overall compound annual growth rate (CAGR) at 16% over a 10 year period thus displaying a constantly increasing online advertising revenue year over year.

Noteworthy is the fact that mobile online advertising revenue also surpassed the desktop generated revenue for the first time in 2016 marking another threshold. Further analysis of the five year CAGR shows that there is a large gap between the mobile CAGR at 86% and the non-mobile CAGR at 6% which suggest that consumers and as a response advertising businesses are moving from desktops towards smartphones. The above mentioned migration is highly relevant when considering new platforms to which advertising can extend to once said technologies are available to the masses.
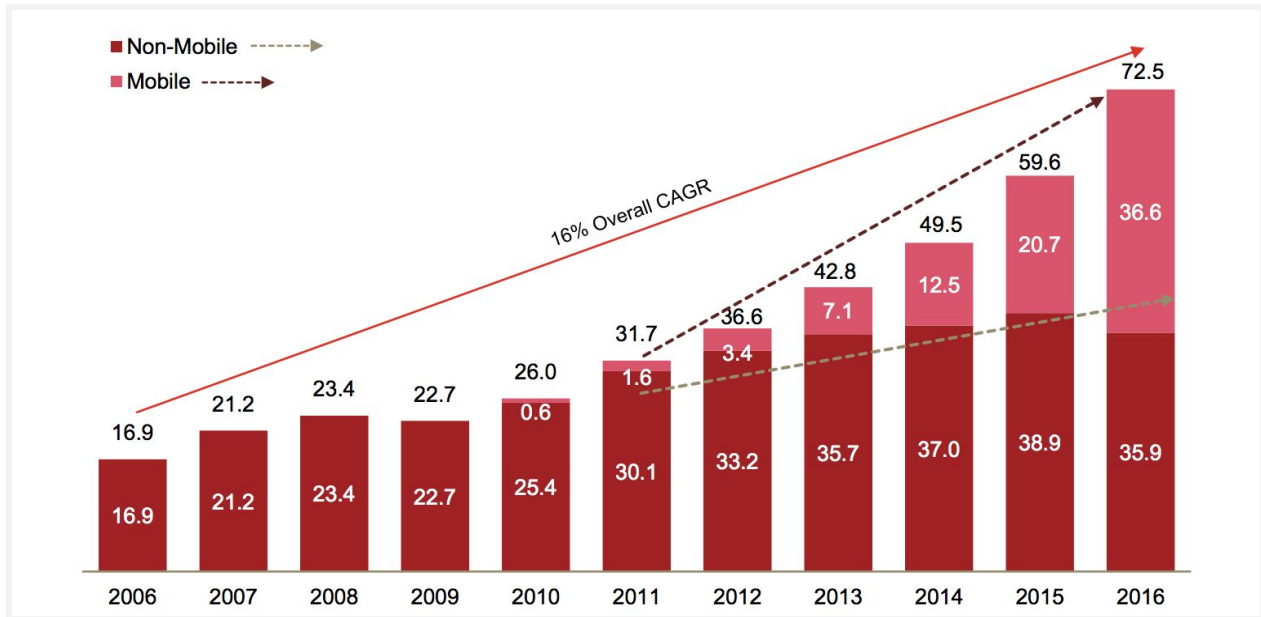
Figure 1. Mobile makes up more than 50% of internet advertising revenue, In *IAB*, 2017.

One technology which is starting to be both available and affordable to the masses is virtual reality (VR) and the afferent Head Mounted Displays (HMDs). According to Schnipper (n.d.) pinpointing the creation of the first VR is not easy as there is no consensus on how existing in an alternate reality can be defined. However, it will be considered that the Sensorama simulator (Heilig, 1962) was the first VR machine available to consumers which provided them with a VR experience (Brockwell, 2016). As technology evolved over the past 50 years, modern VR devices such as but not limited to the HTC Vive (HTC Vive, 2017), Playstation VR (Playstation VR, 2017), or the Oculus Rift (Oculus Rift, 2017) have revolutionised the industry through the flexibility of their platform, increased portability, video and sound fidelity, and performance. Due to the higher grade of realism HMDs offer, they have been implemented and used successfully in fields like gaming (Playstation VR, 2017), architecture (Abdelhameed, 2013; Portman, Natapov, & Fisher-Gewirtzman, 2015) and psychology (Maani et al., 2011; Kampmann, Emmelkamp, Hartanto, Brinkman, Zijlstra, & Morina, 2016; Yeh, Tsai, Fan, Liu & Rizzo, 2012).

As mentioned above advertising follows emerging technologies which appeal to the masses. According to Statista (2017) VR software and hardware is expected to increase by 40.4

billion US Dollars in market size until 2020 and is estimated to have an economic impact of 15.6 billion US Dollars in the same timeframe.

Considering the above, the purpose of this study is to investigate whether advertising in virtual reality (VR) through HMDs can be effective at increasing the purchase intent of consumers. This will be evaluated based on psychological concepts such as immersion and presence, key elements of consumer psychology online and the increased reality-like level of HMDs. The focus will be set on comparing VR environments and HMD to to other advertising platforms as to determine which advertising method led to a greater purchase intent.

Literature Review

HMDs have the potential to bring fictional virtual worlds closer to reality, an ability which is sought after in many fields. Portman, Natapov, and Fisher-Gewirtzman (2015) argue that VR is essential in the field of architecture as it gives a much needed overview of how the design of a building will fit with its surrounding landscape. In other words this means that one can replicate reality inside a virtual world, add an element to it and then compare the two different worlds with one another. In psychology HMDs have been used from distracting burn victims and enabling doctors to prescribe less pain medication (Maani et al., 2011), assessing ADHD in children (Yeh, Tsai, Fan, Liu & Rizzo, 2012), to providing training for children with autism (Didehbani, Allen, Kandalaft, Krawczyk & Chapman, 2016). Moreover, HMD have been used successfully in treating persecutory delusions (Freeman et al., 2016) and a large range of anxieties and phobias such as but not limited to social anxiety (Anderson, Rothbaum & Hodges, 2003; Kampmann, Emmelkamp, Hartanto, Brinkman, Zijlstra, & Morina, 2016; Parsons & Rizzo, 2008; Rothbaum, Anderson, Zimand, Hodges, Lang & Wilson, 2006), flight anxiety, (Cardoș, David & David, 2017), arachnophobia (Garcia-Palacios, Hoffman, Carlin, Furness & Botella, 2002) and acrophobia (Emmelkamp, Krijn, Hulsbosch, De Vries, Schuemie & Van der Mast, 2002). In addition to the above, Laforest, Bouchard, Crétu and Mesly (2016) tested whether virtual reality has the capacity to emulate reality to a high enough degree in order to induce an anxiety response in participants diagnosed with obsessive-compulsive disorder (OCD). When OCD suffering participants were shown a contaminated VR world it triggered an anxiety response which suggested that HMD can be indeed used to ameliorate and perhaps treat OCD. What the above underlines is that, HMDs are advanced enough to simulate a high fidelity real-world-like environment which is convincing enough to trigger anxiety responses in users and help them overcome their disorders.

Therefore, a need arises to test whether advertising would benefit from the high fidelity virtual reality created with HMDs and if said reality like environment will in any way enhance the experience leading to a greater purchase intent.

Immersion Leading to Presence

Immersion and presence are two psychological concepts that have been studied for more than three decades. Witmer and Singer issued one of the first main definitions of immersion and presence in 1994. Later, in 2005 Witmer, Jerome and Singer update their definitions and state that presence is "a psychological state of 'being there' mediated by an environment that engages our senses, captures our attention, and fosters our active involvement. The environment that mediates presence can be real, virtual, symbolic or some combination thereof" (p. 298). The authors also state that "Immersion is a psychological state characterized by perceiving oneself to be enveloped by, included in, and interacting with an environment that provides a continuous stream of stimuli and experiences" (Witmer, Jerome & Singer, 2005, p. 299). After Witmer and Singer's early definition was published, Slater and Wilbur (1997) contradicted it and argued that "Presence is a state of consciousness, the (psychological) sense of being in the virtual environment" (p. 603) whereas "Immersion is a description of a technology, and describes the extent to which the computer displays are capable of delivering an inclusive, extensive, surrounding and vivid illusion of reality to the senses of a human participant" (p. 605). Although the aforementioned definitions have been shown to be incomplete or wrong (Brown & Cairns, 2004; Slater & Wilbur, 1997; Weibel, Wissmath & Mast, 2010; Witmer, Jerome & Singer, 2005), they still serve as a starting point for further research.

Brown and Cairns (2004) conducted a qualitative, grounded theory study on gamers and their report of immersion in games and concluded that immersion had three stages. The first stage is engagement where gamers reported being willing to invest time and effort into the game. The second level, engrossment, was defined as a stage where gamers would be dedicated and emotionally involved into the game. Finally, the third level of immersion is characterised by gamers reporting they are "in the game" for a short period of time. This description of the final stage of immersion led the authors to conclude that the third level of immersion as described above is presence. This last stage is being revised in 2014 by Cairns, Cox and Nordin which argue that, although they agree with the three separate levels of immersion as stated above, what players reported as "being in the game" is not the same as feeling a

social or spatial dissociation. The authors argue that the players' statement is a way of describing being completely focused and synchronised with the events in the game which can be observed even in games that have no spatial or social space to inhabit (for example the game Bubble Bobble by Agame.com (1986)). The above is extremely important as it shows that immersion and presence, although being similar, are two very distinct concepts.

The current literature is lacking a highly used and validated questionnaire which measures immersion in VR or 2D video ads. One of the few validated immersion questionnaires, the Immersive Experience Questionnaire (IEQ) was developed by Jennett et al. (2008) to be used to measure immersion in video games. As the IEQ is not suited to measure immersion in other conditions Rigby, Brumby, Cox and Gould (2016) adapted it to be used for movies. The authors however did not release the questionnaire as it was not validated. As it stands, immersion will not be measured in this experiment as no questionnaire is available which could accurately determine immersion levels cross-platform. However, it is important to note that according to the current literature presence cannot exist without immersion or vice versa which means that while this experiment will measure presence, there will be no way of determining how immersive the environment was or if immersion had an impact on presence in the different conditions.

Presence. Effects on Purchase Intent

The consensus within the academic community is that the following are key characteristics of presence: (a) achieving a state of presence is a complex process and requires a number of triggers, (b) to a certain degree, users report either a spatial or a social dissociation and at times both, and (c) once achieved, presence can be easily lost (Baños, Botella, Alcañiz, Liaño, Guerrero & Rey, 2004; Cairns, Cox & Nordin, 2014; Lombard and Snyder-Duch, 2001; Slater & Wilbur, 1997; Witmer, Jerome & Singer, 2005; Witmer & Singer, 1994; Witmer & Singer, 1998). To test whether virtual experiences and presence are effective tools in online advertising Li, Daugherty, and Biocca (2002) created an interactive 3D ad as a visualisation of a jacket. The authors tested the hypothesis that presence created through the consumer's interaction with this ad will lead to an increase in (a) product knowledge (PK), (b) brand attitude

(BA) and (c) purchase intention (PI). Based on the results of the experiment the authors conclude that the 3D ad did generate presence and led to an increase in PK, BA and PI in comparison to the 2D version. However, they point out that there are limitations to their study so that the link between presence and increased PK, BA and PI needs further research.

Despite the abundance of scientific articles and research with presence as a main focus, testing presence is still a roadblock. In order to help solve this issue Lessiter, Freeman, Keogh and Davidoff (2001) developed the Independent Television Commission Sense of Presence Inventory or short ITC-SOPI. In contrast to other questionnaires mentioned above, the ITC-SOPI has an advantage of being suited to be applied cross-platform. In other terms, the ITC-SOPI was developed to measure presence regardless of the medium that the participant is using to engage with virtual worlds. This allows it to be used accurately in measuring and comparing presence generated through both a 2D video ad and a VR environment. Therefore, for the purpose of this research, the ITC-SOPI will be chosen to measure presence. This questionnaire will tests the following four dimensions of presence: (a) **spatial presence** which is the classical definition of users reporting being somewhere else than the real world, (b) **engagement** which measures to which degree participants interacted with the virtual environment, (c) **ecological validity/ naturalness** which describes to what degree participants believe that the virtual environment emulates reality and (d) **negative effects** which can be generated by being in a virtual environment.

Purchase Intent Online

Presently, there is a lack of research which would suggest that branding (association of product and brand with specific qualities in the mind of a potential buyer) or direct-response advertising (advertising which generates an immediate sale) would not be suited for VR. However, as VR is a highly visual medium it can be argued that branding would be more effective and thus the focus will be set on the experience conveyed through the ad and not the simplicity of the purchasing process.

PI is defined as "a plan to purchase a particular good or service in the future" (BusinessDictionary, n.d.). This definition aligns with the goals of the upper section of the sales

and marketing funnel called leads or awareness (Armstrong et al., 2006). As shown in the graphical representation below, the upper section is the first line of engagement with the consumers. This is relevant as a broad scoped, highly immersive ad would raise awareness with the goals of (a) guiding the consumers towards converting and (b) accelerating the customers' journey through the funnel (Figure. 2).
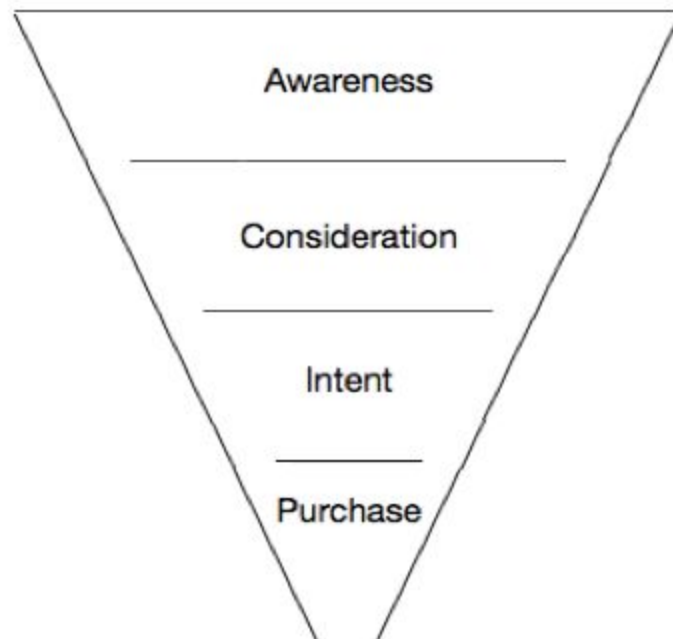
Figure 2. General Sales Funnel Sketch

For measurement purposes, PI will be evaluated on a 7-point Likert scale (i.e "Would you be inclined to purchase the Bose SoundLink Revolve Bluetooth Speaker?")

Object Interactivity and Mental Imagery

This research focuses on investigating if a link exists between VR, presence and PI and if so, whether the higher presence level will lead to a higher PI. However, the reason why VR was chosen as a visualisation medium besides it being an emerging, fairly popular technology, is the ease with which object interactivity and mental imagery can be created within the virtual world.

Hoffman and Novak (1996) argued that potential customers browsing the internet can be categorised in (a) searchers, defined by a task-specific behaviour with a focus on acquiring information and (b) browsers, defined as consumers who are browsing the internet as a recreational activity with a focus on the experience, less interested in the specific information available. Considering the above, it can be argued that VR and 2D ads are more suitable for browsers as they do not provide specific product details.

Schlosser (2003) defines object interactivity in website development as the ability of the website to change its appearance based on user input. In other words, the website and the presented product are dynamic and react to user actions such as modifying the angle of view of the product, changing its color, etc. The author then links the concept of object interactivity to mental imagery defined as

"(1) all those quasi-sensory and quasi-perceptual experiences of which (2) we are self-consciously aware, and which (3) exist for us in the absence of those stimulus conditions that are known to produce their genuine sensory or perceptual counterparts, and which (4) may be expected to have different consequences from their sensory or perceptual counterparts." (Richardson, 1969, p. 2–3).

Schlosser (2003) argues that mental imagery is not a logical processing of a message and thus applies to browsers and not searchers. The argument that object interactivity generates a higher level of mental imagery, or in other words more vivid mental images is highly relevant when evaluating how advertising influences consumers. The two key concepts that can be applied here are (a) Anderson's (1983) proposal that the process of evaluating a behaviour is influenced in part by the person's ability to imagine themselves behaving in that way and (b) MacInnis and Price (1987) statement that mental imagery represents real life experience more accurately compared to cognitive elaboration (process used by searchers in information gathering) and therefore will have more success in influencing intentions and behaviour. Schlosser (2003) argues that these two concepts translate to a correlation whereby the easier it is for consumers to imagine themselves purchasing or using a good or service, the more inclined they are to follow through with that purchase, or in other words they will show a higher purchase intent.

To test whether this can be applied to websites to increase sales, the author performed an experiment where participants are divided into four groups with searchers and browsers each using a object-interactive site and a passive site. Schlosser (2003) states that as expected, PI was higher for the object-interactive site than the passive site. Surprisingly despite searchers reporting less favourable brand attitudes, they too scored a higher PI when using the object-interactive site compared to the passive one.

Similar to Schlosser (2003), participants in this study's experiment will be asked to grade the vividness of the mental imagery on a 7-point Likert scale (i.e "How vivid was the mental image of you using the Bose SoundLink Revolve Bluetooth Speaker?") as well as the ease with which these mental images were created (Was it easy for you to imagine yourself using the Bose SoundLink Revolve Bluetooth Speaker?). Additional to mental imagery, object interactivity levels will also be measured (i.e "To what degree could you interact with the Bose SoundLink Revolve Bluetooth Speaker?").

The Present Study

As shown in the previous sections, psychologists have already implemented VR in different treatment plans for anxieties and phobias. These exposure treatments rely on the ability of HMDs and VR to emulate reality to a high degree. On the other hand, in architecture VR is used for the exact opposite purpose. Instead of separating the user from reality architects use VR to emulate the real world to gain the ability to simulate and evaluate new objects (i.e building's design) and their interactions with the surrounding landscapes. Therefore, the argument can be made that HMDs showing controlled VR environments have to a certain degree the ability to immerse the user, to induce presence and to help through environment interactivity the creation of more complex mental imagery compared to 2D visualisation technologies.

The rationale for this research stems from the need to fill the gap in knowledge that exists presently in the field of advertising and marketing in VR using HMDs. There are multiple factors which potentially led to the current gap in knowledge such as (a) HMDs being relatively unavailable to consumers due to high prices, low performance and low portability, (b) the small

number of ads created to run in VR or (c) advertising itself being a field where for profit organisations are more active and involved than academia. Nonetheless, the research carried out here intends to contribute to the filling of said gap by investigating if and how object interactivity and presence contribute to PI. In order to achieve this, the Bose SoundLink Revolve Bluetooth Speaker will be used. It will be presented in VR for the first condition, in a 2D commercial video ad for the second condition and as a physical object in the in-store condition.

Research questions and hypotheses.

RQ1: Which group will report the highest levels of object interactivity?

> **RQ1.1:** Which group reported the lowest degree of difficulty in creating mental images?

> **RQ1.2:** Which group reported the highest degree of mental image vividness?

RQ2: Which group will report the highest levels of presence?

RQ3: Which group will report the highest level of PI?

> **RQ3.1:** Does higher levels of object interactivity predict higher levels of PI?

> **RQ3.2:** Does higher levels of mental imagery creation ease predict higher levels of PI?

> **RQ3.3:** Does higher levels of mental imagery vividness predict higher levels of PI?

> **RQ3.4:** Does higher levels of any of the dimensions of presence dimensions predict higher levels of PI?

Taking these research questions into account, the hypotheses below were tested.

The spatial presence and engagement dimensions of presence will show significant differences between the VR condition and the 2D condition. The ecological validity and negative effects dimensions will show no such differences.

> **H1.1:** A significant decrease in levels of spatial presence will exist when comparing the 2D condition to the VR condition

> **H1.2:** A significant decrease in levels of engagement will exist when comparing the 2D condition to the VR condition

H1.3: No significant difference in levels of ecological validity/ naturalness will exist when comparing the 2D condition to the VR condition

H1.4: No significant difference in levels of negative effects will exist when comparing the 2D condition to the VR condition

There will be significant differences in object interactivity levels when comparing the three groups

H2.1: A significant decrease in levels of object interactivity will exist when comparing the 2D condition to the VR condition

H2.2: A significant decrease in levels of object interactivity will exist when comparing the VR condition to the in-store condition

H2.3: A significant decrease in levels of object interactivity will exist when comparing the 2D condition to the in-store condition

There will be significant differences in mental imagery creation ease levels when comparing the three groups

H3.1: A significant decrease in levels of mental imagery will exist when comparing the 2D condition to the VR condition

H3.2: There will be no significant difference in levels of mental imagery when comparing the VR condition to the in-store condition

H3.3: A significant decrease in levels of mental imagery creation ease will exist when comparing the 2D condition to the in-store condition

There will be significant differences in mental imagery vividness levels when comparing the three groups

H4.1: A significant decrease in levels of mental imagery vividness will exist when comparing the 2D condition to the in-store condition

H4.2: A significant decrease in levels of mental imagery vividness will exist when comparing the 2D condition to the VR condition

H4.3: There will be no significant difference in levels of mental imagery vividness when comparing the VR condition to the in-store condition

There will be significant differences in purchase intent levels when comparing the three groups

H5.1: There will be no significant difference in levels of purchase intent when comparing the VR condition to the 2D

H5.2: There will be no significant difference in levels of purchase intent when comparing the VR condition to the in-store condition

H5.3: A significant decrease in levels of purchase intent will exist when comparing the 2D condition to the in-store condition

There will be a significant positive correlation between **object interactivity** and PI

H6.1: There will be a significant positive correlation between **mental image creation ease** and PI

H6.2: There will be a significant positive correlation between **mental image vividness** and PI

There will be a significant correlation between presence and PI

H7.1: There will be a significant positive correlation between spatial presence and PI

H7.2: There will be a significant positive correlation between engagement and PI

H7.3: There will be a significant positive correlation between ecological validity and PI

H7.4: There will be a significant negative correlation between negative effects and PI

Methodology

Design

       In order to answer the research questions, this study used a fixed, independent, three condition comparison, experimental design. By assigning a participant to a maximum of one condition, participants' objectivity is maintained while also avoiding any carry-over effects which might exist if participants were assigned to more than one conditions. The above mentioned fixed, independent, condition comparison, experimental design is consistent with previous research in the context of measuring PI based on factors like presence or mental imagery (i.e. Biocca, Daugherty, Li and Chae, 2001; Li, Daugherty and Biocca, 2002; Schlosser, 2003).

The user reported dependant variable (DV) can be found below:

       DV1: Object interactivity level

       DV2: Mental Imagery creation ease

       DV3: Mental Imagery vividness

       DV4: Presence level (not applicable for the in-store group)

              DV4.1: Spatial Presence

              DV4.2: Engagement

              DV4.3: Ecological validity/ Naturalness

              DV4.4: Negative effects

       DV5: Purchase intent level

The independent variables (IV) for this experiment are as follows:

       IV1: Product type (as the same product is used in all three conditions)

       IV2: Visualisation type (VR, 2D, physical object)

A Cronbach Alpha test had to be performed as the questions for object interactivity, mental image creation ease and mental image vividness were not part of any validated questionnaire nor was it clear if they were related to the presence questionnaire. The results can be seen both below (Table 1) as well as in the appendices (Appendix C) and show that the questions can be used in the study.

Table 1

Cronbach Alpha Test

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.787	.767	8

Next, in order to determine what type of tests can be performed (parametric or nonparametric) the distribution of the data was tested with a Shapiro Wilk test as can be seen in Table 2 and in the appendices (Appendix D).

Table 2

Table of Normality

	Tests of Normality	Image_creation_ease	Image_Vividness	Obect_interactivity	Purchase_intent	Spatial_presence	Engagement	Ecological_validity	Negative_effects
Shapiro-Wilk	Statistic	0.769	0.852	0.791	0.913	0.954	0.922	0.946	0.71
	df	51.000	51	51	51	51	51	51	51
	Sig.	0	0	0	0.001	0.045	0.003	0.022	0

As it can be seen above, all eight sections are significant and therefore the assumption of normally distributed data is nullified. The histograms for this data can be found in the appendices (Appendix D)

Participants

Previous studies examining PI levels such as Li, Daugherty and Biocca (2002) or Schlosser (2003) have used a pool of 50 to 100 participants. For this study, participants have been recruited from IADT's student body by class visits and handing out of information sheets. There were in total 74 participants (42 female, 32 male, average age 23.18) where the VR condition had 16 participants (8 female, 8 male), the 2D condition had 35 participants (23 female, 12 male) and the in-store group had 23 participants, 11 female and 12 male (dataset available in Appendix E with the decoding in Appendix F).

Materials

Several materials are required for this study. Pre-experiment, information sheets (Appendix G) were distributed and consent forms (Appendix H) needed to be signed before taking part in the study.

After the participants performed the task needed in their allocated condition, they were asked to complete a questionnaire comprised of several topics. The first part of the questionnaire was used to establish the level of purchase intent felt by the participant as well as the ease and vividness levels of mental images that were created by the task performed. Additionally, the object-interactivity level was evaluated for each condition. Afterwards presence was measured using the ITC-SOPI questionnaire developed by Lessiter, Freeman, Keogh and Davidoff (2001) (Appendix J). Lastly, the participants received a debrief form containing all relevant information (Appendix I).

Apparatus

Firstly, the Bose SoundLink Revolve Bluetooth Speaker was made available to the participants which were assigned to the in-store group. This allowed them to use the Bose SoundLink Revolve Bluetooth Speaker as if they were in a store and were inspecting the device before a purchase.

Secondly, a classroom within IADT was used for the participants in the 2D condition. They were shown the video ad on a projector with sound and then were given the questionnaire in paper format.

Lastly, participants in the VR condition interacted with a simulation of the Bose SoundLink Revolve Bluetooth Speaker created by Prof. Robert Griffin in IADT. This simulation, as show in the images below (Figure 3, 4 and 5), depicts a furnished open space living room plus bedroom. The Bose SoundLink Revolve Bluetooth Speaker is located on the living room table. Participants can pick up the device and put it back down as well as move through and inspect the room. Music was built into the simulation and coded in the functions of the speaker as to emulate real life. In other words, distance from the speaker played a role in the music's volume as well as moving the speaker left and right which directly influenced which of the headphone's sides played music louder to simulate real life use.

This simulation was displayed to (a) the researcher via a 24-inch monitor and (b) the participants via the HMD HTC Vive (HTC Vive, 2017).

Figure 3. VR Environment - View 1

Figure 4. VR Environment - View 2
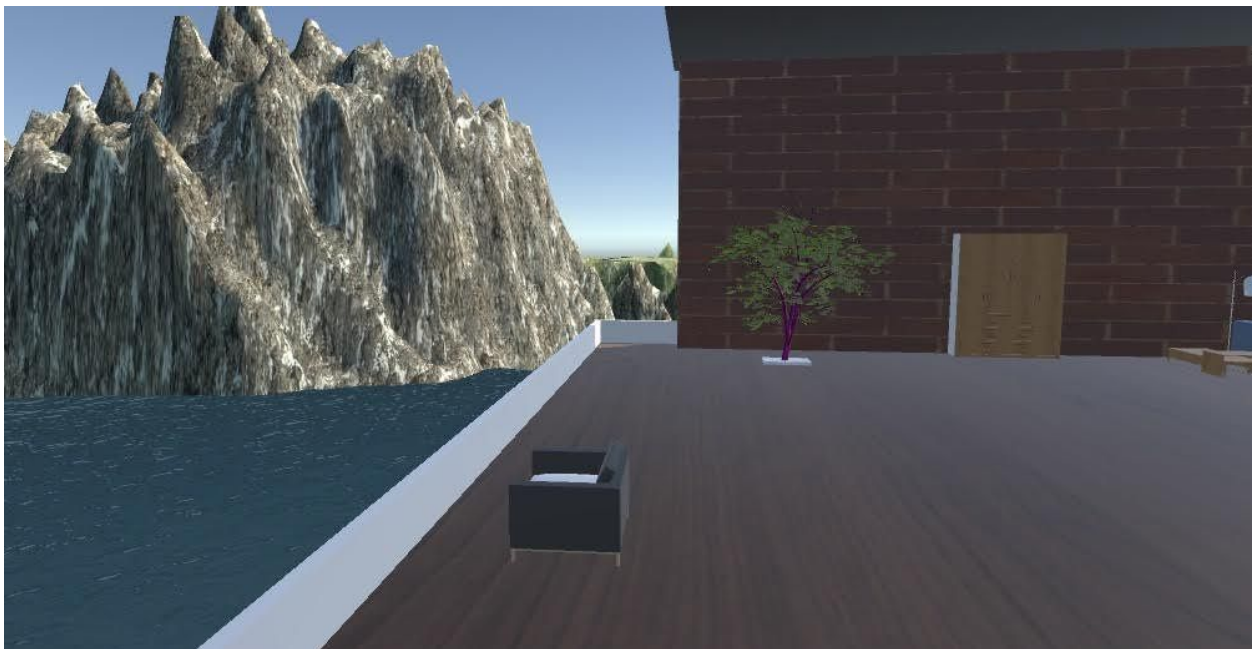
Figure 5. VR Environment - View 3

Procedure

Participants were recruited at the Dún Laoghaire Institute of Art, Design and Technology (IADT). Depending on the random assignment of the 74 participants into the three conditions, each group received different information about the study.

On the day of the experiment, each participant was given a participation code and a consent form which needed to be signed before starting the assigned task. The participation code served as identification in case any one participant would want to have their data removed (required as the data gathered was in no way associated with the student's name).

For the VR condition, participants used the HTC Vive and headphones. They were allowed to explore the simulated environment presented in the section above. While interacting with the environment and speaker they were listening to music in the headphones which simulated the functionality of the speaker in VR. Participants in the 2D condition, watched a video ad of the Bose SoundLink Revolve Bluetooth Speaker for in its entire length (1:02 min) (Appendix K). In the in-store condition, students inspected the Bose SoundLink Revolve Bluetooth Speaker as they would in store, being able to search for music and play it on the device. This interaction was limited to three to five minutes. After the students completed the task, they were asked to complete a questionnaire which measured object interactivity, mental imagery, presence and purchase intention levels.

At the end of the experiment all participants were debriefed. The goals of the experiment were explained and a debrief form was handed out. The participants were asked not to discuss the details of the experiment with their colleagues because this could potentially bias further responses. Additionally, a date was set until when a request for the deletion of data can be made.

Ethics

Standard procedure was followed by handing out information sheets and consent forms to participants. After the experiment took place, participants received debrief forms explaining the purpose of the research. The data collected is anonymous and therefore cannot be directly

associated with any participant. This data can be used for further studies as part of the signed consent form.

As the research requires participants to use VR equipment, precautions have to be taken in case participants show symptoms of VR induced motion sickness. In order to minimize this risk, participants were allowed to stop the experiment at any time if they reported feeling unwell. Additionally, the recruitment of participants was restrained to IADT students only above the age of 18. As a last step, participants were informed of the side effects of VR before performing the experiment and were given the opportunity to decline to participate.

All relevant materials were reviewed by the DTP Ethics Committee as part of a Form B Ethics application and approved before the data collection took place.

Results

Descriptive Statistics

The experiment was performed in order to gather data to test whether VR and HMDs as an emerging technology hold the key requirements to become a successful marketing platform by investigating if presence and object interactivity lead to a higher purchase intent compared to more traditional 2D ads or in-store experiences. The tables below (Table 3 and Table 4) show the descriptive statistics for object interactivity, presence and purchase intent across the three conditions (Group 1 = VR, Group 2 = 2D, Group 3 = in-store, N = 74, male = 32, female = 42, ages 20-44) (Appendix E and Appendix F**).** It is important to note that the four dimensions of presence were only tested in the VR and 2D condition. This was done as by definition presence is the result of a feeling of leaving the real world for a virtual one and therefore it can be argued that this condition cannot be met when interacting with non-virtual objects.

Table 3

Object Interactivity and Purchase Intent Median

Group	1			2			3		
	N			N			N		
	Valid	Missing	Median	Valid	Missing	Median	Valid	Missing	Median
Image_creation_ease	16		6	35		7	23		6
Image_Vividness	16		5.5	35		5	23		6
Obect_interactivity	16	0	5.5	35	0	6	23	0	7
Purchase_intent	16		4	35		5	23		6

Table 4

Presence Median

Group			Spatial_presence	Engagement	Ecological_validity	Negative_effects
1	N	Valid	16	16	16	16
		Missing	0	0	0	0
		Median	4.03	4.115	3.8	1.67
2	N	Valid	35	35	35	35
		Missing	0	0	0	0
		Median	2.11	3.38	3.6	1.17

Inferential Statistics

Presence.

Presence was examined in the VR and 2D condition and the results of the Kruskal-Wallis Test on the four dimensions can be seen in the table below (Table 5 and Table 6) and in the appendices (Appendix M).

Table 5

Mean Rank across the four dimensions of presence

Ranks	Group	N	Mean Rank
Spatial_presence	1	16	41.00
	2	35	19.14
	Total	51	
Engagement	1	16	34.00
	2	35	22.34
	Total	51	
Ecological_validity	1	16	27.69
	2	35	25.23
	Total	51	
Negative_effects	1	16	33.13
	2	35	22.74
	Total	51	

Table 6

Kruskal-Wallis Test - Presence

Test Statistics[a,b]				
Group	Spatial_presence	Engagement	Ecological_validity	Negative_effects
Chi-Square	23.772	6.775	.303	5.738
df	1	1	1	1
Asymp. Sig.	.000	.009	.582	.017

According to the first hypothesis spatial presence and engagement will show significant differences between the groups while ecological validity and negative effects will not. A Kruskal-Wallis Test revealed a statistically significant difference in spatial presence levels across the two groups (Gp 1, *n* = 16: VR condition, Gp 2, *n* = 35: 2D condition) *p* = .000, *r* = 0.48. The VR condition recorded a higher median score (*Md* = 4.0300) than the 2D condition which recorded a median value of *Md* = 2.1100. This confirms the hypothesis H1.1 which states that a significant decrease in levels of spatial presence will exist when comparing the 2D condition to the VR condition.

A secondary Kruskal-Wallis Test revealed a statistically significant difference in engagement levels across the two groups (Gp 1, *n* = 16: VR condition, Gp 2, *n* = 35: 2D condition) *p* = .009, *r* = 0.14. The VR condition recorded a higher median score (*Md* = 4.1150) than the 2D condition which recorded a median value of *Md* = 3.3800. This confirms the hypothesis H1.2 which states that a significant decrease in levels of engagement will exist when comparing the 2D condition to the VR condition.

A third Kruskal-Wallis Test revealed no statistically significant difference in ecological validity levels across the two groups (Gp 1, *n* = 16: VR condition, Gp 2, *n* = 35: 2D condition) *p* = .582, *r* = 0.006. This confirms the hypothesis H1.3 which states that no significant difference in levels of ecological validity/ naturalness will exist when comparing the 2D condition to the VR condition.

Finally, a fourth Kruskal-Wallis Test revealed a statistically significant difference in engagement levels across the two groups (Gp 1, *n* = 16: VR condition, Gp 2, *n* = 35: 2D condition) *p* = .017, *r* = 0.11. The VR condition recorded a higher median score (*Md* = 1.6700) than the 2D condition which recorded a median value of *Md* = 1.1700. This does not support the hypothesis H1.4 which states that no significant difference in levels of negative effects will exist when comparing the 2D condition to the VR condition

Object interactivity, mental image creation ease and vividness, and purchase intent.

The tables below (Table 7 and Table 8) show the Kruskal-Wallis Test performed on the three groups (Group 1 = VR, Group 2 = 2D and Group 3 = in-store).

Table 7

Kruskal-Wallis Test - Rank of Object interactivity, Mental Image Creation Ease and Vividness, and PI

Ranks	Image_creation_ease				Image_Vividness				Obect_interactivity				Purchase_intent			
Group	1	2	3	T	1	2	3	T	1	2	3	T	1	2	3	T
N	16	35	23	74	16	35	23	74	16	35	23	74	16	35	23	74
Mean Rank	24.41	42.3	39.3		34.13	34.93	43.76		34.59	33.1	46.22		25.84	39.07	43.22	

Table 8

Kruskal-Wallis Test - Object interactivity, Mental Image Creation Ease and Vividness, and PI

Test Statistics[a,b]				
	Image_creation_ease	Image_Vividness	Obect_interactivity	Purchase_intent
Chi-Square	8.899	3.059	5.999	6.742
df	2	2	2	2
Asymp. Sig.	.012	.217	.050	.034
a. Kruskal Wallis Test				
b. Grouping Variable: Group				

A Kruskal-Wallis Test revealed statistically significant differences in (a) image creation ease levels, (b) object interactivity and (c) purchase intent levels across three different groups (Gp 1, n = 16: VR condition, Gp 2, n = 35: 2D condition, Gp 3, n = 23: in-store condition), with (a) p = .012, r = 0.121, (b) p = .050, r = 0.082 and (c) p = .034, r = 0.092. The analysis showed no significant differences in levels of image vividness (Gp 1, n = 16: VR condition, Gp 2, n = 35: 2D condition, Gp 3, n = 23: in-store condition) p = .217. This analysis confirms the second, third and fifth hypotheses and does not support the fourth hypothesis which stated that there will be significant differences in mental imagery vividness levels when comparing the three groups.

In order to further analyse which groups show significant differences a series of Kruskal-Wallis Test were performed comparing Group 1 to Group 2, Group 1 to Group 3 and finally Group 2 to Group 3. To control for Type 1 errors a Bonferroni adjustment was used thus lowering the alpha to 0.017. The tables below (Table 9, Table 10 and Table 11) will be used as reference when presenting the results in the following sections

Table 9

Kruskal-Wallis Test - Group 1 and Group 2

Test Statistics[a,b]				
	Image_creation_ease	Image_Vividness	Obect_interactivity	Purchase_intent
Chi-Square	8.683	.011	.025	3.946
df	1	1	1	1
Asymp. Sig.	.003	.916	.874	.047
a. Kruskal Wallis Test				
b. Grouping Variable: Group				

Table 10

Kruskal-Wallis Test - Group 1 and Group 3

<table>
<tr><th colspan="5">Test Statistics[a,b]</th></tr>
<tr><th></th><th>Image_creation_ease</th><th>Image_Vividness</th><th>Obect_interactivity</th><th>Purchase_intent</th></tr>
<tr><td>Chi-Square</td><td>4.837</td><td>2.117</td><td>2.662</td><td>6.834</td></tr>
<tr><td>df</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>Asymp. Sig.</td><td>.028</td><td>.146</td><td>.103</td><td>.009</td></tr>
<tr><td colspan="5">a. Kruskal Wallis Test</td></tr>
<tr><td colspan="5">b. Grouping Variable: Group</td></tr>
</table>

Table 11

Kruskal-Wallis Test - Group 2 and Group 3

<table>
<tr><th colspan="5">Test Statistics[a,b]</th></tr>
<tr><th></th><th>Image_creation_ease</th><th>Image_Vividness</th><th>Obect_interactivity</th><th>Purchase_intent</th></tr>
<tr><td>Chi-Square</td><td>.300</td><td>2.473</td><td>5.949</td><td>.455</td></tr>
<tr><td>df</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>Asymp. Sig.</td><td>.584</td><td>.116</td><td>.015</td><td>.500</td></tr>
<tr><td colspan="5">a. Kruskal Wallis Test</td></tr>
<tr><td colspan="5">b. Grouping Variable: Group</td></tr>
</table>

Object interactivity.

A Kruskal-Wallis Test revealed no statistically significant difference in object interactivity levels across the two groups (Gp 1, n = 16: VR condition, Gp 2, n = 35: 2D condition) p = .874. This does not support the hypothesis H2.1 which states that a significant decrease in levels of object interactivity will exist when comparing the 2D condition to the VR condition.

A second Kruskal-Wallis Test revealed no statistically significant difference in object interactivity levels across the two groups (Gp 1, n = 16: VR condition, Gp 3, n = 23: in-store

condition) $p = .103$. This does not support the hypothesis H2.2 which states that a significant decrease in levels of object interactivity will exist when comparing the VR condition to the in-store condition.

A third Kruskal-Wallis Test revealed a statistically significant difference in object interactivity levels across the two groups (Gp 2, n = 35: 2D condition, Gp 3, n = 23: in-store condition) $p = .015$, $r = 0.10$. The in-store condition recorded a higher median score ($Md = 7$) than the 2D condition which recorded a median value of $Md = 6$. This confirms the hypothesis H2.3 which states that a significant decrease in levels of object interactivity will exist when comparing the 2D condition to the in-store condition.

Mental image creation ease.

A Kruskal-Wallis Test revealed a statistically significant difference in mental image creation ease levels across the two groups (Gp 1, n = 16: VR condition, Gp 2, n = 35: 2D condition) $p = .003$, $r = 0.17$. The 2D condition recorded a higher median score ($Md = 7$) than the VR condition which recorded a median value of $Md = 6$. This does not support the hypothesis H3.1 which states that a significant decrease in levels of mental imagery will exist when comparing the 2D condition to the VR condition by showing the opposite.

A secondary Kruskal-Wallis Test revealed a difference in mental image creation ease levels approaching statistical significance across the two groups (Gp 1, n = 16: VR condition, Gp 3, n = 23: in-store condition) $p = .028 > 0.017$. This does not support the hypothesis H3.2 which states that a significant decrease in levels of mental imagery will exist when comparing the VR condition to the in-store condition.

A Kruskal-Wallis Test revealed no statistically significant difference in mental image creation ease levels across the two groups (Gp 2, n = 35: 2D condition, Gp 3, n = 23: in-store condition) $p = .584$. This does not support the hypothesis H3.3 which states that a significant decrease in levels of mental imagery creation ease will exist when comparing the 2D condition to the in-store condition.

Purchase Intent.

A Kruskal-Wallis Test revealed no statistically significant difference in purchase intent levels across the two groups (Gp 1, n = 16: VR condition, Gp 2, n = 35: 2D condition) p = .047. This confirms the hypothesis H5.1 which states that there will be no significant difference in levels of purchase intent when comparing the VR condition to the 2D.

A second Kruskal-Wallis Test revealed a statistically significant difference in purchase intent levels across the two groups (Gp 1, n = 16: VR condition, Gp 3, n = 23: in-store condition) p = .009, r = 0.180. The in-store condition recorded a higher median score (Md = 6) than the VR condition which recorded a median value of Md = 4. This does not support the hypothesis H5.2 which states that there will be no significant difference in levels of purchase intent when comparing the VR condition to the in-store condition.

Lastly, a final Kruskal-Wallis Test revealed no statistically significant difference in purchase intent levels across the two groups (Gp 2, n = 35: 2D condition, Gp 3, n = 23: in-store condition) p = .500. This does not support the hypothesis H5.3 which states that a significant decrease in levels of purchase intent will exist when comparing the 2D condition to the in-store condition.

Purchase intent correlations.

The table below (Table 12) shows the correlations across the measured variables.

Table 12

Spearman's rho - Correlations

			Purchase_intent
Spearman's rho	Image_creation_ease	Correlation Coefficient	.637**
		Sig. (2-tailed)	0
		N	74
	Image_Vividness	Correlation Coefficient	.453**
		Sig. (2-tailed)	0
		N	74
	Obect_interactivity	Correlation Coefficient	.450**
		Sig. (2-tailed)	0
		N	74
	Spatial_presence	Correlation Coefficient	0.157
		Sig. (2-tailed)	0.27
		N	51
	Engagement	Correlation Coefficient	.403**
		Sig. (2-tailed)	0.003
		N	51
	Ecological_validity	Correlation Coefficient	.486**
		Sig. (2-tailed)	0
		N	51
	Negative_effects	Correlation Coefficient	-.423**
		Sig. (2-tailed)	0.002
		N	51
**. Correlation is significant at the 0.01 level (2-tailed).			
*. Correlation is significant at the 0.05 level (2-tailed).			

The sixth hypothesis states that there will be a significant positive correlation between object interactivity and PI. The Spearman's rho correlation test performed suggests that higher object interactivity levels may lead to higher PI levels $r = 0.45$, $p < 0.01$. Further testing also revealed that there is a strong positive correlation between both (a) mental image creation

ease and (b) mental image vividness, and PI with the first scoring $r = 0.637$, $p < 0.01$ and the second at $r = 0.453$, $p < 0.01$ thus supporting both hypotheses H6.1 and H6.2.

The last hypothesis states that there will be significant correlations between the four dimensions of presence and PI. The Spearman's rho correlation test performed suggests that there is no correlation between spatial presence and PI which does not support H7.1. On the other hand, the results suggest a strong positive correlation between both (a) engagement ($r = 0.403$, $p = 0.003$) and (b) ecological validity ($r = 0.486$, $p < 0.01$), and PI supporting the hypotheses H7.2 and H7.3. Lastly, hypothesis H7.4 stated that there will be a significant negative correlation between negative effects and PI which appears to be supported by the results of the Spearman's rho correlation test ($r = 0.\text{-}423$, $p = 0.002$).

Lastly statistical significance of the difference between correlation coefficients was tested by performing a Spearman's rho correlation test on each individual group and then calculating the z and z_{abs} score which can be seen in the table below (Table 13).

Table 13

Statistical significance of the difference between correlation coefficients

	Group 1 - 2		Group 1 - 3		Group 2 - 3	
	N	**z_{abs}**	**N**	**z_{abs}**	**N**	**z_{abs}**
Image_creation_ease		0.22		0.20		-0.71
Image_Vividness	51	1.80	39	1.70	58	0.88
Obect_interactivity		1.93		1.80		-0.39
Spatial_presence		0.48				
Engagement	51	-0.49				
Ecological_validity		0.27				
Negative_effects		1.90				

$$z_{abs} = \frac{z_1 - z_2}{\sqrt{\frac{1}{N_1 - 3}} + \sqrt{\frac{1}{N_2 - 3}}}$$

As before, adjustments to the alpha level have to be made and as such the above results are only significant if they are outside of the interval -2.31 to 2.31 (equivalent of alpha = 0.017) After performing the statistical tests the results show that the null hypothesis cannot be rejected as all z_{abs} values fall within the rejection interval.

<div align="center">**Discussion**</div>

Overview of the findings

     Presence in VR compared to 2D.

     The present study tested whether presence and object interactivity influence purchase intent across a range of advertising practices. The reason for researching this topic is to identify whether VR can drive purchase intent and if so to what degree as advertising both branding and performance have ultimately the same goal - to engage with consumers and promote a good or service.

     The argument is made that based on previous findings and the current use cases of HMDs and VR, participants in the VR condition will experience a higher degree of presence compared to the participants in the 2D condition. The findings support this theory by showing that participants reported higher levels of spatial presence and engagement in the VR condition. Furthermore, the ecological validity dimension showed no significant difference between VR and 2D suggesting that the virtual environment was realistic enough for participants to accept the presupposition that what they are seeing is real. Finally, contrary to the expected the negative effects dimension was significant in favour of the 2D environment suggesting that HMD technology still needs improvement for it to be used in longer exposure sessions.

     Object interactivity and mental image creation ease across conditions.

     The concepts tested next were object interactivity, mental image creation ease and mental image vividness with past literature also suggesting that they drive purchase intent. These concepts together form a system which depicts the advertised product with as much detail as possible to further drive awareness and sales.

     Below, the results of object interactivity and mental image creation ease will be discussed. To be noted that mental image vividness did not show any statistically significant differences across the groups possibly indicating that the same level of mental image vividness

is achieved via all three mediums. This is turn would suggest that seeing an ad in 2D or experiencing it in VR would lead to the same result as seeing the product first hand in store.

Object interactivity levels did not show any significant difference when comparing the VR group to the 2D group or the VR group to the in-store group. This might suggest that despite the lack of a physical product to inspect, the VR and 2D environment were able to relay the main characteristics of the product to the consumers. However, object interactivity levels differ significantly when comparing the 2D condition to the in-store condition with the latter scoring higher. Although this appears to be in contradiction with the findings in the other two pairs of groups, it can be argued that out of the three conditions, only two were actually using Bose made materials and equipment. The VR ad was created in house and given a number of limitations which will be presented in the limitations section, it could not achieve the quality standard that consumers expect from Bose, be it in the quality of the product or in the ad itself. This in turn might suggest that the VR environment performed better than could be measured. Arguably, if the experiment would be duplicated with both VR and 2D environments created in house and then compared, the VR condition could possibly show statistically significant differences.

Mental image creation ease shows similar patterns and trends to object interactivity. There were no significant differences when comparing VR to in-store or 2D to in-store. This suggests that participants reported similar levels of mental image creation ease which fulfilled the presupposition of effective advertising, this being that the consumers have to be able to understand the purpose and the uses of the product without having it at hand. However, there were significant differences in levels of mental image creation ease between the VR and 2D condition which at first seems to contradict the above. It can be argued that there were subtle differences in the messages conveyed in the two conditions that led to this discrepancy. The 2D video ad shows a social event of a young group of people enjoying themselves while listening to music, while the VR environment depicts the home use approach. What this indicates is that there are still areas which should be researched such as the depiction of group versus individual use of products which will be covered in the limitations sections below.

Purchase intent.

In line with previous findings, purchase intent levels did not show significant differences when comparing the VR to the 2D group or the 2D to the in-store group. This would suggest that all three performed equally well in driving purchase intent. However, when comparing the VR group to the in-store group a significant difference was found in favour of the in-store group. This finding opposes the conclusions that was drawn from the other comparisons and might be explained by the novelty factor of VR. In other terms, if participants were too distracted by using VR for the first time it could be possible that they lost the focus which was set on the speaker thus lowering the impact that the environment had on purchase intent.

Purchase intent correlations.

In order to test whether there are correlations between the concepts tested and purchase intent, a Spearman's rho correlation test was performed. This test revealed that all psychological concepts except for spatial presence had significant correlations to purchase intent. This supports the previous findings and suggests that that these concepts can be used as guidelines to drive purchase intent. Surprisingly, spatial presence had no significant correlation when tested across groups. Arguably, this could have been explained by the significant difference in levels of spatial presence between the VR and the 2D group. To isolate this further, the statistical significance of the difference between correlation coefficients had to be calculated. These calculations revealed no significant difference across all dimensions which not only showed that the null hypothesis cannot be rejected but also suggests that the difference in levels of spatial presence cannot account for the lack of a significant correlation. This will be discussed further in the limitations section.

Practical Implications

The research is centered around the practical implications of advertising effectiveness in VR environments. The argument was made that given the characteristics of object interactivity and presence, VR environments could possibly drive both awareness and purchase intent (ergo sales) better than the video equivalent used presently. What becomes clear from the research

conducted here is that VR environments are able to create and/or reproduce certain psychological concepts that are necessary for a successful advertising platform from a psychological point of view. As expected this is not enough and further analyses of both the concepts presented as well as the economical and financial aspects are required to establish if a migration toward VR environments is profitable.

Limitations

As described above there are several limitations of this study. The first one which could possibly account for the deviations in the results is the VR environment developed in IADT. Severely limited timeframes and financial resources led the VR environment to a state of unfinished coding where the functionality was limited and the video quality visibly lower than the 2D ad. As the purpose of this environment was to emulate the real world as closely as possible in order to drive an increase in presence levels, it can be argued that given the same ratio of resources invested by Bose in the 2D ad, the VR environment could have performed better.

Secondly, the design of the VR environment is not based on any previous research on the target audience and the market demographics that the producer of the speaker wants to cover. The 2D ad shows multiple social events centered around easy accessibility to great music equipment. This is not reflected in the VR environment. To better understand why the target audience research is vital consider that a Bluetooth, 360 degree sound, waterproof speaker does not find the best application indoors. Where it performs best is an outdoor environment where the music must be heard by all involved, where portability is essential and where the connectivity has to be performant, stable and common.

Lastly, the third major limitation of this study is the sample used. Because of the same time and financial limitations mentioned above, a convenient sample was used and 74 participants were recruited in IADT, with 97.3% of those recruited being Irish. This limits the applicability of the results on a larger population size, other demographics or non-irish citizens.

The above should encourage researchers to further study advertising in VR and account for the mentioned limitations.

Conclusion

This study's aim was to fill the gap in knowledge by investigating if (a) presence and object interactivity will influence purchase intent and if so, (B) whether a VR environment is better at driving purchase intent compared to a 2D video ad. Based on the findings above, it can be argued that both the dimensions of presence and object interactivity with its subcategories can influence purchase intent. In terms of which platform can drive purchase intent more based on presence and object interactivity, the results are not conclusive. Further research is needed to evaluate the performance of VR advertising with a major improvement being using a widely available VR ad.

Overall, from a psychological perspective VR environments seems to be suited for advertising purposes as long as technological limitations are overcome. What should be noted is that this research started with a clear expectation of the in-store condition to perform overall better than the others as it could be argued that having the product in hand will increase all tested psychological concepts and will drive purchase intent the most. The results however suggest that this is not the case, and that both 2D and VR can replace the in-store experience to a certain degree.

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Appendices

Appendix A: List Of Figures

Appendix B: List Of Tables

Appendix C: Cronbach Alpha

```
RELIABILITY
  /VARIABLES=Image_creation_easeImage_VividnessObect_interactivityPurchase_
intent
    Spatial_presenceEngagement Ecological_validityNegative_effects
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE CORR
  /SUMMARY=TOTAL.
```

Reliability

Notes

Output Created		**30-MAR-2018 18:57…**
Comments		
Input	**Data**	**/Users/asozanschi/Desktop/SPSS.sav**
	Active Dataset	**DataSet1**
	Filter	**<none>**
	Weight	**<none>**
	Split File	**<none>**
	N of Rows in Working Data File	**74**
	Matrix Input	
Missing Value Handling	**Definition of Missing**	**User-defined missing values are treated as missing.**
	Cases Used	**Statistics are based on all cases with valid data for all variables in the procedure.**
Syntax		**RELIABILITY**
		/VARIABLES=Image_creation_ease Image_Vividness Obect_interactivity Purchase_intent Spatial_presence Engagement Ecological_validity Negative_effects /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA
		/STATISTICS=DESCRIPTIVE SCALE CORR /SUMMARY=TOTAL.

Notes

Resources	Processor Time	00:00:00.01
	Elapsed Time	00:00:00.00

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	51	68.9
	Excluded[a]	23	31.1
	Total	74	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.787	.767	8

Item Statistics

	Mean	Std. Deviation	N
Image_creation_ease	5.9804	1.19147	51
Image_Vividness	5.2941	1.52701	51
Obect_interactivity	5.3333	1.65731	51
Purchase_intent	4.6667	1.86190	51
Spatial_presence	2.6610	1.06601	51
Engagement	3.4973	.79982	51
Ecological_validity	3.5373	.86947	51
Negative_effects	1.4539	.62935	51

Inter-Item Correlation Matrix

	Image_creation_ease	Image_Vividness	Obect_interactivity	Purchase_intent	Spatial_presence
Image_creation_ease	1.000	.641	.510	.664	.130
Image_Vividness	.641	1.000	.514	.563	.305
Obect_interactivity	.510	.514	1.000	.413	.344
Purchase_intent	.664	.563	.413	1.000	.145
Spatial_presence	.130	.305	.344	.145	1.000
Engagement	.458	.462	.392	.454	.741
Ecological_validity	.528	.529	.351	.518	.554
Negative_effects	-.347	-.432	-.307	-.309	.080

Inter-Item Correlation Matrix

	Engagement	Ecological_validity	Negative_effects
Image_creation_ease	.458	.528	-.347
Image_Vividness	.462	.529	-.432
Obect_interactivity	.392	.351	-.307
Purchase_intent	.454	.518	-.309
Spatial_presence	.741	.554	.080
Engagement	1.000	.722	-.116
Ecological_validity	.722	1.000	-.337
Negative_effects	-.116	-.337	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Image_creation_ease	26.4435	30.936	.684	.632	.734
Image_Vividness	27.1298	28.266	.667	.554	.731
Obect_interactivity	27.0906	28.890	.549	.414	.757
Purchase_intent	27.7573	26.383	.605	.526	.750
Spatial_presence	29.7629	34.775	.438	.697	.772
Engagement	28.9267	34.241	.699	.736	.749
Ecological_validity	28.8867	33.818	.677	.651	.748
Negative_effects	30.9700	44.123	-.370	.343	.836

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
32.4239	41.423	6.43610	8

Appendix D: Normality

```
EXAMINE VARIABLES=Image_creation_easeImage_VividnessObect_interactivityPurc
hase_intent
    Spatial_presenceEngagement Ecological_validityNegative_effects
  /PLOT BOXPLOT STEMLEAF HISTOGRAM NPPLOT
  /COMPARE GROUPS
  /STATISTICS DESCRIPTIVES
  /CINTERVAL 95
  /MISSING LISTWISE
  /NOTOTAL.
```

Explore

Notes

Output Created		**30-MAR-2018 19:07…**
Comments		
Input	**Data**	**/Users/asozanschi/Desk top/SPSS.sav**
	Active Dataset	**DataSet1**
	Filter	**<none>**
	Weight	**<none>**
	Split File	**<none>**
	N of Rows in Working Data File	**74**
Missing Value Handling	**Definition of Missing**	**User-defined missing values for dependent variables are treated as missing.**
	Cases Used	**Statistics are based on cases with no missing values for any dependent variable or factor used.**

Notes

Syntax		EXAMINE VARIABLES=Image_creation_ease Image_Vividness Obect_interactivity Purchase_intent Spatial_presence Engagement Ecological_validity Negative_effects /PLOT BOXPLOT STEMLEAF HISTOGRAM NPPLOT /COMPARE GROUPS /STATISTICS DESCRIPTIVES /CINTERVAL 95 /MISSING LISTWISE /NOTOTAL.
Resources	**Processor Time**	00:00:05.81
	Elapsed Time	00:00:05.00

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	**Percent**	**N**	**Percent**	**N**	**Percent**
Image_creation_ease	51	68.9%	23	31.1%	74	100.0%
Image_Vividness	51	68.9%	23	31.1%	74	100.0%
Obect_interactivity	51	68.9%	23	31.1%	74	100.0%
Purchase_intent	51	68.9%	23	31.1%	74	100.0%
Spatial_presence	51	68.9%	23	31.1%	74	100.0%
Engagement	51	68.9%	23	31.1%	74	100.0%
Ecological_validity	51	68.9%	23	31.1%	74	100.0%
Negative_effects	51	68.9%	23	31.1%	74	100.0%

Descriptives

			Statistic	Std. Error
Image_creation_ease	**Mean**		5.9804	.16684
	95% Confidence Interval for Mean	**Lower Bound**	5.6453	
		Upper Bound	6.3155	
	5% Trimmed Mean		6.1111	
	Median		6.0000	
	Variance		1.420	
	Std. Deviation		1.19147	
	Minimum		2.00	
	Maximum		7.00	
	Range		5.00	
	Interquartile Range		1.00	
	Skewness		-1.585	.333
	Kurtosis		2.593	.656
Image_Vividness	**Mean**		5.2941	.21382
	95% Confidence Interval for Mean	**Lower Bound**	4.8646	
		Upper Bound	5.7236	
	5% Trimmed Mean		5.4259	
	Median		5.0000	
	Variance		2.332	
	Std. Deviation		1.52701	
	Minimum		1.00	
	Maximum		7.00	
	Range		6.00	
	Interquartile Range		1.00	
	Skewness		-1.153	.333
	Kurtosis		1.308	.656
Obect_interactivity	**Mean**		5.3333	.23207
	95% Confidence Interval for Mean	**Lower Bound**	4.8672	
		Upper Bound	5.7995	
	5% Trimmed Mean		5.4815	
	Median		6.0000	
	Variance		2.747	
	Std. Deviation		1.65731	
	Minimum		1.00	
	Maximum		7.00	
	Range		6.00	
	Interquartile Range		1.00	

Descriptives

			Statistic	Std. Error
Purchase_intent	**Skewness**		-1.492	.333
	Kurtosis		1.779	.656
	Mean		4.6667	.26072
	95% Confidence Interval for Mean	**Lower Bound**	4.1430	
		Upper Bound	5.1903	
	5% Trimmed Mean		4.7407	
	Median		5.0000	
	Variance		3.467	
	Std. Deviation		1.86190	
	Minimum		1.00	
	Maximum		7.00	
	Range		6.00	
	Interquartile Range		3.00	
	Skewness		-.438	.333
	Kurtosis		-.911	.656
Spatial_presence	**Mean**		2.6610	.14927
	95% Confidence Interval for Mean	**Lower Bound**	2.3612	
		Upper Bound	2.9608	
	5% Trimmed Mean		2.6481	
	Median		2.5600	
	Variance		1.136	
	Std. Deviation		1.06601	
	Minimum		1.00	
	Maximum		4.61	
	Range		3.61	
	Interquartile Range		1.72	
	Skewness		.176	.333
	Kurtosis		-.971	.656
Engagement	**Mean**		3.4973	.11200
	95% Confidence Interval for Mean	**Lower Bound**	3.2723	
		Upper Bound	3.7222	
	5% Trimmed Mean		3.5575	
	Median		3.6900	
	Variance		.640	
	Std. Deviation		.79982	
	Minimum		1.15	
	Maximum		4.77	

Descriptives

			Statistic	Std. Error
	Range		3.62	
	Interquartile Range		1.07	
	Skewness		-1.034	.333
	Kurtosis		1.092	.656
Ecological_validity	Mean		3.5373	.12175
	95% Confidence Interval for Mean	Lower Bound	3.2927	
		Upper Bound	3.7818	
	5% Trimmed Mean		3.5719	
	Median		3.6000	
	Variance		.756	
	Std. Deviation		.86947	
	Minimum		1.20	
	Maximum		5.00	
	Range		3.80	
	Interquartile Range		1.20	
	Skewness		-.744	.333
	Kurtosis		.388	.656
Negative_effects	Mean		1.4539	.08813
	95% Confidence Interval for Mean	Lower Bound	1.2769	
		Upper Bound	1.6309	
	5% Trimmed Mean		1.3631	
	Median		1.3300	
	Variance		.396	
	Std. Deviation		.62935	
	Minimum		1.00	
	Maximum		4.33	
	Range		3.33	
	Interquartile Range		.67	
	Skewness		2.594	.333
	Kurtosis		8.873	.656

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Image_creation_ease	.271	51	.000	.769	51	.000
Image_Vividness	.247	51	.000	.852	51	.000
Obect_interactivity	.244	51	.000	.791	51	.000
Purchase_intent	.159	51	.002	.913	51	.001
Spatial_presence	.092	51	.200[*]	.954	51	.045
Engagement	.113	51	.103	.922	51	.003
Ecological_validity	.137	51	.019	.946	51	.022
Negative_effects	.235	51	.000	.710	51	.000

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Image_creation_ease

Histogram

Mean = 5.98
Std. Dev. = 1.191
N = 51

Image_creation_ease
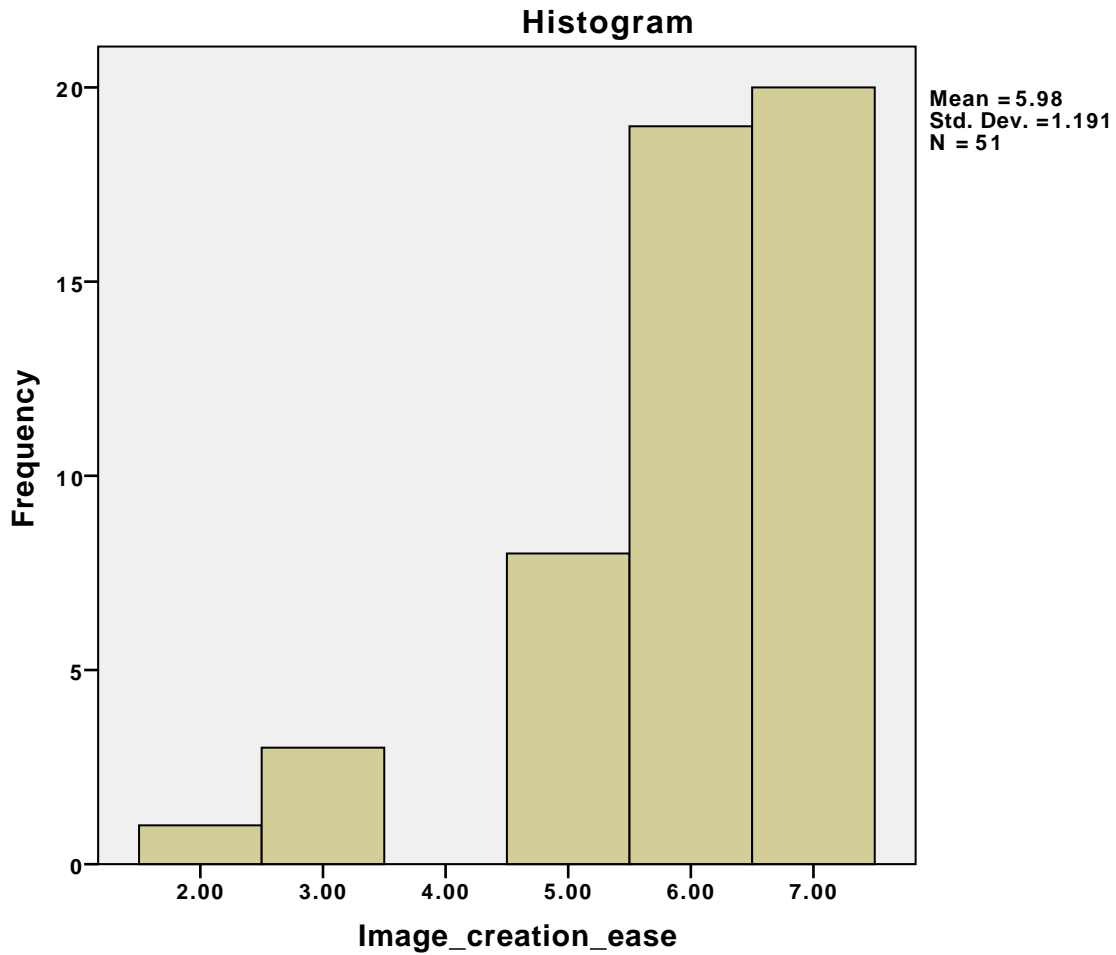
```
Image_creation_ease Stem-and-Leaf Plot

 Frequency     Stem &  Leaf

     4.00 Extremes    (=<3.0)
     8.00         5 .  00000000
      .00         5 .
    19.00         6 .  0000000000000000000
      .00         6 .
    20.00         7 .  00000000000000000000

 Stem width:      1.00
 Each leaf:        1 case(s)
```

Normal Q-Q Plot of Image_creation_ease

Detrended Normal Q-Q Plot of Image_creation_ease

Image_Vividness

Histogram

Mean = 5.29
Std. Dev. =1.527
N = 51
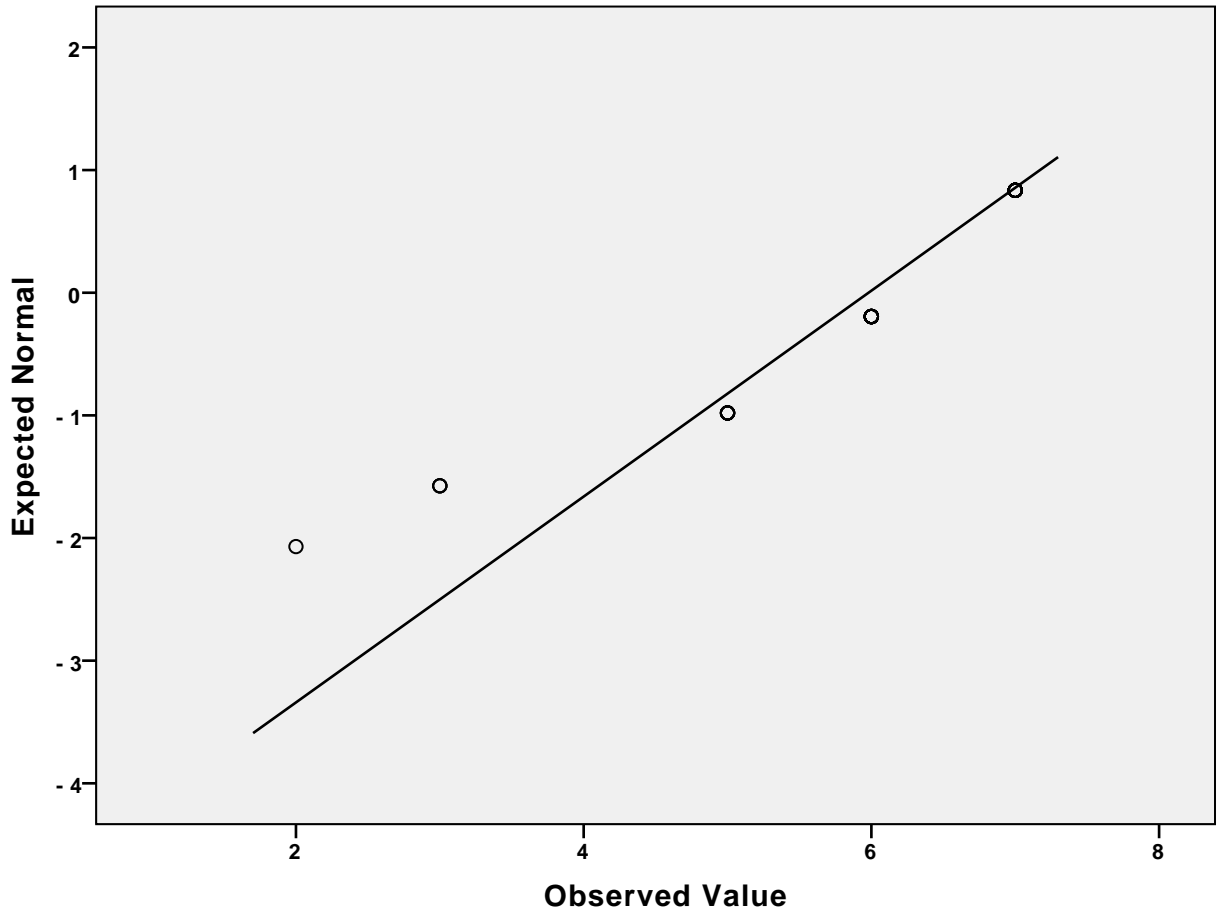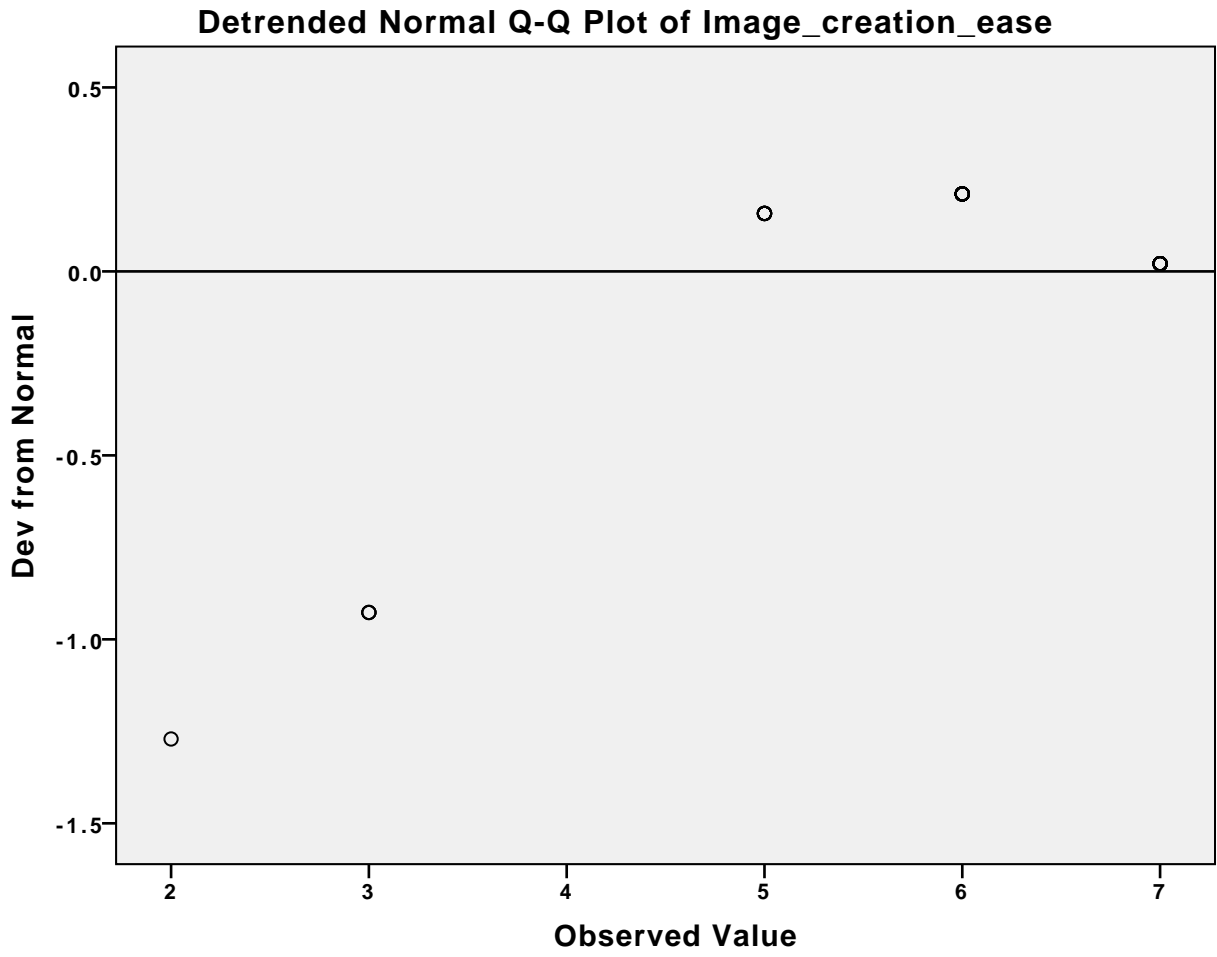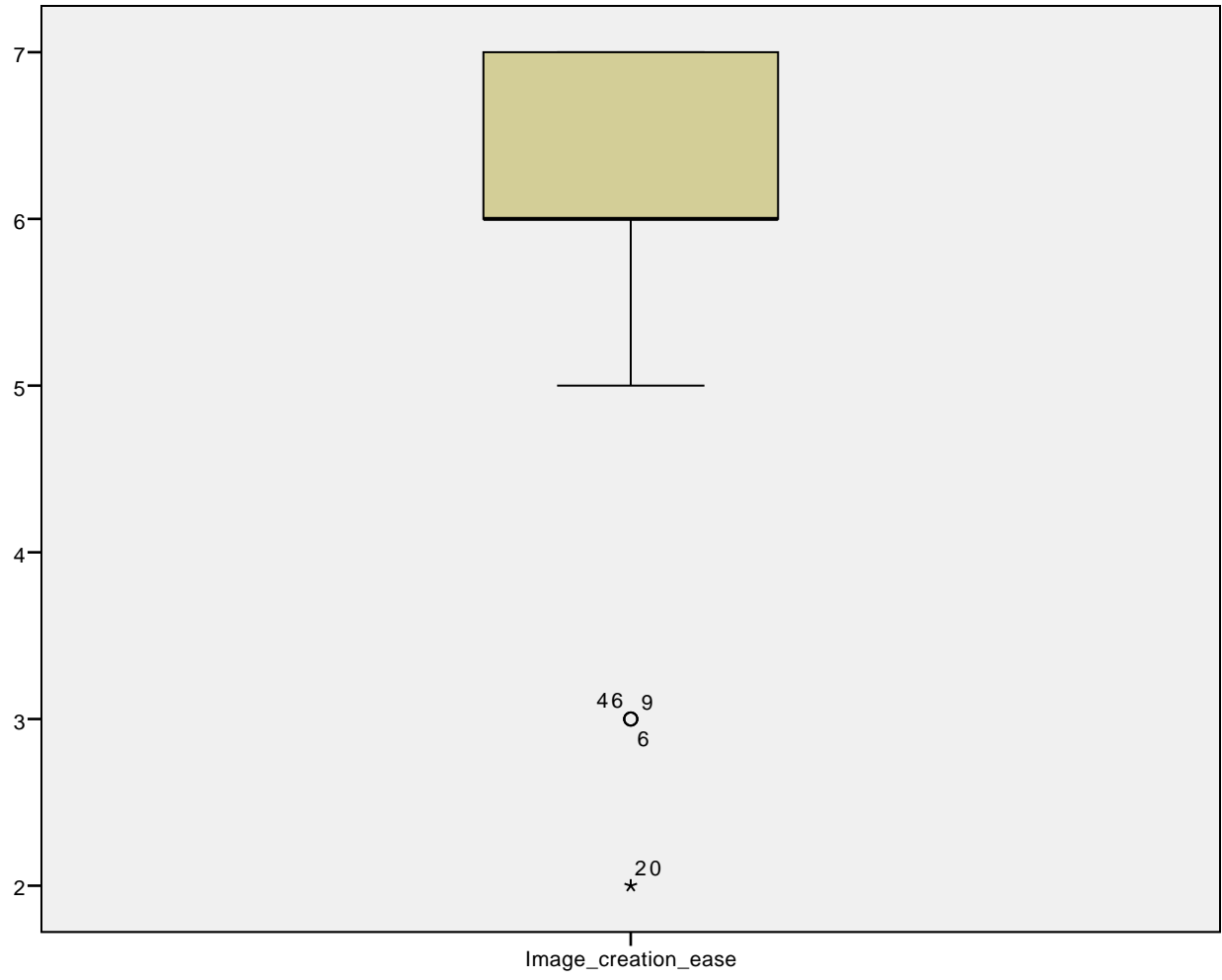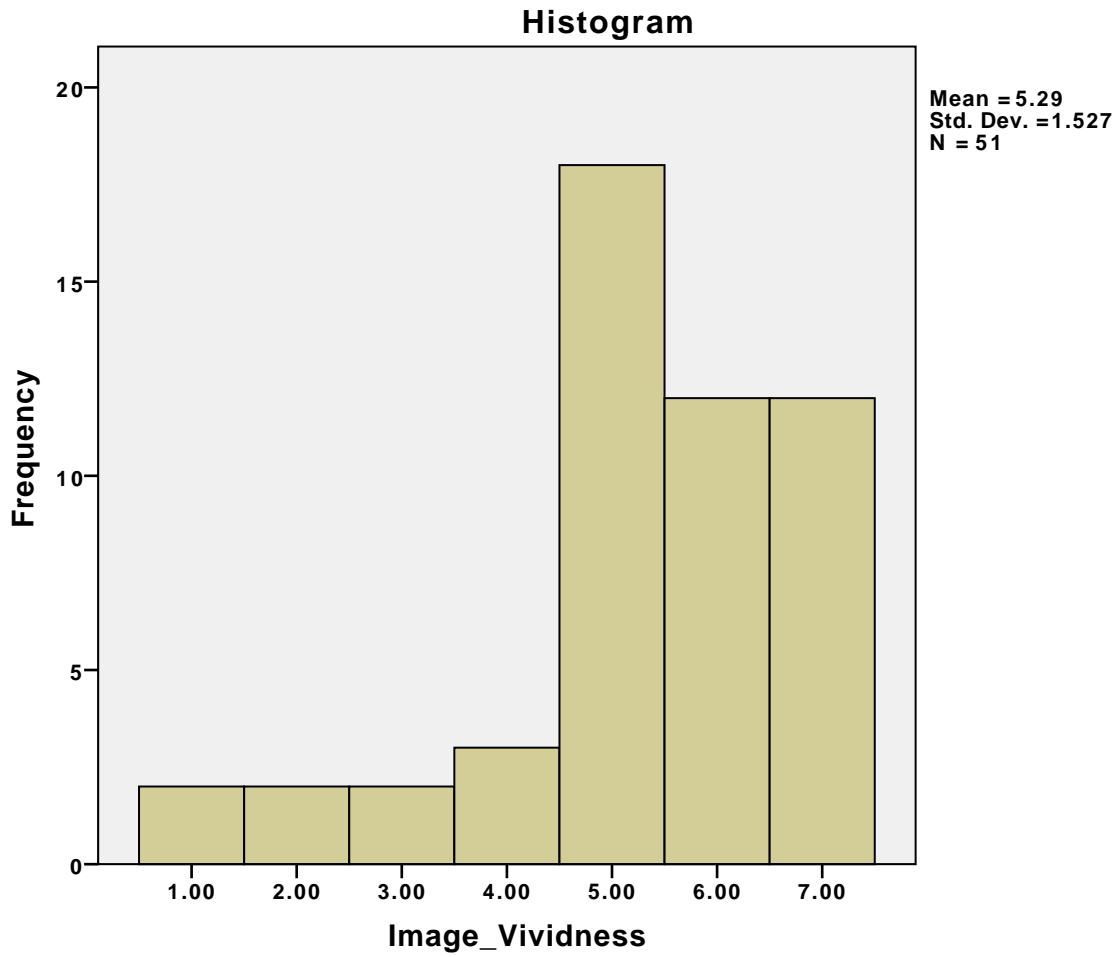
```
Image_Vividness Stem-and-Leaf Plot

 Frequency     Stem &  Leaf

     6.00 Extremes     (=<3.0)
     3.00        4 .  000
      .00        4 .
    18.00        5 .  000000000000000000
      .00        5 .
    12.00        6 .  000000000000
      .00        6 .
    12.00        7 .  000000000000

 Stem width:      1.00
 Each leaf:        1 case(s)
```

Normal Q-Q Plot of Image_Vividness

Detrended Normal Q-Q Plot of Image_Vividness

Obect_interactivity

Histogram

Mean = 5.33
Std. Dev. = 1.657
N = 51

Frequency (y-axis)
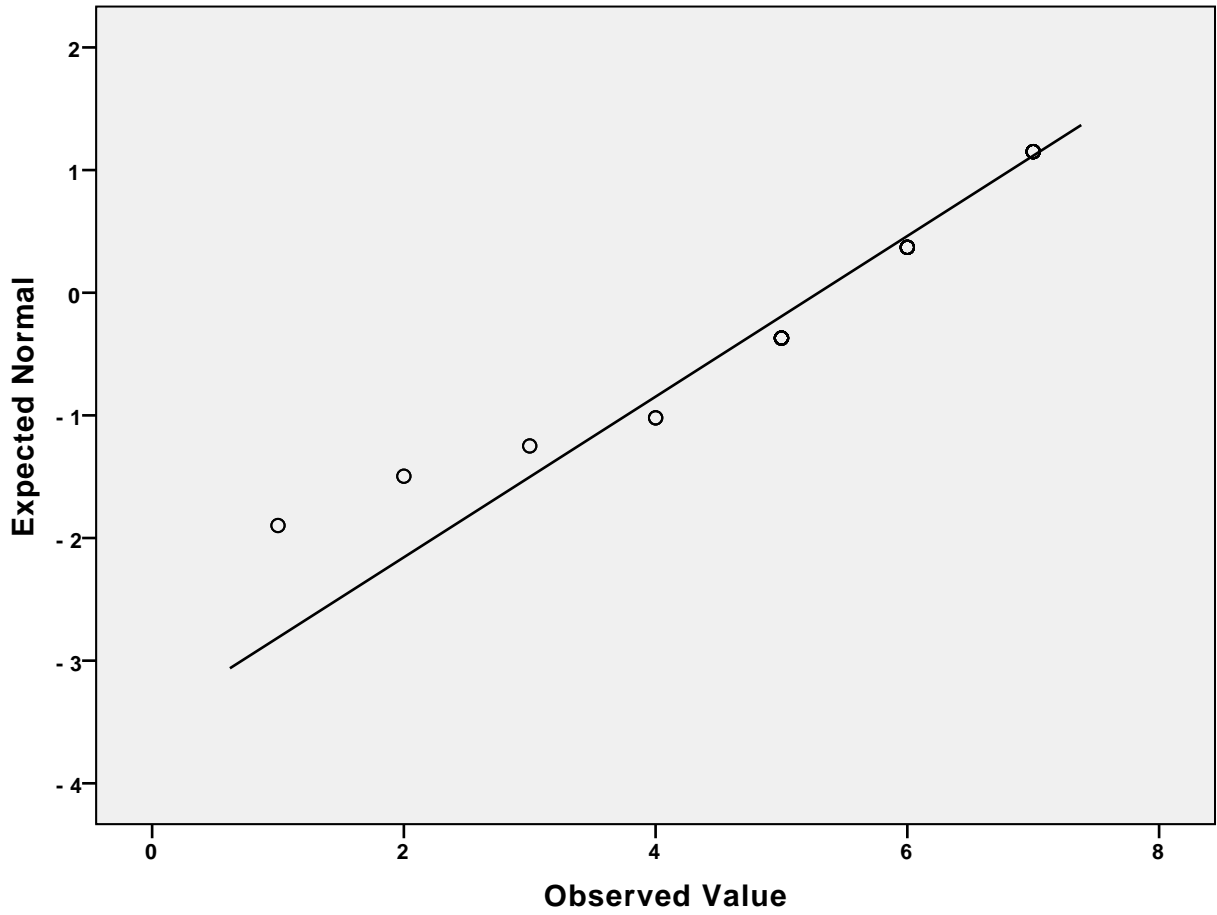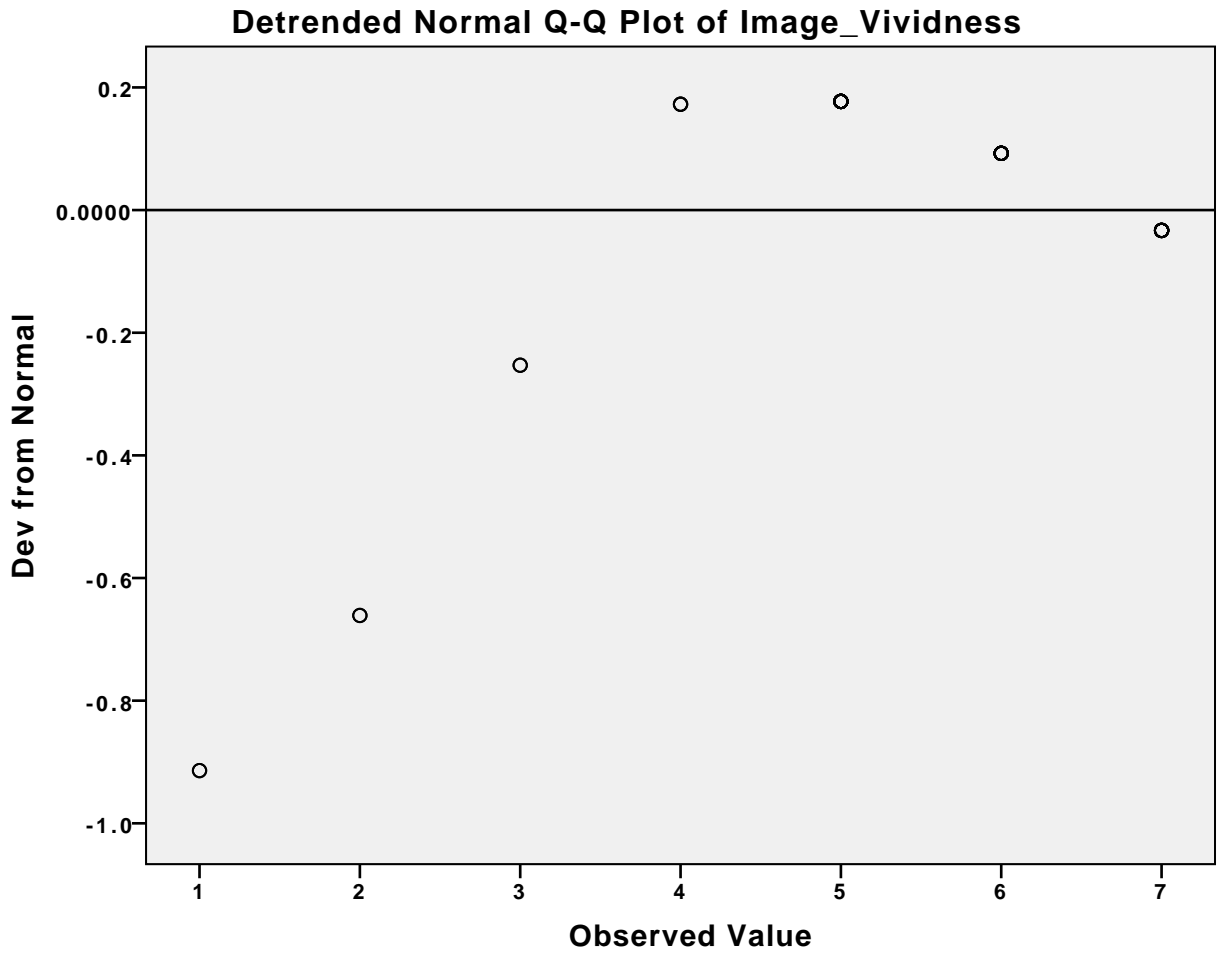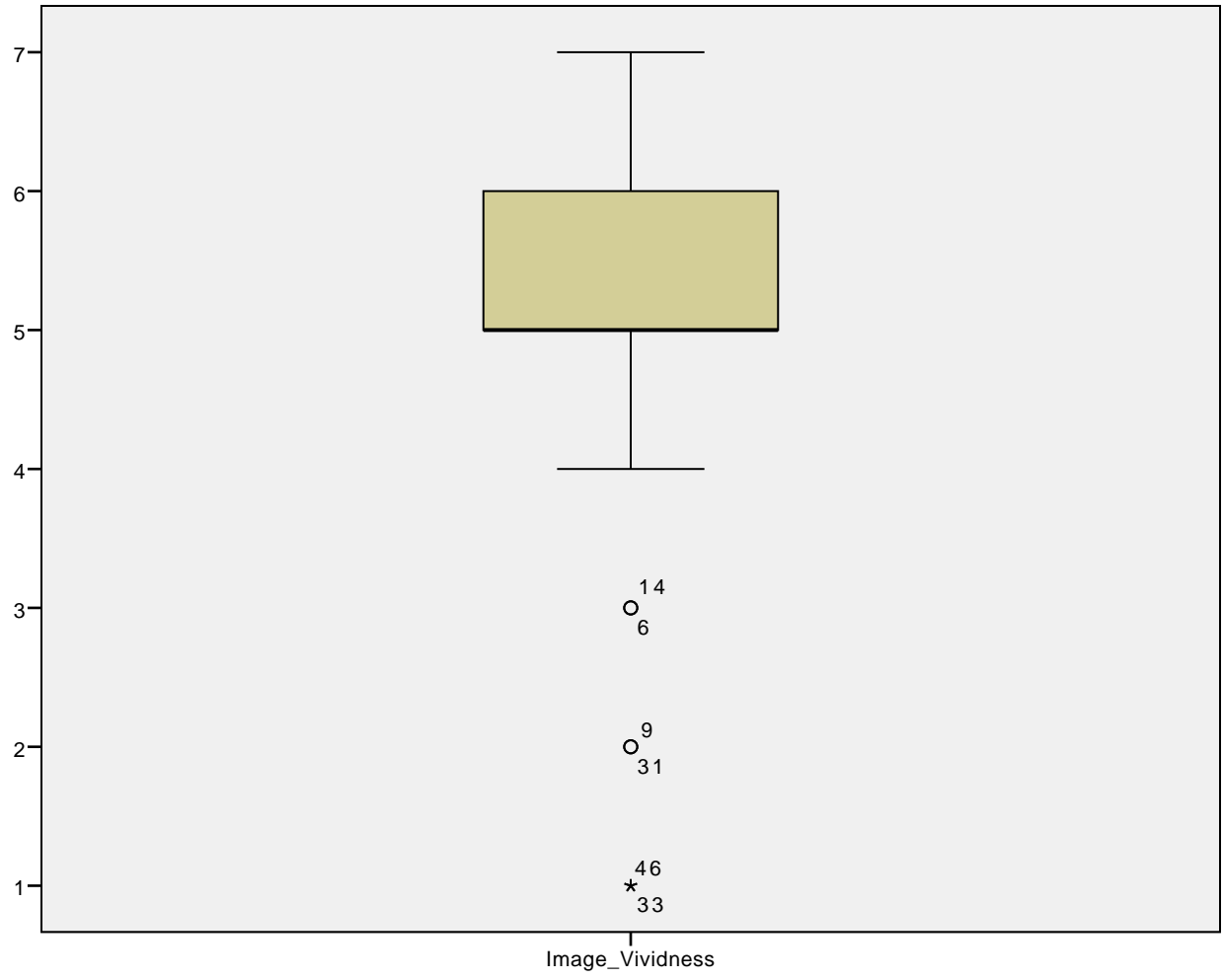
Obect_interactivity (x-axis)
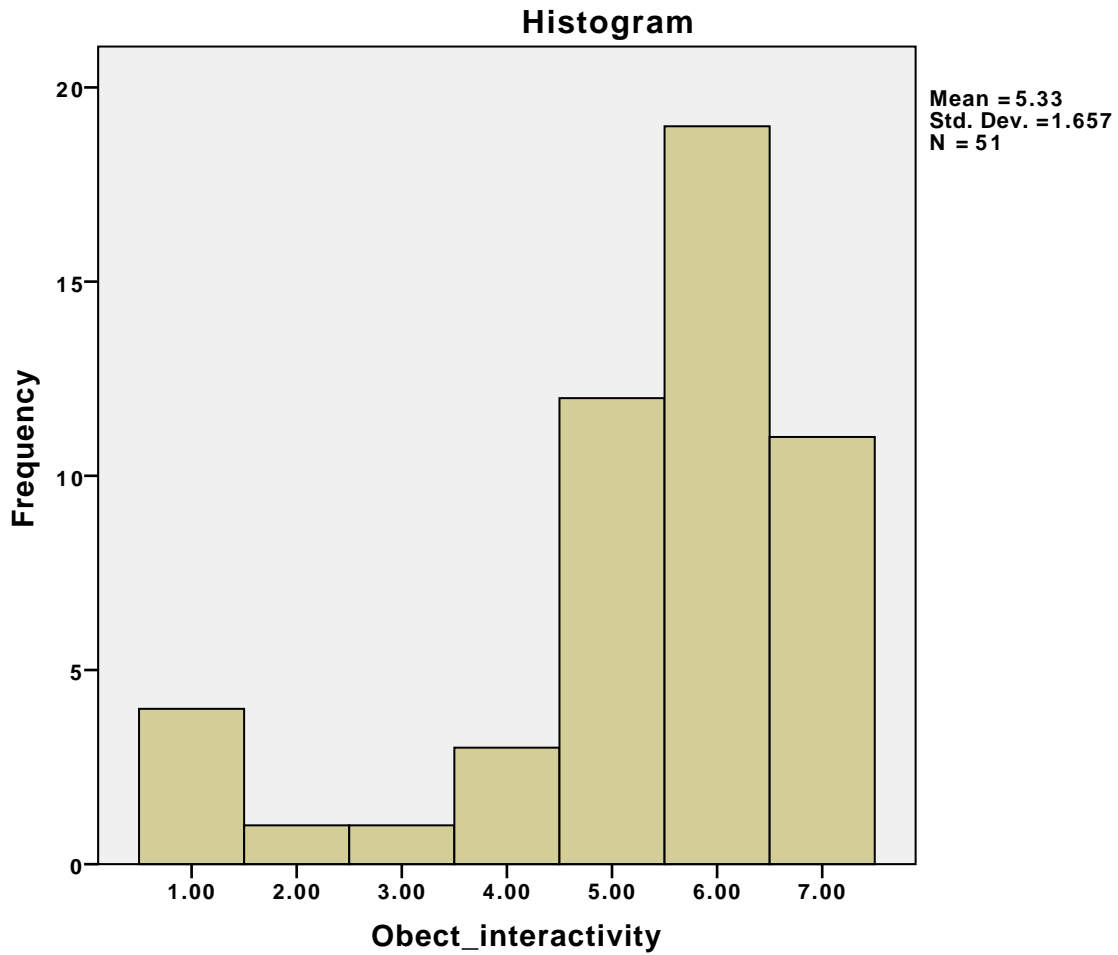
```
Obect_interactivity Stem-and-Leaf Plot

 Frequency     Stem &  Leaf

     6.00 Extremes     (=<3.0)
     3.00          4 .  000
      .00          4 .
    12.00          5 .  000000000000
      .00          5 .
    19.00          6 .  0000000000000000000
      .00          6 .
    11.00          7 .  00000000000

 Stem width:      1.00
 Each leaf:        1 case(s)
```

Normal Q-Q Plot of Obect_interactivity

Detrended Normal Q-Q Plot of Obect_interactivity

Purchase_intent

Histogram

Mean = 4.67
Std. Dev. =1.862
N = 51
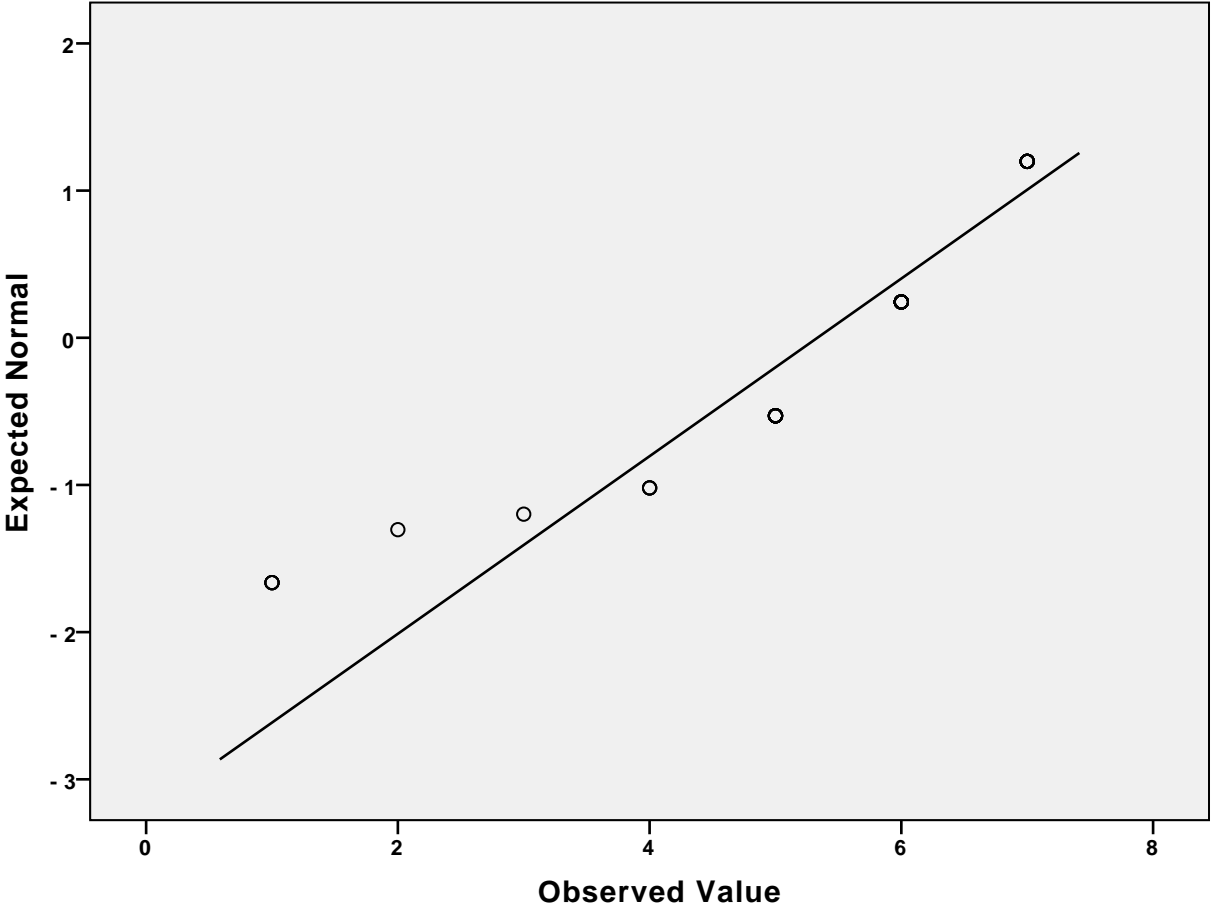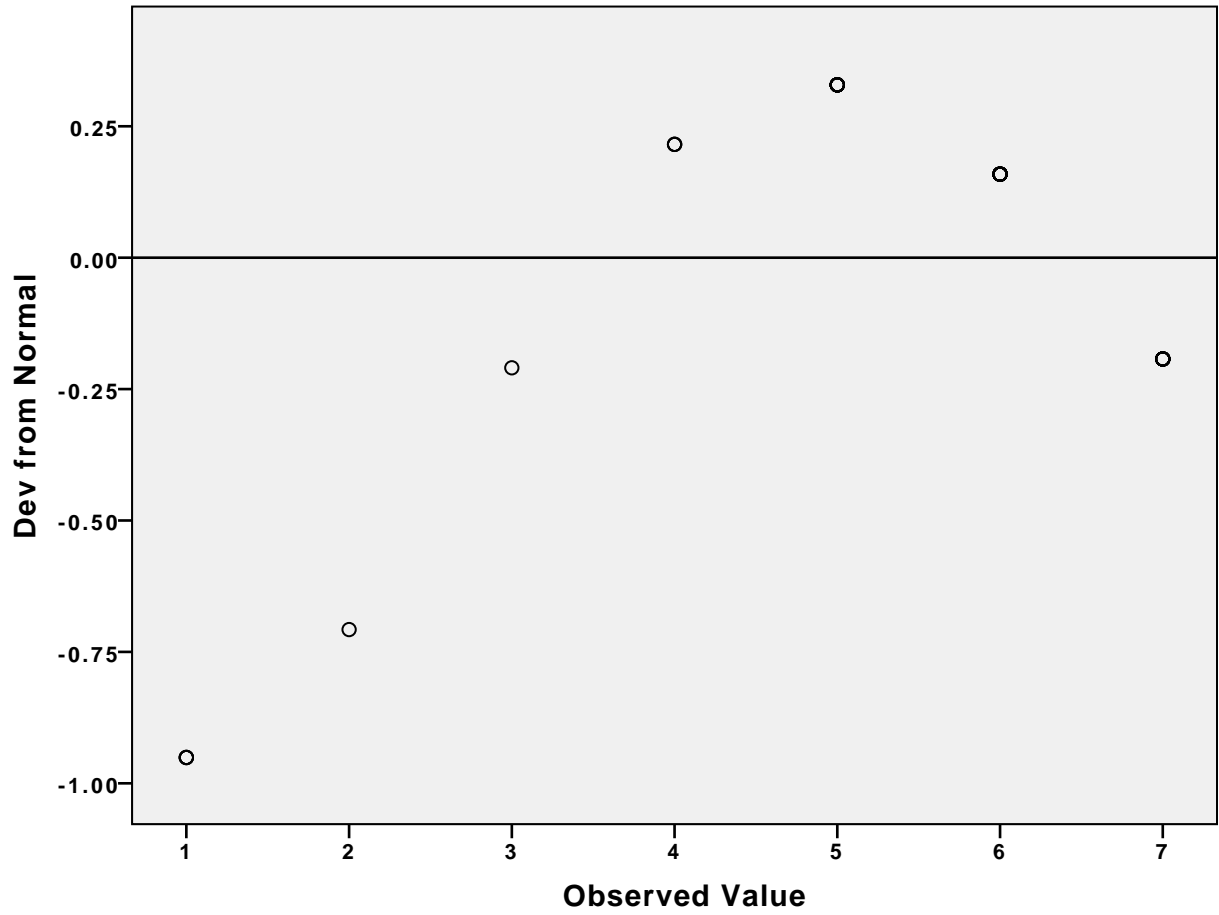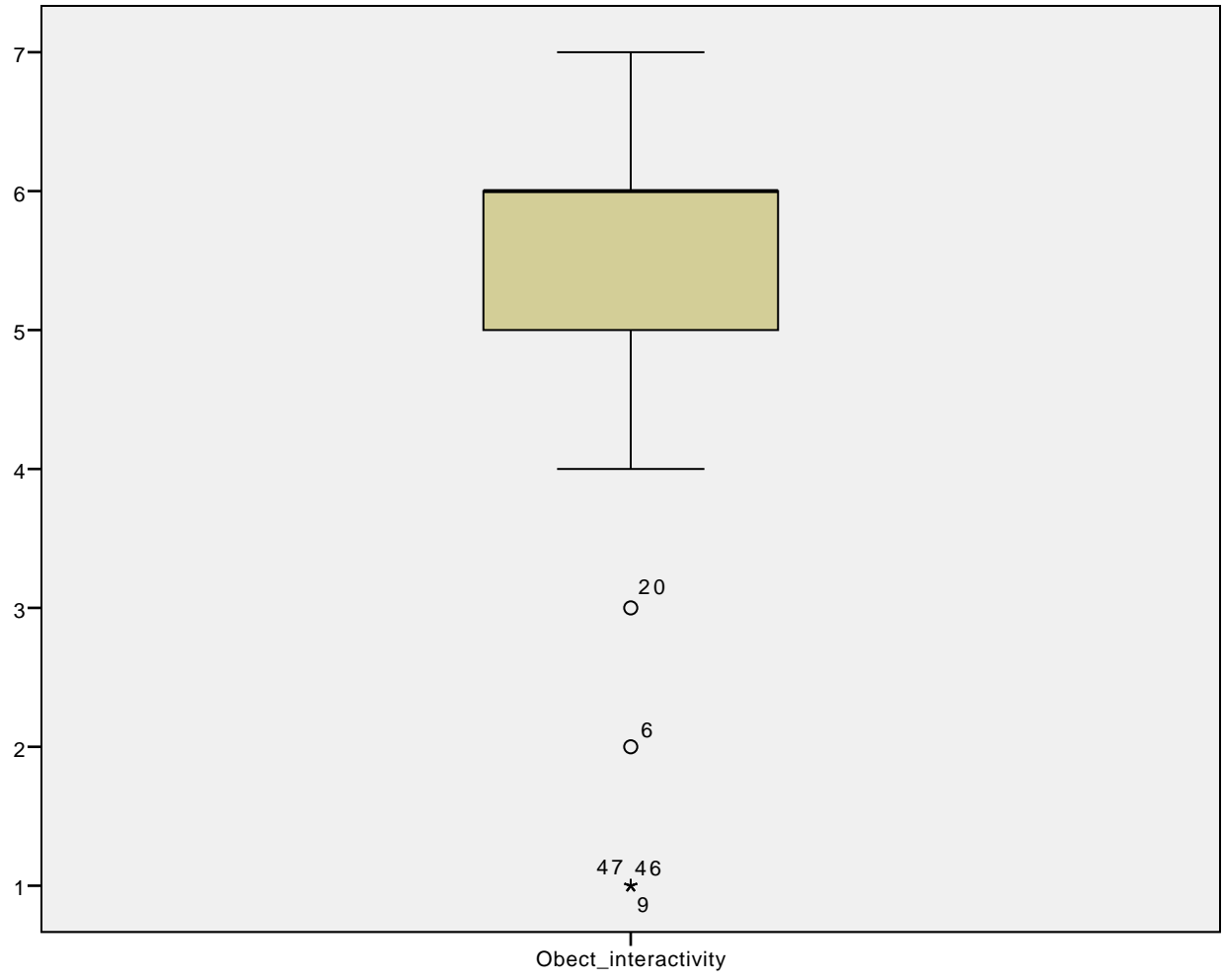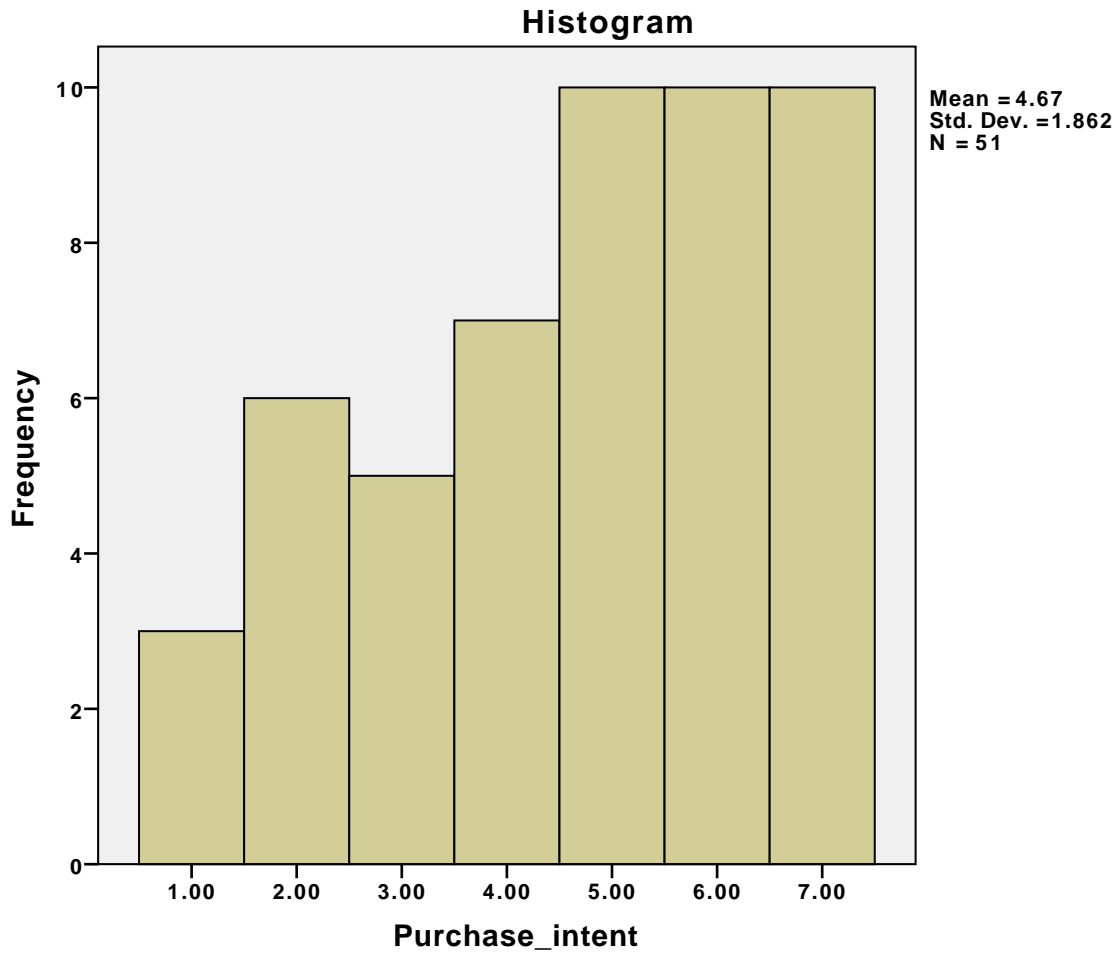
Purchase_intent

```
Purchase_intent Stem-and-Leaf Plot

 Frequency      Stem &  Leaf

     3.00          1 .  000
     6.00          2 .  000000
     5.00          3 .  00000
     7.00          4 .  0000000
    10.00          5 .  0000000000
    10.00          6 .  0000000000
    10.00          7 .  0000000000

 Stem width:       1.00
 Each leaf:        1 case(s)
```

Normal Q-Q Plot of Purchase_intent

Detrended Normal Q-Q Plot of Purchase_intent

Purchase_intent

Spatial_presence

Histogram

Mean = 2.66
Std. Dev. = 1.066
N = 51
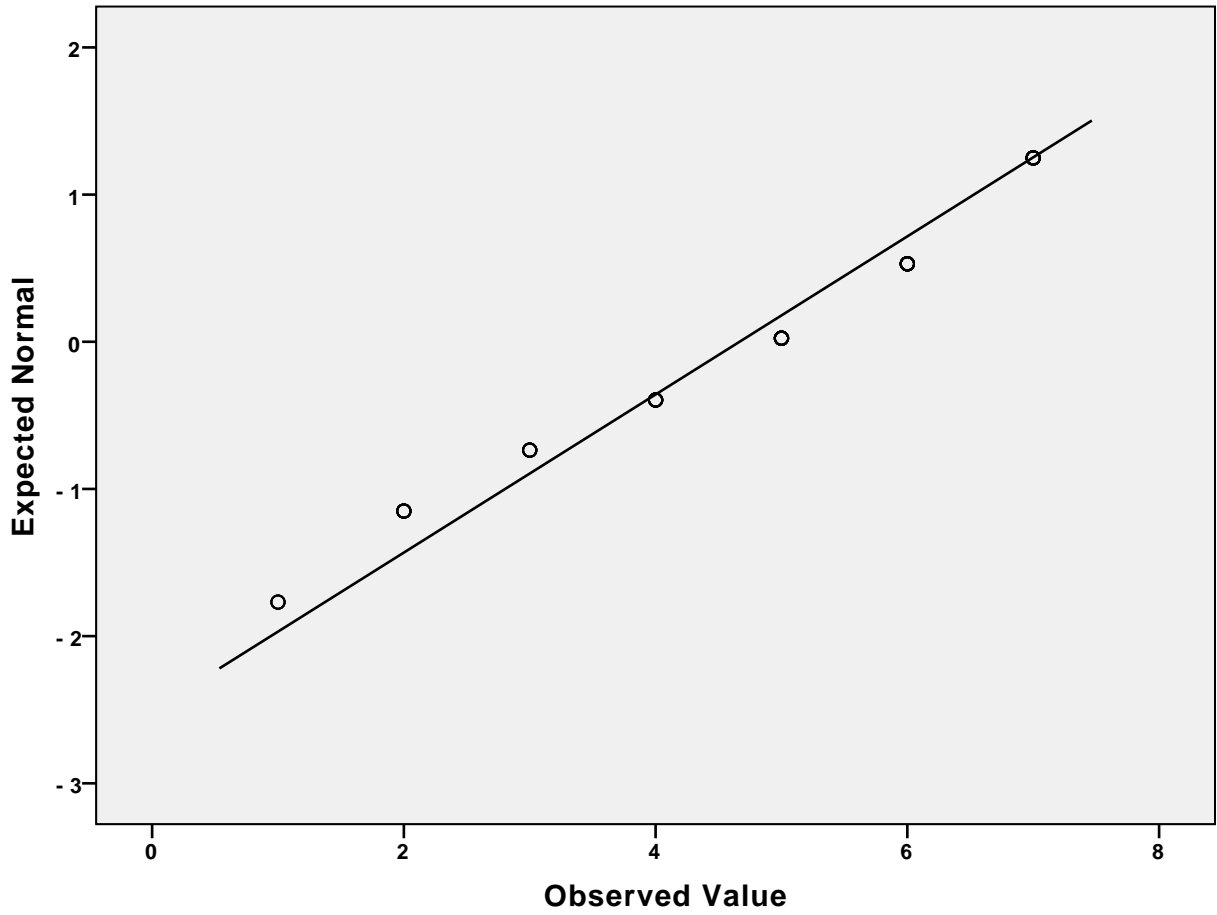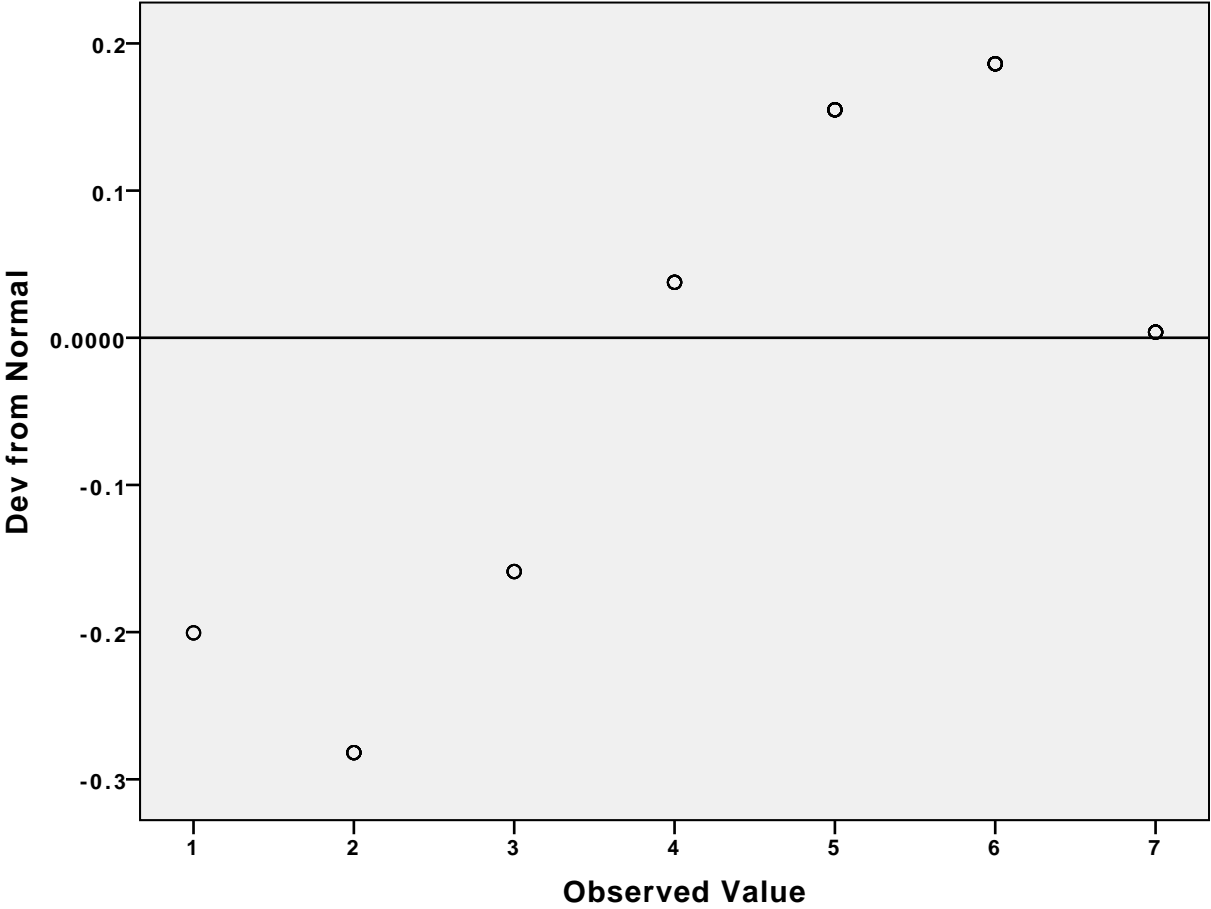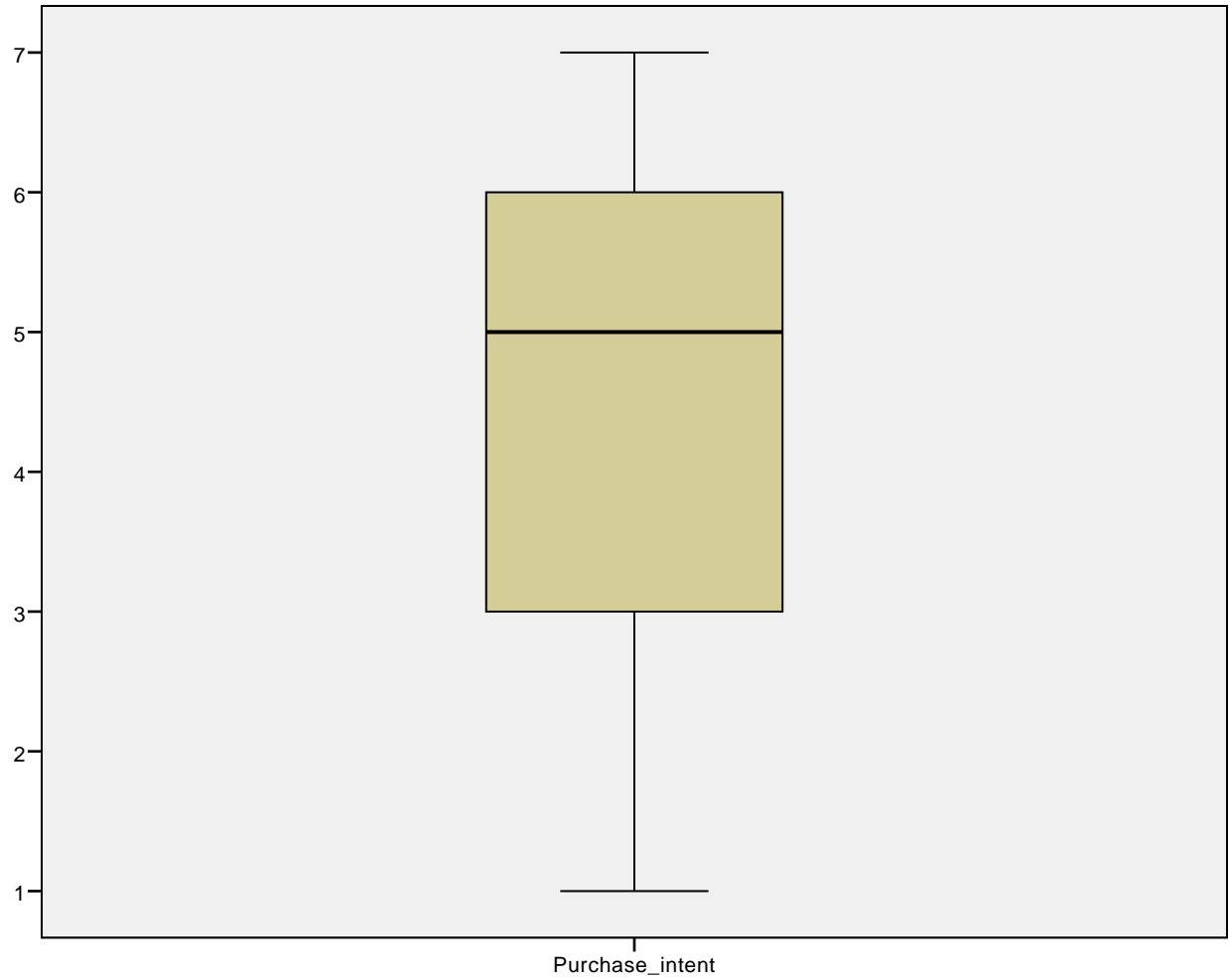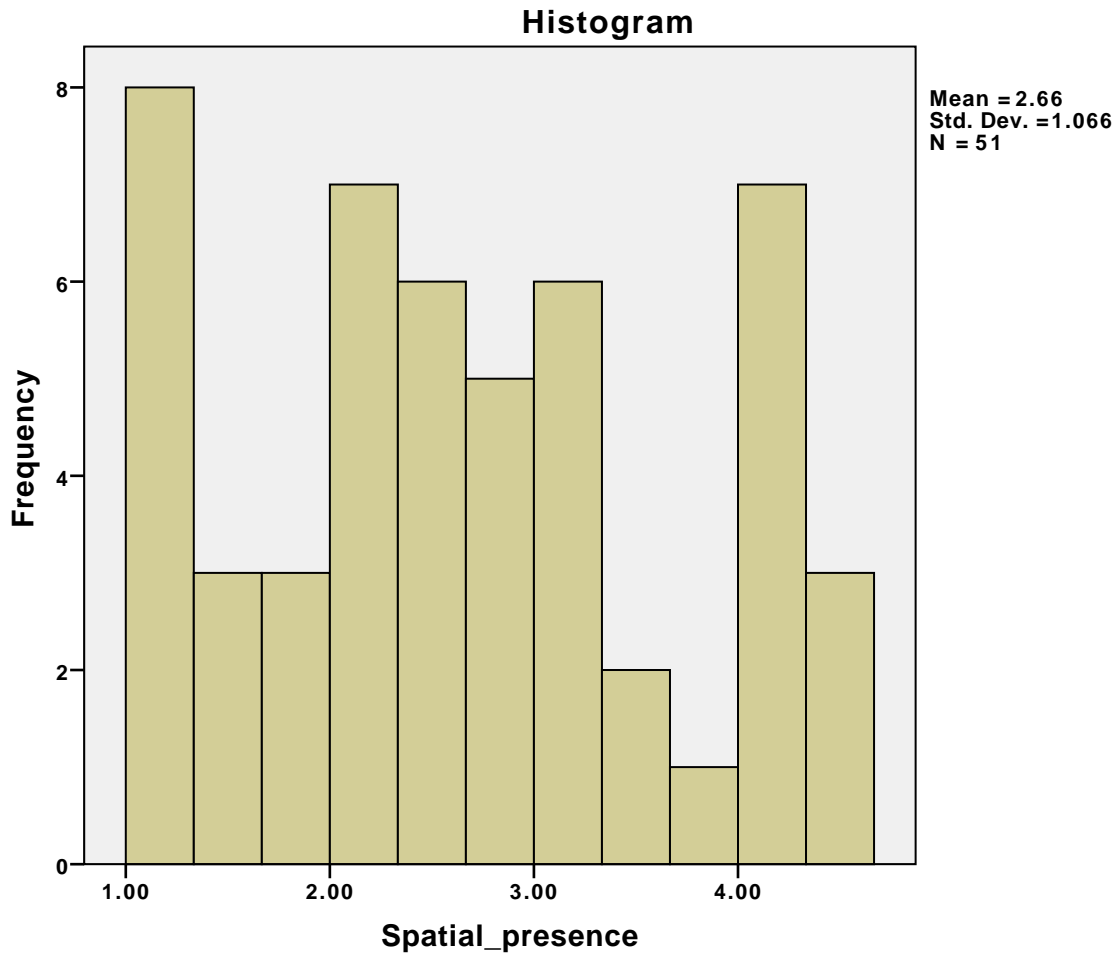
Spatial_presence

```
Spatial_presence Stem-and-Leaf Plot

Frequency      Stem &  Leaf

     8.00         1 .  00111113
     6.00         1 .  666777
     9.00         2 .  011133344
     9.00         2 .  555677888
     7.00         3 .  0001224
     2.00         3 .  57
     8.00         4 .  00011334
     2.00         4 .  56

 Stem width:      1.00
 Each leaf:        1 case(s)
```

Normal Q-Q Plot of Spatial_presence

Detrended Normal Q-Q Plot of Spatial_presence

Spatial_presence

Engagement

Histogram

Mean = 3.50
Std. Dev. = .80
N = 51

Frequency (y-axis)
Engagement (x-axis)
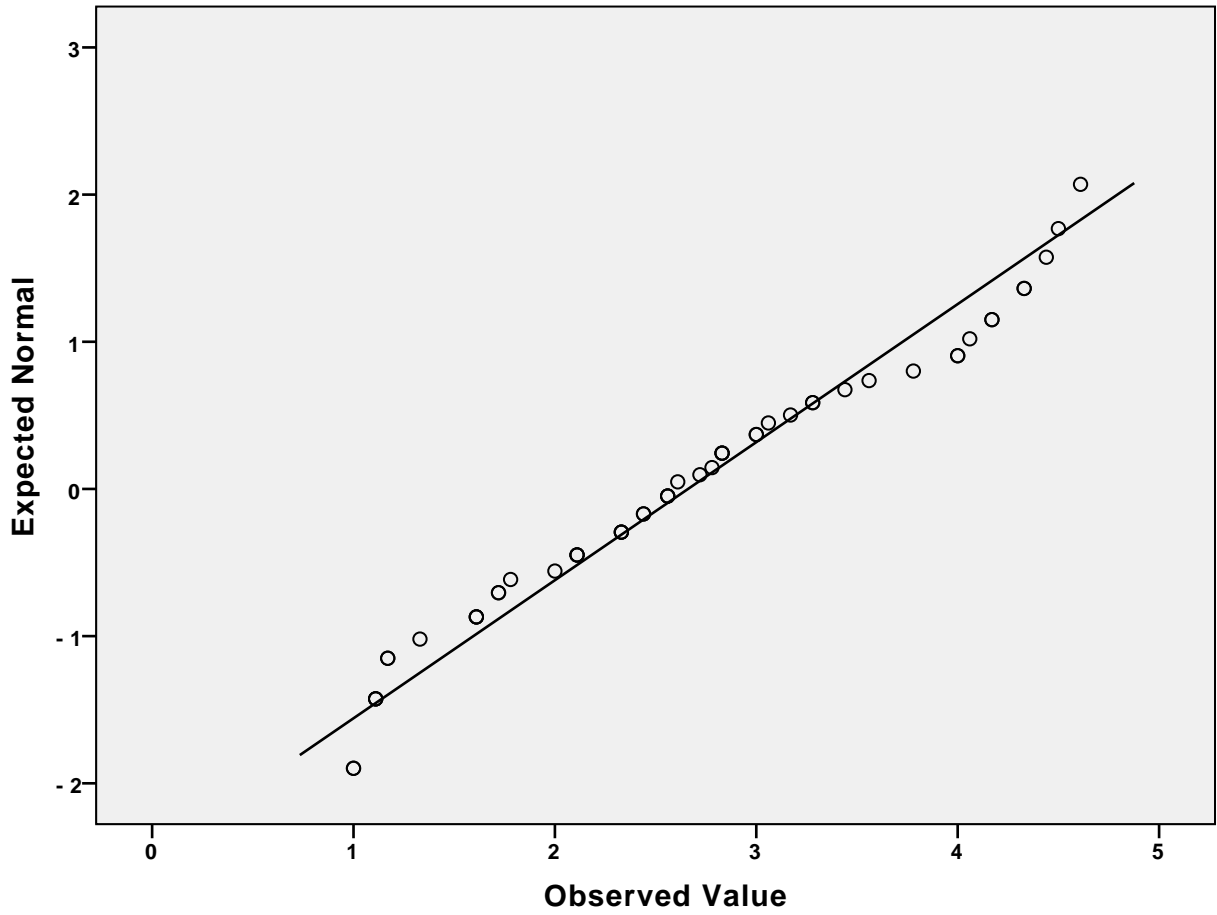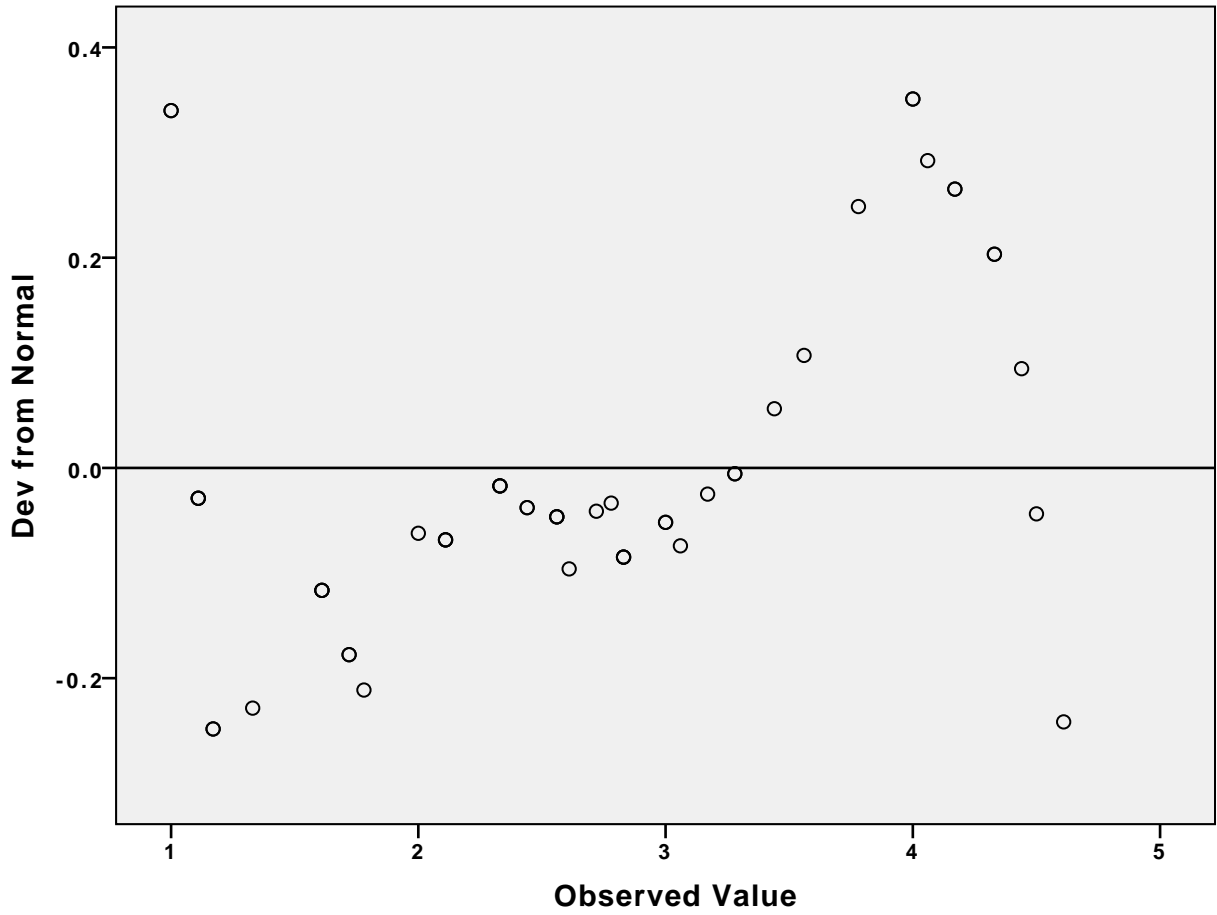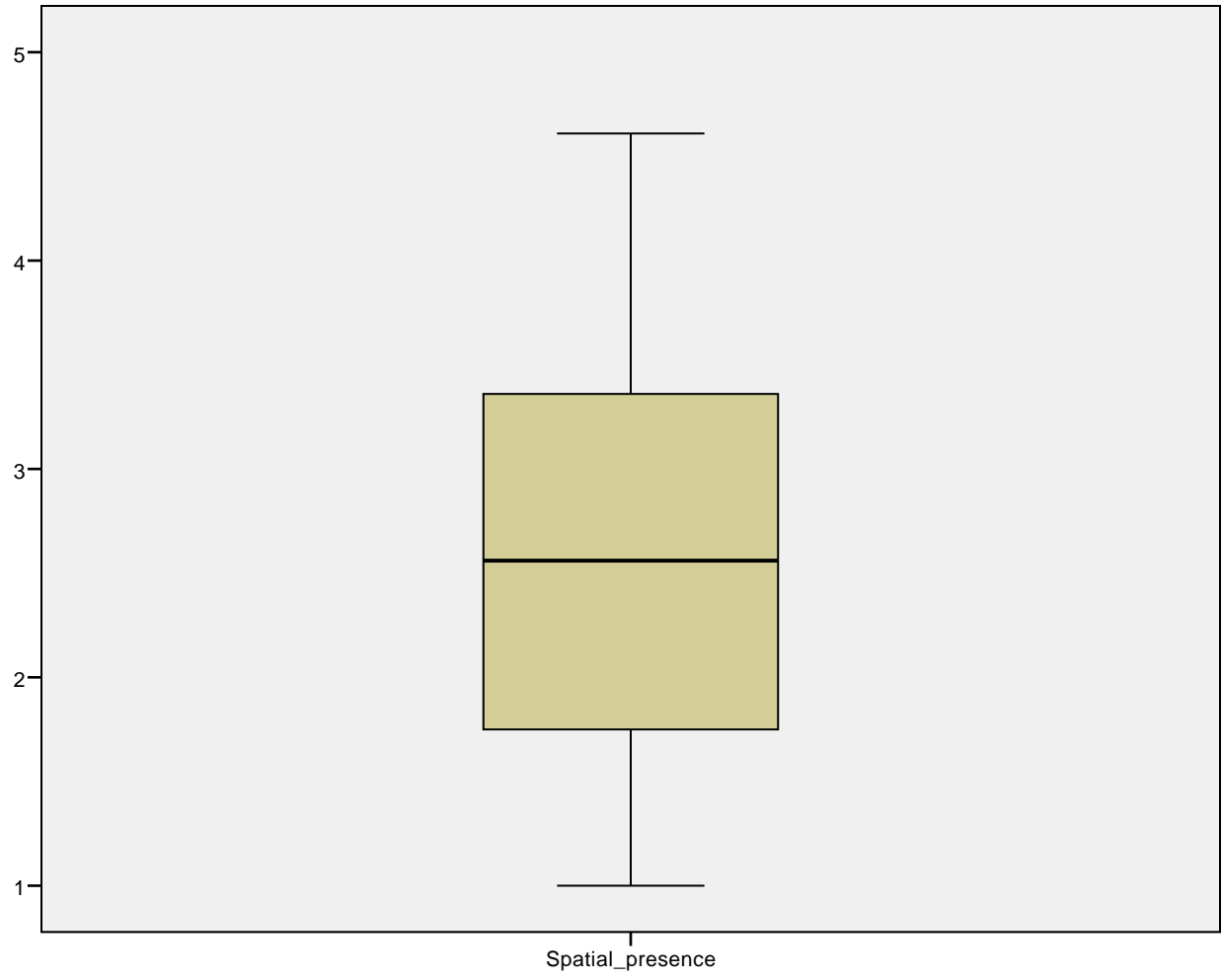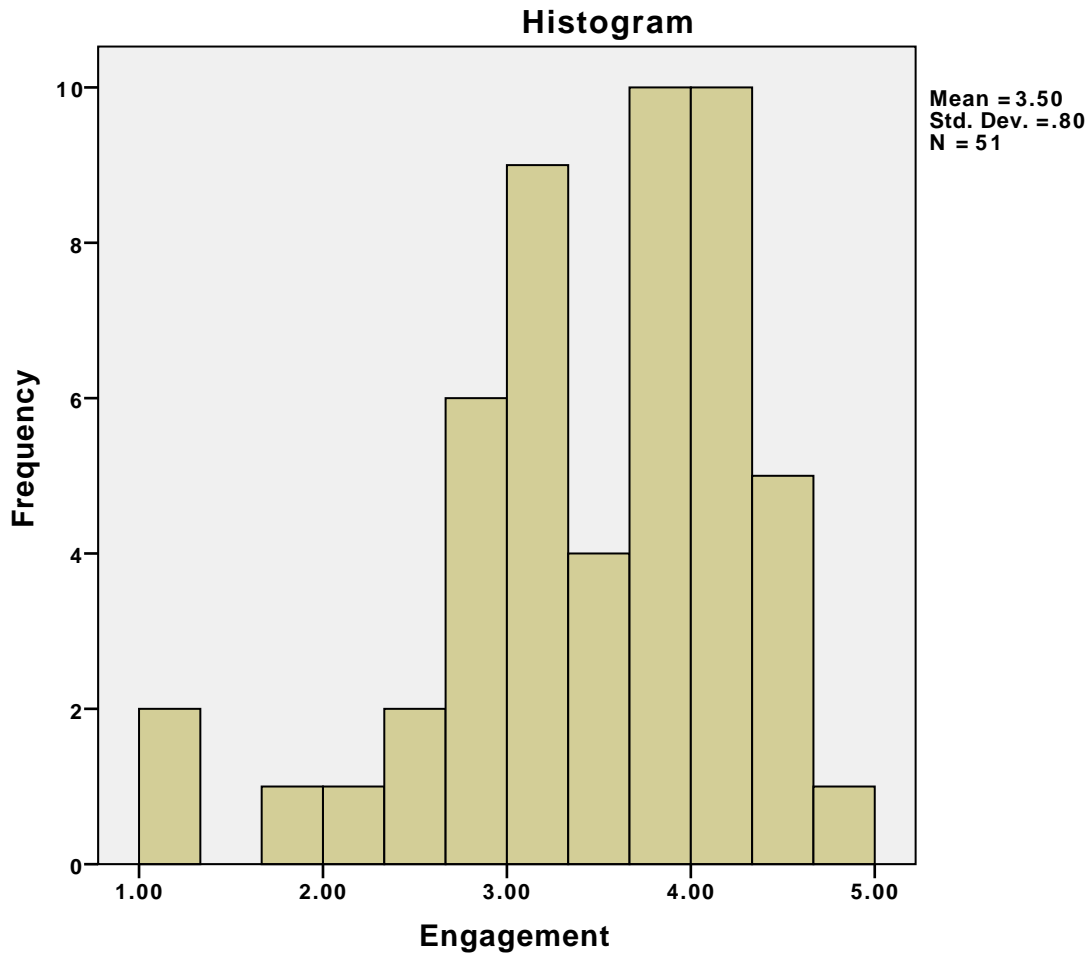
Engagement Stem-and-Leaf Plot

```
 Frequency      Stem &  Leaf

    2.00 Extremes     (=<1.3)
    1.00        1 .  6
    1.00        2 .  2
    8.00        2 .  66678888
   11.00        3 .  01122223334
   12.00        3 .  666677899999
   15.00        4 .  001112222233344
    1.00        4 .  7

 Stem width:       1.00
 Each leaf:        1 case(s)
```

Normal Q-Q Plot of Engagement

Detrended Normal Q-Q Plot of Engagement

Ecological_validity

Histogram

Mean = 3.54
Std. Dev. = .869
N = 51
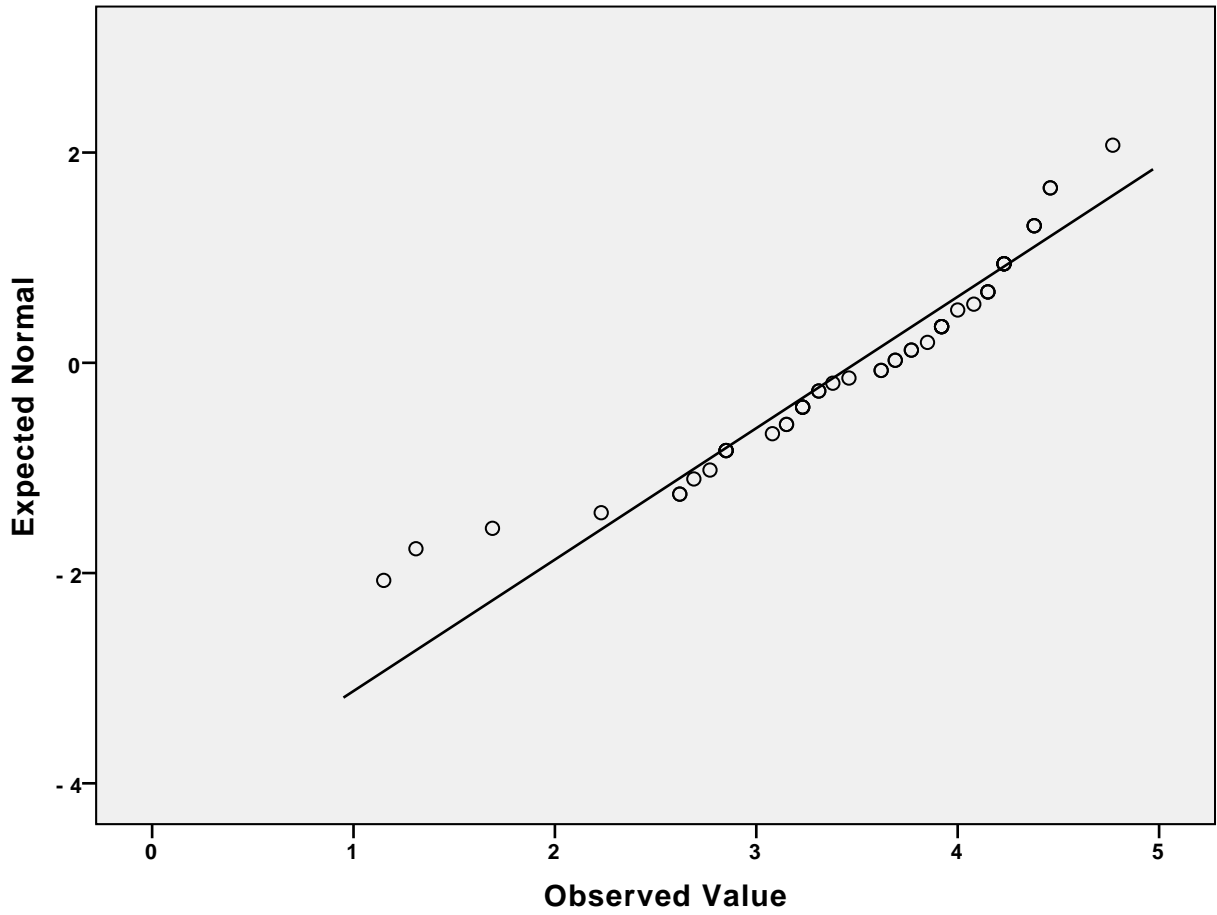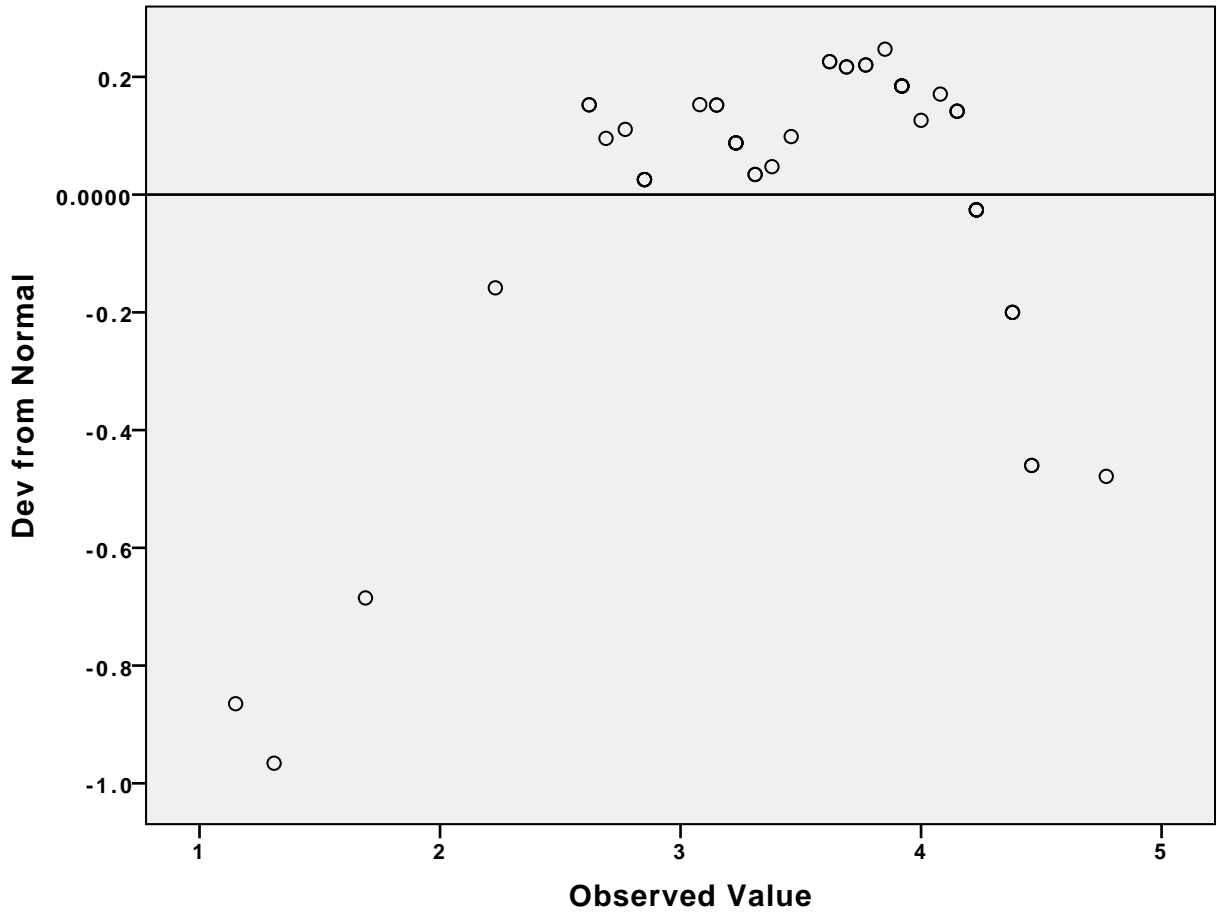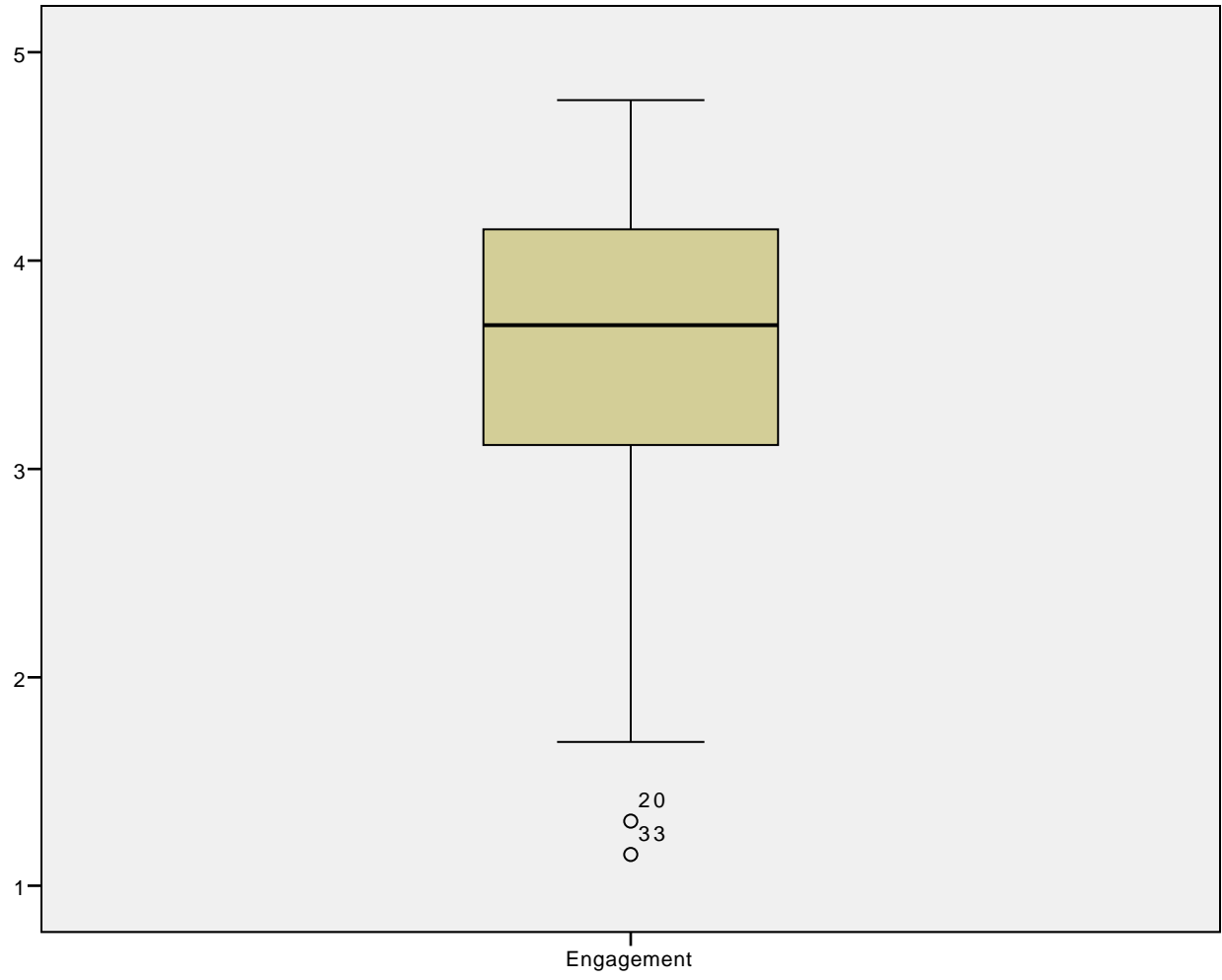
Ecological_validity
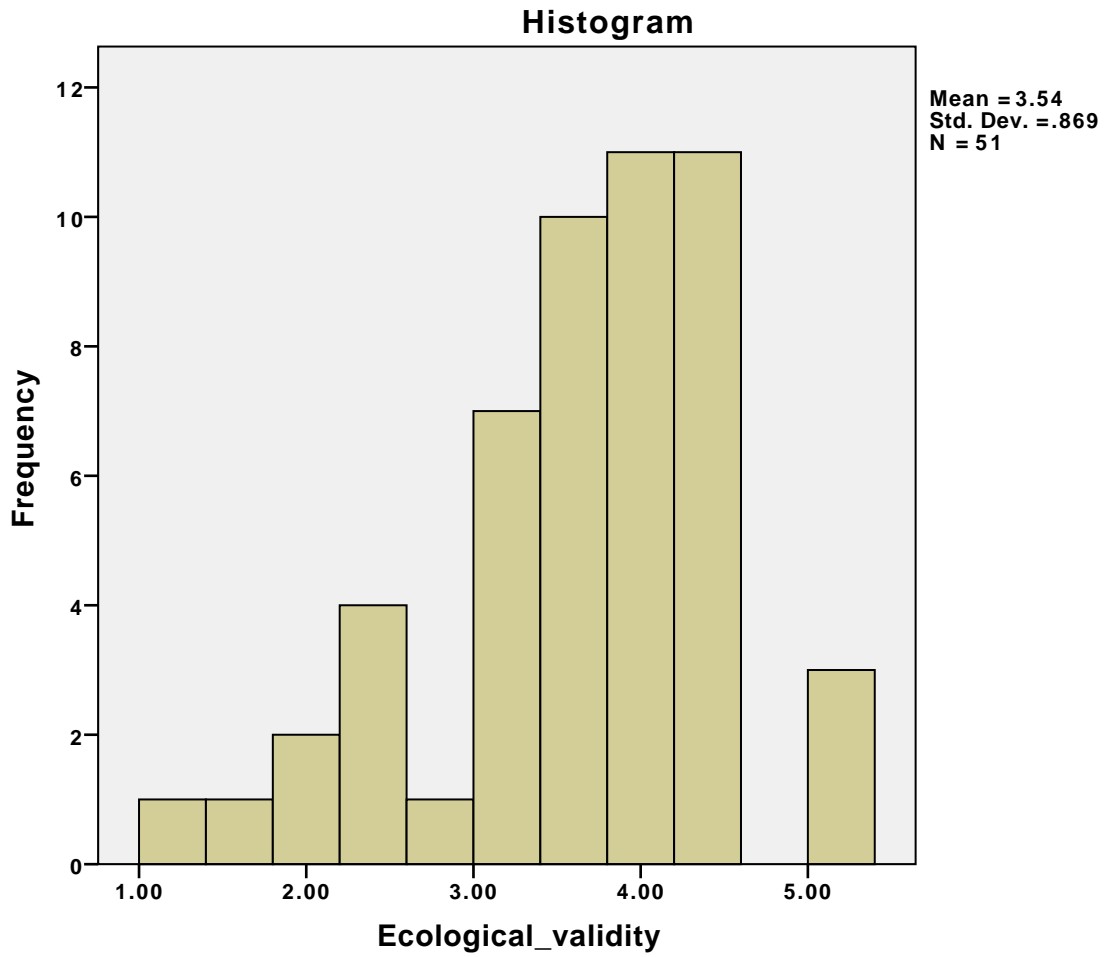
```
Ecological_validity Stem-and-Leaf Plot

 Frequency     Stem &  Leaf

     2.00         1 .  24
      .00         1 .
     6.00         2 .  002244
     1.00         2 .  8
    11.00         3 .  00000224444
    12.00         3 .  666666888888
    16.00         4 .  0000022222444444
      .00         4 .
     3.00         5 .  000

 Stem width:      1.00
 Each leaf:        1 case(s)
```

Normal Q-Q Plot of Ecological_validity

Detrended Normal Q-Q Plot of Ecological_validity

Ecological_validity

Negative_effects

Histogram

Mean = 1.45
Std. Dev. = .629
N = 51

```
Negative_effects Stem-and-Leaf Plot

 Frequency     Stem &  Leaf

    23.00          1 .  00000000000000000000111
     8.00          1 .  33333333
     4.00          1 .  5555
     6.00          1 .  666666
     4.00          1 .  8888
     2.00          2 .  01
     1.00          2 .  3
     1.00          2 .  5
     2.00 Extremes     (>=3.3)

 Stem width:      1.00
 Each leaf:        1 case(s)
```
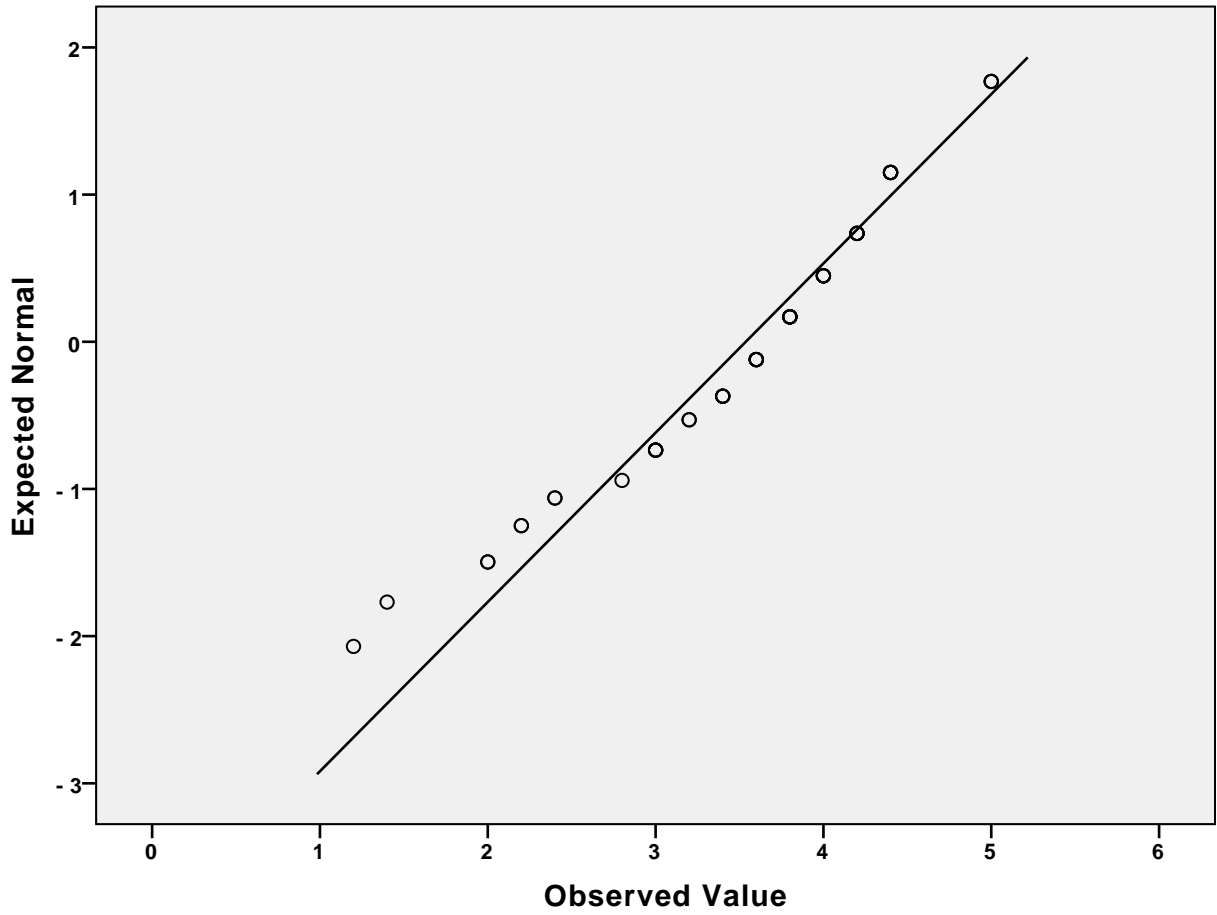
Normal Q-Q Plot of Negative_effects
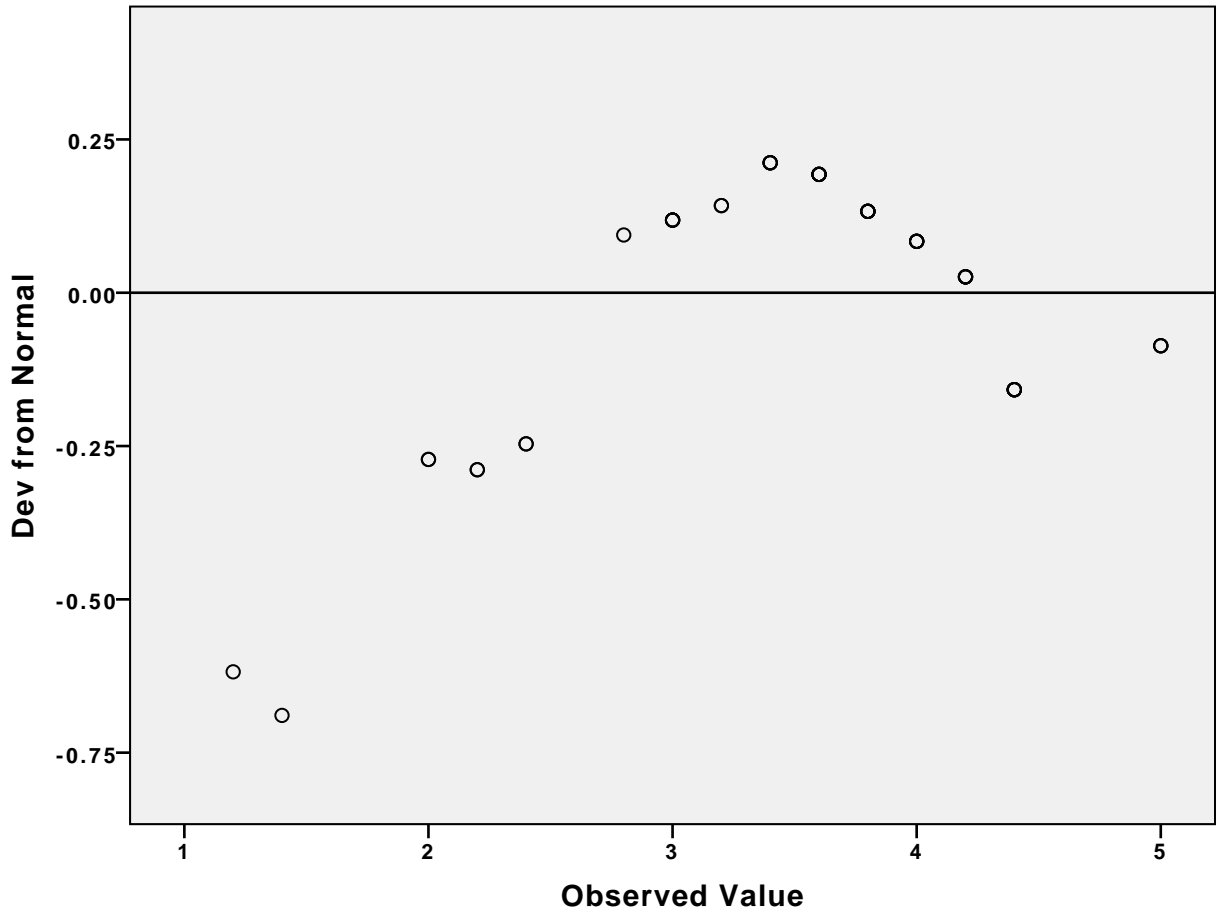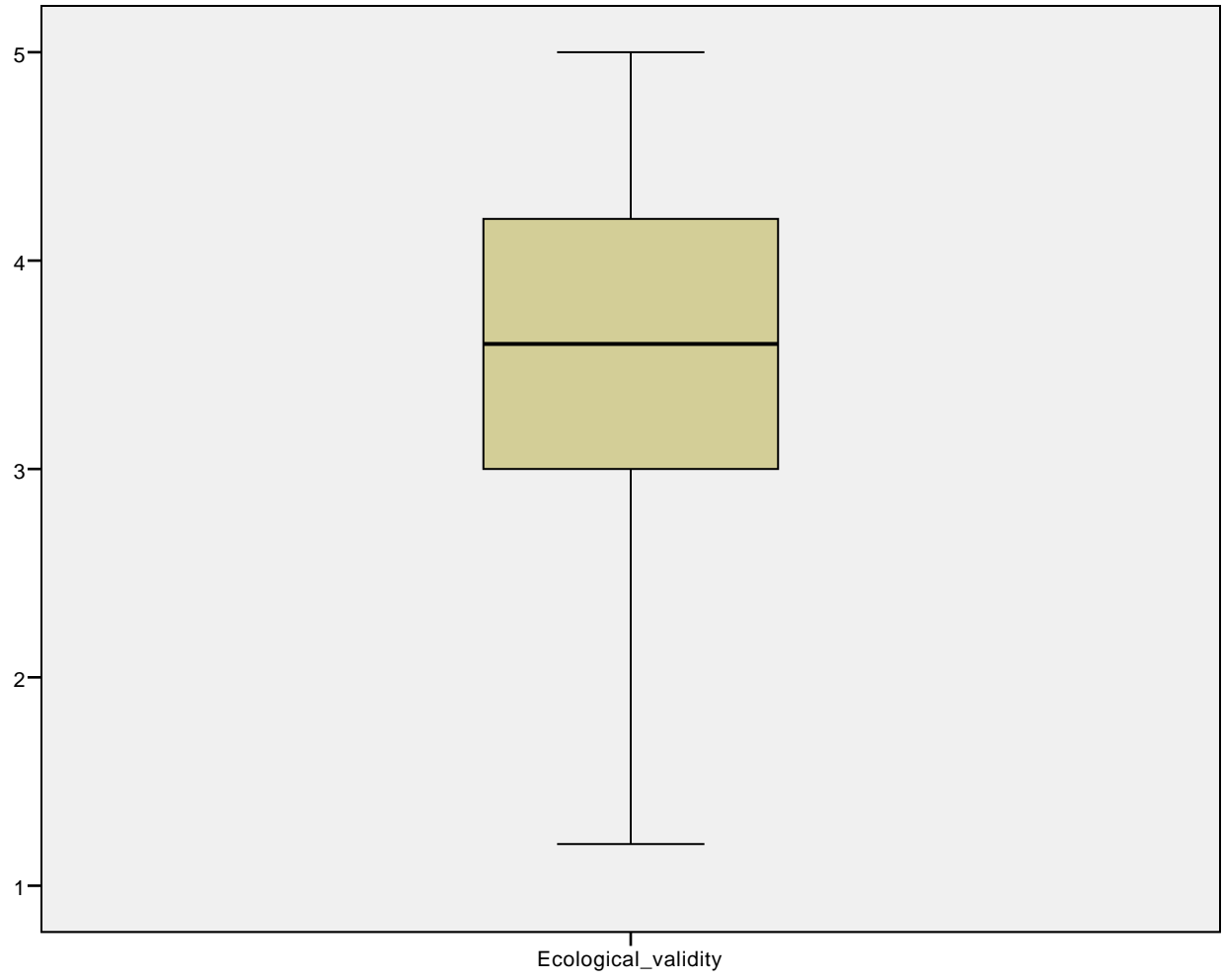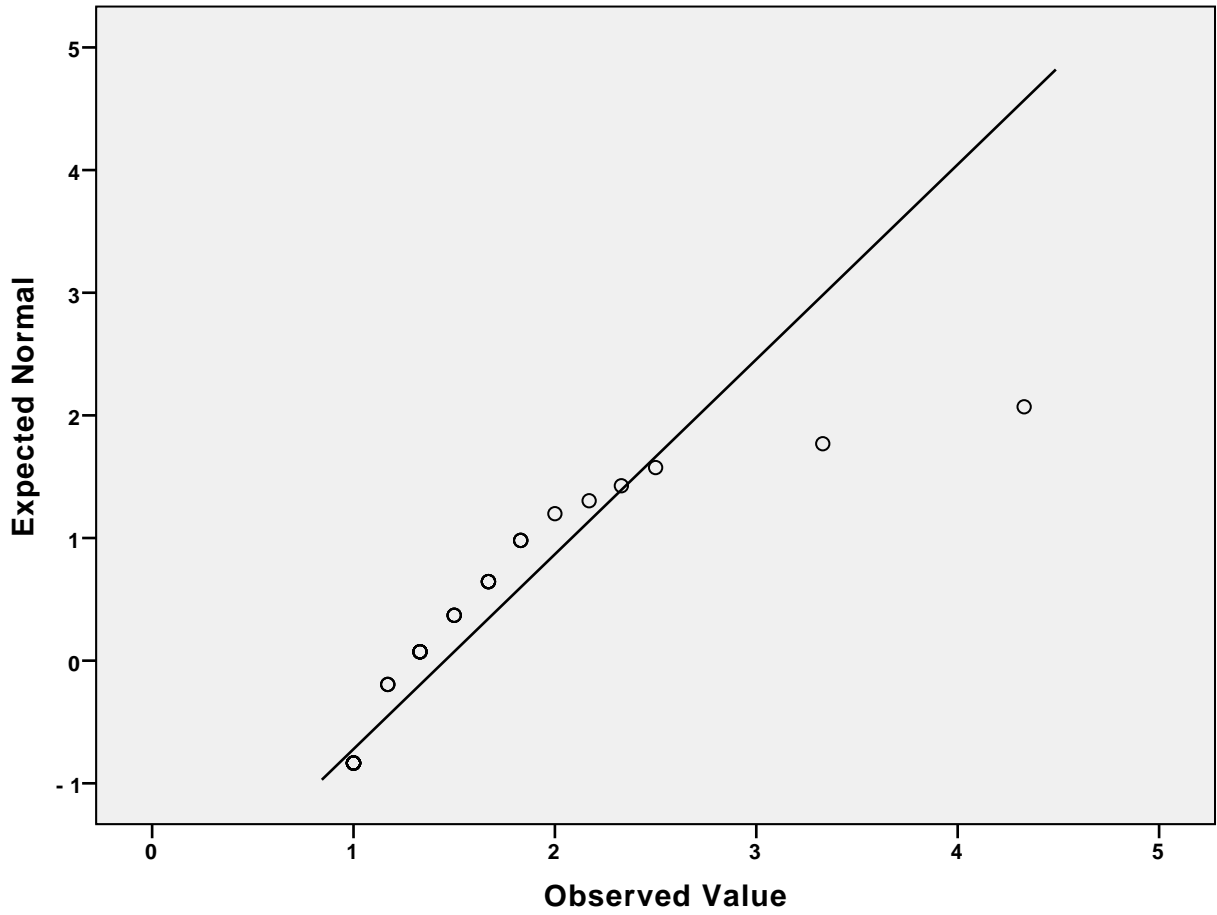
Detrended Normal Q-Q Plot of Negative_effects

Negative_effects
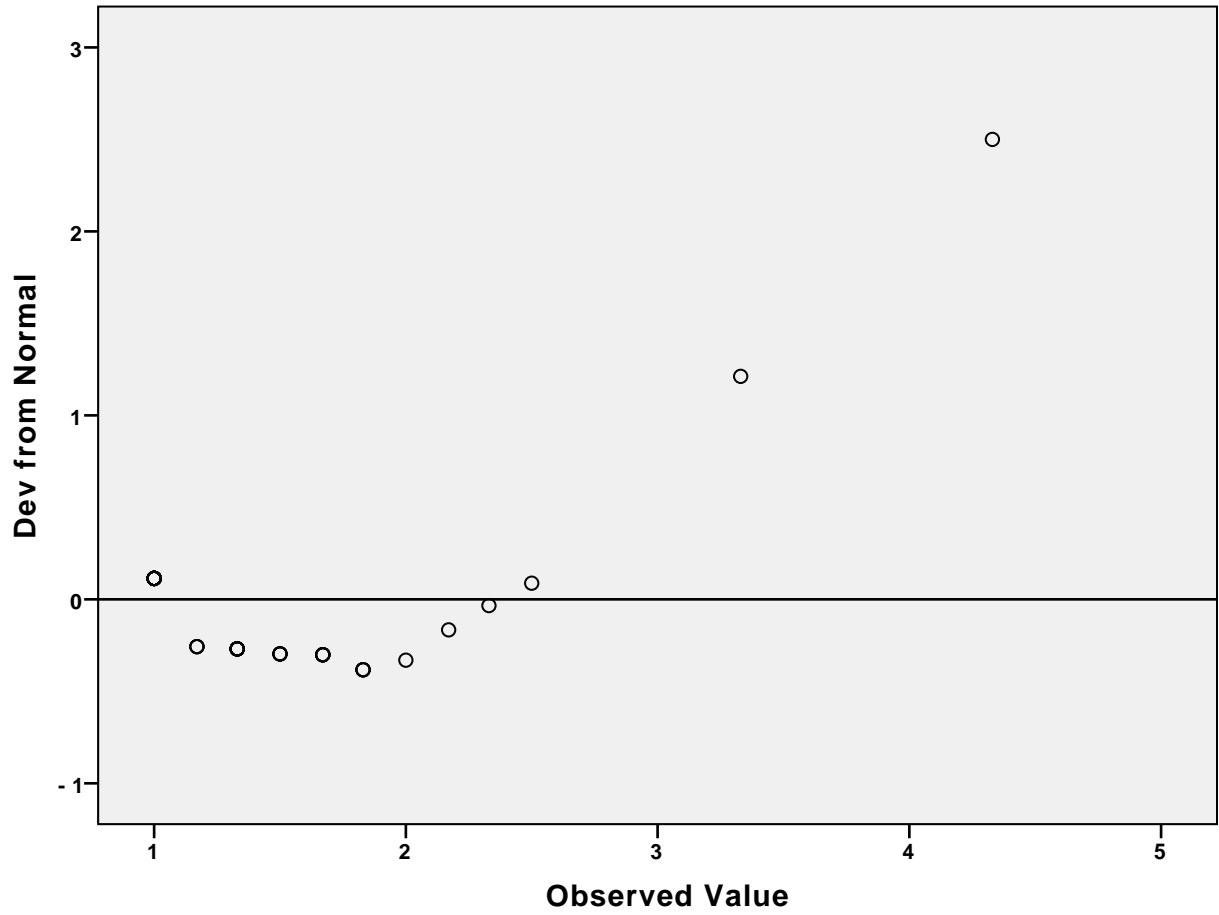
Appendix E: SPSS Dataset

ID	Group	Age	Gender	Occupatio	Nationalit	PC_exp	TV_viewir	TV_size	IMAX
1	1	21.00	2.00	1.00	1.00	2.00	3.00	2.00	1.00
2	1	25.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00
3	1	23.00	2.00	1.00	1.00	1.00	2.00	3.00	1.00
4	1	22.00	2.00	1.00	1.00	2.00	2.00	2.00	1.00
5	1	21.00	1.00	1.00	1.00	2.00	2.00	3.00	1.00
6	1	21.00	1.00	1.00	1.00	1.00	2.00	2.00	1.00
7	1	20.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00
8	1	20.00	2.00	1.00	1.00	1.00	2.00	3.00	1.00
9	1	20.00	2.00	1.00	1.00	3.00	3.00	2.00	2.00
10	1	25.00	1.00	1.00	1.00	3.00	2.00	1.00	1.00
11	1	23.00	1.00	1.00	1.00	3.00	2.00	3.00	1.00
12	1	22.00	1.00	1.00	1.00	2.00	3.00	2.00	1.00
13	1	21.00	1.00	1.00	1.00	2.00	1.00	2.00	1.00
14	1	21.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00
15	1	23.00	1.00	1.00	1.00	2.00	4.00	3.00	1.00
16	1	24.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00
17	2	24.00	1.00	1.00	1.00	2.00	4.00	3.00	1.00
18	2	21.00	2.00	1.00	1.00	2.00	1.00	2.00	1.00
19	2	24.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00
20	2	31.00	2.00	1.00	1.00	2.00	2.00	2.00	1.00
21	2	22.00	1.00	1.00	1.00	2.00	1.00	3.00	1.00
22	2	24.00	1.00	1.00	1.00	1.00	3.00	3.00	1.00
23	2	22.00	2.00	1.00	1.00	2.00	2.00	3.00	1.00
24	2	22.00	2.00	1.00	1.00	2.00	2.00	3.00	1.00
25	2	22.00	2.00	1.00	1.00	2.00	3.00	3.00	1.00
26	2	21.00	2.00	1.00	1.00	2.00	2.00	1.00	1.00
27	2	21.00	1.00	2.00	1.00	1.00	1.00	2.00	1.00
28	2	21.00	2.00	1.00	1.00	2.00	1.00	3.00	1.00
29	2	28.00	2.00	1.00	1.00	3.00	1.00	3.00	1.00
30	2	44.00	1.00	1.00	1.00	2.00	1.00	3.00	2.00
31	2	29.00	2.00	1.00	1.00	2.00	2.00	3.00	1.00
32	2	22.00	2.00	1.00	1.00	2.00	2.00	3.00	1.00
33	2	22.00	1.00	1.00	1.00	2.00	1.00	1.00	1.00
34	2	21.00	2.00	1.00	1.00	2.00	1.00	3.00	1.00
35	2	21.00	2.00	1.00	1.00	2.00	1.00	2.00	2.00
36	2	25.00	2.00	2.00	2.00	2.00	2.00	3.00	1.00
37	2	22.00	2.00	1.00	1.00	2.00	1.00	2.00	1.00
38	2	22.00	2.00	1.00	1.00	1.00	1.00	2.00	1.00
39	2	22.00	2.00	1.00	1.00	2.00	2.00	3.00	1.00
40	2	21.00	1.00	1.00	1.00	2.00	2.00	3.00	1.00
41	2	31.00	2.00	1.00	1.00	2.00	2.00	3.00	1.00
42	2	22.00	1.00	1.00	1.00	2.00	3.00	3.00	1.00
43	2	22.00	2.00	1.00	1.00	1.00	3.00	1.00	1.00
44	2	22.00	2.00	1.00	3.00	2.00	1.00	3.00	1.00
45	2	22.00	2.00	1.00	1.00	2.00	1.00	2.00	2.00
46	2	28.00	1.00	1.00	1.00	3.00	2.00	3.00	1.00

47	2	21.00	1.00	1.00	1.00	2.00	2.00	3.00	1.00
48	2	28.00	1.00	1.00	1.00	2.00	4.00	3.00	1.00
49	2	25.00	2.00	1.00	1.00	2.00	2.00	1.00	1.00
50	2	22.00	1.00	1.00	1.00	2.00	3.00	3.00	1.00
51	2	23.00	2.00	1.00	1.00	3.00	2.00	3.00	1.00
52	3	21.00	2.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
53	3	21.00	1.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
54	3	25.00	2.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
55	3	23.00	1.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
56	3	27.00	1.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
57	3	21.00	2.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
58	3	23.00	2.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
59	3	20.00	2.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
60	3	22.00	1.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
61	3	24.00	1.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
62	3	21.00	1.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
63	3	21.00	2.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
64	3	24.00	1.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
65	3	22.00	2.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
66	3	25.00	1.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
67	3	21.00	1.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
68	3	21.00	2.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
69	3	21.00	1.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
70	3	28.00	1.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
71	3	22.00	2.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
72	3	24.00	1.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
73	3	24.00	2.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00
74	3	23.00	2.00	1.00	1.00	99999.00	99999.00	99999.00	99999.00

Games_fr	Education	VR_use	Image_cre	Image_Vi	Obect_int	Purchase_	Spatial_pr	Engageme	Ecological
2.00	3.00	1.00	6.00	7.00	7.00	5.00	4.33	4.23	4.40
3.00	1.00	1.00	5.00	5.00	6.00	4.00	2.44	3.31	2.20
1.00	6.00	1.00	6.00	5.00	6.00	2.00	4.00	3.92	3.40
1.00	6.00	1.00	5.00	5.00	5.00	4.00	3.78	3.62	3.60
4.00	3.00	2.00	5.00	6.00	5.00	2.00	4.00	3.92	4.40
1.00	3.00	2.00	3.00	3.00	2.00	3.00	2.56	2.85	2.00
1.00	3.00	1.00	6.00	5.00	5.00	2.00	4.33	4.15	3.80
2.00	3.00	1.00	6.00	6.00	5.00	4.00	4.17	4.23	3.80
1.00	6.00	1.00	3.00	2.00	1.00	2.00	2.56	2.62	2.20
3.00	6.00	1.00	6.00	7.00	6.00	7.00	4.44	4.46	4.40
4.00	6.00	1.00	7.00	7.00	7.00	7.00	4.61	4.23	4.20
3.00	3.00	1.00	6.00	6.00	7.00	5.00	4.06	4.38	4.20
5.00	3.00	1.00	6.00	5.00	5.00	3.00	3.28	3.23	3.40
3.00	3.00	1.00	5.00	3.00	5.00	2.00	3.56	4.38	3.00
5.00	6.00	1.00	6.00	6.00	7.00	6.00	4.17	4.08	4.00
1.00	6.00	2.00	6.00	6.00	7.00	5.00	4.50	4.77	4.40
2.00	3.00	1.00	5.00	4.00	4.00	5.00	1.61	2.77	3.60
1.00	6.00	1.00	7.00	7.00	7.00	5.00	2.11	3.69	3.80
1.00	6.00	1.00	6.00	6.00	5.00	5.00	1.11	2.23	2.00
2.00	6.00	1.00	2.00	4.00	3.00	1.00	1.00	1.31	1.20
4.00	3.00	1.00	6.00	5.00	6.00	3.00	2.78	3.92	3.40
4.00	2.00	2.00	6.00	5.00	6.00	5.00	2.56	2.85	3.60
2.00	6.00	1.00	7.00	5.00	4.00	6.00	1.78	3.31	3.20
3.00	6.00	1.00	7.00	7.00	6.00	6.00	3.17	4.46	4.40
2.00	3.00	2.00	7.00	5.00	6.00	6.00	3.00	3.46	3.80
1.00	6.00	1.00	7.00	6.00	6.00	7.00	1.17	3.62	3.00
3.00	3.00	1.00	6.00	7.00	6.00	6.00	3.44	4.38	5.00
1.00	6.00	1.00	6.00	5.00	7.00	7.00	2.72	3.77	4.00
2.00	5.00	2.00	5.00	4.00	5.00	5.00	2.33	2.69	4.20
3.00	6.00	2.00	7.00	7.00	5.00	4.00	1.17	1.69	1.40
1.00	5.00	1.00	7.00	2.00	5.00	6.00	2.83	4.00	3.20
3.00	3.00	1.00	7.00	7.00	6.00	7.00	2.83	4.15	4.20
4.00	3.00	1.00	5.00	1.00	4.00	1.00	1.00	1.15	2.40
1.00	6.00	1.00	7.00	6.00	6.00	7.00	1.72	3.85	3.80
1.00	6.00	2.00	7.00	7.00	7.00	7.00	3.28	4.23	3.80
1.00	6.00	2.00	7.00	5.00	6.00	5.00	3.00	4.15	3.60
1.00	3.00	1.00	7.00	6.00	5.00	6.00	2.11	3.69	3.00
1.00	2.00	1.00	7.00	6.00	7.00	7.00	2.83	3.92	5.00
3.00	3.00	1.00	6.00	5.00	5.00	6.00	2.44	3.23	4.00
2.00	6.00	1.00	6.00	5.00	6.00	3.00	1.61	3.08	3.40
3.00	5.00	2.00	6.00	5.00	6.00	7.00	2.00	2.85	3.00
3.00	3.00	1.00	6.00	5.00	6.00	5.00	2.11	3.15	3.60
1.00	3.00	1.00	7.00	7.00	7.00	6.00	3.06	3.77	4.00
1.00	2.00	1.00	7.00	5.00	6.00	4.00	1.11	3.15	2.80
3.00	2.00	2.00	5.00	5.00	7.00	3.00	1.11	2.62	3.00
4.00	3.00	1.00	3.00	1.00	1.00	1.00	1.33	3.23	2.40

2.00	2.00	1.00	7.00	6.00	1.00	7.00	1.72	3.92	5.00
5.00	3.00	2.00	6.00	6.00	6.00	2.00	1.61	2.85	3.60
2.00	5.00	1.00	7.00	5.00	6.00	4.00	2.61	3.23	4.00
2.00	2.00	1.00	7.00	7.00	1.00	4.00	2.33	3.38	4.40
1.00	3.00	1.00	7.00	7.00	6.00	6.00	2.33	4.23	4.20
99999.00	99999.00	99999.00	5.00	4.00	6.00	4.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	6.00	6.00	7.00	6.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	7.00	5.00	7.00	7.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	6.00	7.00	7.00	7.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	7.00	7.00	6.00	7.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	7.00	5.00	7.00	7.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	3.00	2.00	4.00	2.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	4.00	7.00	7.00	4.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	6.00	7.00	3.00	5.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	6.00	6.00	5.00	4.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	6.00	7.00	6.00	5.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	7.00	7.00	7.00	7.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	7.00	5.00	7.00	5.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	4.00	2.00	6.00	3.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	7.00	7.00	7.00	5.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	7.00	7.00	7.00	6.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	6.00	6.00	7.00	6.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	7.00	7.00	5.00	6.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	7.00	5.00	6.00	7.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	7.00	6.00	7.00	6.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	5.00	7.00	7.00	5.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	6.00	5.00	6.00	6.00	99999.00	99999.00	99999.00
99999.00	99999.00	99999.00	7.00	7.00	5.00	5.00	99999.00	99999.00	99999.00

Negative_effects
1.33
3.33
1.67
1.83
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Appendix F: SPSS Dataset Decoding

Name	Label	Values
Gender	Gender	Male = 1 Female = 2
Occupation	Occupation	Student = 1 Supervisor = 2
Nationality	Nationality	Irish = 1 South African = 2 Polish = 3
PC_exp	Rate your level of computer experience	Basic = 1 Intermediate = 2 Expert = 3 None = 4
TV_viewing	Rate your average weekly TV viewing	0-8 hours = 1 9-16 hours = 2 17-24 hours = 3 25-32 hours = 4 33-40 hours = 5 41+ hours = 6
TV_size	What is the TV size you watch the most?	Small = 1 Medium = 2 Large = 3
IMAX	Have you viewed stereoscopic (3D) images using polarised glasses (e.g. IMAX 3D) before?	Yes = 1 No = 2
Games_freq	Rate how often you play computer games	Never = 1 Occasionally = 2 Less than 50% = 3 More than 50% = 4 Every day = 5
Education_level	Education Level	None = 1 CSE/O-level = 2 A-level = 3 City & Guilds = 4 Diploma = 5 Degree = 6 Professional Qualification = 7
VR_use	Have you used an experimental virtual reality system before (beyond a consumer computer / arcade game)?	Yes = 1 No = 2

Appendix G: Information Sheet

Information Sheet - VR condition

You are being invited to consider taking part in the research study investigating virtual reality environments. This project is being undertaken by Andrei Sozanschi, a Masters student at IADT. Before you decide whether or not you wish to take part, it is important for you to understand why this research is being done and what it will involve. Ask us if there is anything that is unclear or if you would like more information.

Do I have to take part?

You are free to decide whether you wish to take part or not. If you do decide to take part, you will be asked to sign a consent form. You are free to withdraw from this study at any time and without giving reasons. Moreover, your decision to accept or decline our invitation to participate in this study will not affect in any way your grades, assessments or future studies.

If I take part, what do I have to do?

If you decide to participate, you will be provided with a participation code and you will be invited to use the HTC Vive head-mounted display to explore a virtual reality environment. After exploring said environment for approximately 10 minutes you are invited to complete a questionnaire. We predict that the entire experiment will take approximately 30-35 minutes to complete.

At the end of the experiment you will have the possibility to ask any additional questions and you will be provided with a debrief form containing all relevant information.

What are the benefits of taking part?

The benefit of taking part in this study is the contribution that you will be making to the understanding of this field of research.

What are the disadvantages and risks of taking part?

If you decide to participate there is a possibility of VR induced motion sickness during the experiment.

Concordantly:

- please evaluate carefully any history of motion sickness you may have and consider this when accepting or declining our invitation
- be assured that you can stop the experiment at any time if you feel unwell and

How will information about me be used?

The information that you provide will be used to perform statistical analysis to determine if there is a correlation between the effect of the virtual reality environment on intentions.

Who will have access to information about me?

Due to the anonymous nature of the questionnaires no information can be traced back to you. In addition, the data will be stored securely on an encrypted and password protected computer. The data will be retained for no more than five years, after which it will be securely disposed of. The data in the paper questionnaire will be shared with the questionnaire developers so that it can be further validated. As mentioned previously, this is anonymous as well.

What will happen to the results of the study?

The results of this study are a vital component of the researcher's thesis which will be submitted in order to complete the MSc in Cyberpsychology at the Dún Laoghaire Institute of Art, Design & Technology (IADT). You can obtain a copy of this thesis in the IADT library.

Who has reviewed the study?

This study has been approved by the Department of Technology and Psychology Ethics Committee (DTPEC).

What if there is a problem?

If you have a concern about any aspect of this study, you may wish to speak to the researcher who will do their best to answer your questions. You should contact Andrei Sozanschi at n00162967@student.iadt.ie or their supervisor Robert Griffin at robert.griffin@iadt.ie.

Thank you for taking the time to read this information sheet!

Andrei Sozanschi

Information sheet - 2D condition

You are being invited to consider taking part in the research study investigating virtual reality environments. This project is being undertaken by Andrei Sozanschi, a Masters student at IADT. Before you decide whether or not you wish to take part, it is important for you to understand why this research is being done and what it will involve. Ask us if there is anything that is unclear or if you would like more information.

Do I have to take part?

You are free to decide whether you wish to take part or not. If you do decide to take part, you will be asked to sign a consent form. You are free to withdraw from this study at any time and without giving reasons. Moreover, your decision to accept or decline our invitation to participate in this study will not affect in any way your grades, assessments or future studies.

If I take part, what do I have to do?

If you decide to participate, you will be provided with a participation code and you will be invited to watch a short video. Then you are invited to complete a questionnaire. We predict that the entire experiment will take approximately 20-25 minutes to complete.
At the end of the experiment you will have the possibility to ask any additional questions and you will be provided with a debrief form containing all relevant information.

What are the benefits of taking part?

The benefit of taking part in this study is the contribution that you will be making to the understanding of this field of research.

What are the disadvantages and risks of taking part?

There are no known disadvantages or risks.

How will information about me be used?

The information that you provide will be used to perform statistical analysis to determine if there is a correlation between the effect of the virtual reality environment on intentions.

Who will have access to information about me?

Due to the anonymous nature of the questionnaires no information can be traced back to you. In addition, the data will be stored securely on an encrypted and password protected computer. The data will be retained for no more than five years, after which it will be securely disposed of.

The data in the paper questionnaire will be shared with the questionnaire developers so that it can be further validated. As mentioned previously, this is anonymous as well.

What will happen to the results of the study?

The results of this study are a vital component of the researcher's thesis which will be submitted in order to complete the MSc in Cyberpsychology at the Dún Laoghaire Institute of Art, Design & Technology (IADT). You can obtain a copy of this thesis in the IADT library.

Who has reviewed the study?

This study has been approved by the Department of Technology and Psychology Ethics Committee (DTPEC).

What if there is a problem?

If you have a concern about any aspect of this study, you may wish to speak to the researcher who will do their best to answer your questions. You should contact Andrei Sozanschi at n00162967@student.iadt.ie or their supervisor Robert Griffin at robert.griffin@iadt.ie.

Thank you for taking the time to read this information sheet!
Andrei Sozanschi

Information sheet - in-store condition

You are being invited to consider taking part in the research study investigating virtual reality environments. This project is being undertaken by Andrei Sozanschi, a Masters student at IADT. Before you decide whether or not you wish to take part, it is important for you to understand why this research is being done and what it will involve. Ask us if there is anything that is unclear or if you would like more information.

Do I have to take part?

You are free to decide whether you wish to take part or not. If you do decide to take part, you will be asked to sign a consent form. You are free to withdraw from this study at any time and without giving reasons. Moreover, your decision to accept or decline our invitation to participate in this study will not affect in any way your grades, assessments or future studies.

If I take part, what do I have to do?

If you decide to participate, you will be provided with a participation code and you will be invited to interact with a Bluetooth Speaker. Then you are invited to complete a questionnaire. We predict that the entire experiment will take approximately 10 minutes to complete.
At the end of the experiment you will have the possibility to ask any additional questions and you will be provided with a debrief form containing all relevant information.

What are the benefits of taking part?

The benefit of taking part in this study is the contribution that you will be making to the understanding of this field of research.

What are the disadvantages and risks of taking part?

There are no known disadvantages or risks.

How will information about me be used?

The information that you provide will be used to perform statistical analysis to determine if there is a correlation between the effect of the virtual reality environment on intentions.

Who will have access to information about me?

Due to the anonymous nature of the questionnaires no information can be traced back to you. In addition, the data will be stored securely on an encrypted and password protected computer. The data will be retained for no more than five years, after which it will be securely disposed of.

The data in the paper questionnaire will be shared with the questionnaire developers so that it can be further validated. As mentioned previously, this is anonymous as well.

What will happen to the results of the study?

The results of this study are a vital component of the researcher's thesis which will be submitted in order to complete the MSc in Cyberpsychology at the Dún Laoghaire Institute of Art, Design & Technology (IADT). You can obtain a copy of this thesis in the IADT library.

Who has reviewed the study?

This study has been approved by the Department of Technology and Psychology Ethics Committee (DTPEC).

What if there is a problem?

If you have a concern about any aspect of this study, you may wish to speak to the researcher who will do their best to answer your questions. You should contact Andrei Sozanschi at n00162967@student.iadt.ie or their supervisor Robert Griffin at robert.griffin@iadt.ie.

Thank you for taking the time to read this information sheet!

Andrei Sozanschi

Appendix H: Consent Form

Consent Form - VR condition

Name of Researcher: Andrei Sozanschi

Please tick box

❏ I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions.

❏ I understand that my participation is voluntary and that I am free to withdraw at any time.

❏ I agree to take part in this study.

❏ I understand that the data collected about me during this study will be anonymised before it is submitted for publication.

❏ I agree to allow the data collected to be used for future research projects.

❏ I understand the risks of VR.

❏ I confirm that I am over the age of 18

Name of participant	Date	Signature

Researcher	Date	Signature

Consent Form - 2D and in-store condition

Name of Researcher: Andrei Sozanschi

Please tick box

❏ I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions.

❏ I understand that my participation is voluntary and that I am free to withdraw at any time.

❏ I agree to take part in this study.

❏ I understand that the data collected about me during this study will be anonymised before it is submitted for publication.

❏ I agree to allow the data collected to be used for future research projects.

❏ I confirm that I am over the age of 18

Name of participant	Date	Signature

Researcher	Date	Signature

Appendix I: Debrief

Debrief

Thank you very much for taking part in this research study.

The study you just took part in was designed to test whether or not purchase intent is affected by being exposed to a virtual reality environment or a 2D commercial ad compared to seeing the and inspecting the physical product. It investigated a link which could possibly form between the interactivity of the ad and your purchase intent. What this means is that the advertisment's VR construction will ease the process by which you imagine yourself using the speaker, and thus will lead to you wanting to purchase the aforementioned product more. The same is valid for the video.

To examine this link, we measured the following attributes:

- Mental image creation ease and vividness
- Object interactivity
- Presence level (presence leads to you being "in the ad" rather than consciously knowing you are watching a video)
- Intent to purchase

If you have questions about this study or you wish to have your data removed from the study, please contact me at the following e-mail address: n00162967@student.iadt.ie.
Alternatively, you may contact my supervisor, Robert Griffin at IADT, at robert.griffin@iadt.ie
Please note that the deadline for any submission for the deletion of data is: 28/02/2018 and you are required to keep your participation code.

We thank you sincerely for contributing and assure you that your data is confidential and anonymous, and if published, the data will not be in any way identifiable as yours.

Kind regards,

Andrei Sozanschi

Appendix J: Questionnaires

Object Interactivity, Mental image creation ease, Mental image vividness, Purchase intent

Was it easy for you to imagine yourself using the Bose SoundLink Revolve Bluetooth Speaker? *

	1	2	3	4	5	6	7	
Not at all easy	○	○	○	○	○	○	○	Very easy

How vivid was the mental image of you using the Bose SoundLink Revolve Bluetooth Speaker? *

	1	2	3	4	5	6	7	
Not at all vivid	○	○	○	○	○	○	○	Very vivid

To what degree could you interact with the Bose SoundLink Revolve Bluetooth Speaker? *

	1	2	3	4	5	6	7	
Not at all	○	○	○	○	○	○	○	Very much so

Would you be inclined to purchase the Bose SoundLink Revolve Bluetooth Speaker? *

	1	2	3	4	5	6	7	
Not at all	○	○	○	○	○	○	○	Very much so

ITC-SOPI

The ITC-SOPI questionnaire is copyright of i2 media research ltd. i2 can approved distribution of the questionnaire to you subject to Prof. Jonathan Freeman and/or Dr. Jane Lessiter receiving an email from you. (J.Lessiter@gold.ac.uk, J.Freeman@gold.ac.uk)

Appendix K: Video Ad

Link: https://www.youtube.com/watch?v=868EPzKn6a8

Appendix L: Group comparison median

```
FREQUENCIES VARIABLES=Image_creation_ease Image_Vividness Obect_interactivity
Purchase_intent
  /STATISTICS=MEDIAN
  /HISTOGRAM
  /ORDER=ANALYSIS.
```

Frequencies

Notes

Output Created		**30-MAR-2018 20:36…**
Comments		
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	Weight	**<none>**
	Split File	**Group**
	N of Rows in Working Data File	**74**
Missing Value Handling	**Definition of Missing**	**User-defined missing values are treated as missing.**
	Cases Used	**Statistics are based on all cases with valid data.**
Syntax		**FREQUENCIES VARIABLES=Image_creation_ease Image_Vividness Obect_interactivity Purchase_intent /STATISTICS=MEDIAN /HISTOGRAM /ORDER=ANALYSIS.**
Resources	**Processor Time**	**00:00:02.13**
	Elapsed Time	**00:00:02.00**

Statistics

Group			Image_creation_ease	Image_Vividness	Obect_interactivity	Purchase_intent
1	N	Valid	16	16	16	16
		Missing	0	0	0	0
	Median		6.0000	5.5000	5.5000	4.0000
2	N	Valid	35	35	35	35
		Missing	0	0	0	0
	Median		7.0000	5.0000	6.0000	5.0000
3	N	Valid	23	23	23	23
		Missing	0	0	0	0
	Median		6.0000	6.0000	7.0000	6.0000

Frequency Table

Image_creation_ease

Group			Frequency	Percent	Valid Percent	Cumulative Percent
1	Valid	3.00	2	12.5	12.5	12.5
		5.00	4	25.0	25.0	37.5
		6.00	9	56.3	56.3	93.8
		7.00	1	6.3	6.3	100.0
		Total	16	100.0	100.0	
2	Valid	2.00	1	2.9	2.9	2.9
		3.00	1	2.9	2.9	5.7
		5.00	4	11.4	11.4	17.1
		6.00	10	28.6	28.6	45.7
		7.00	19	54.3	54.3	100.0
		Total	35	100.0	100.0	
3	Valid	3.00	1	4.3	4.3	4.3
		4.00	2	8.7	8.7	13.0
		5.00	2	8.7	8.7	21.7
		6.00	7	30.4	30.4	52.2
		7.00	11	47.8	47.8	100.0
		Total	23	100.0	100.0	

Image_Vividness

Group			Frequency	Percent	Valid Percent	Cumulative Percent
1	Valid	2.00	1	6.3	6.3	6.3
		3.00	2	12.5	12.5	18.8
		5.00	5	31.3	31.3	50.0
		6.00	5	31.3	31.3	81.3
		7.00	3	18.8	18.8	100.0
		Total	16	100.0	100.0	
2	Valid	1.00	2	5.7	5.7	5.7
		2.00	1	2.9	2.9	8.6
		4.00	3	8.6	8.6	17.1
		5.00	13	37.1	37.1	54.3
		6.00	7	20.0	20.0	74.3
		7.00	9	25.7	25.7	100.0
		Total	35	100.0	100.0	
3	Valid	2.00	2	8.7	8.7	8.7
		4.00	1	4.3	4.3	13.0
		5.00	5	21.7	21.7	34.8
		6.00	4	17.4	17.4	52.2
		7.00	11	47.8	47.8	100.0
		Total	23	100.0	100.0	

Obect_interactivity

Group			Frequency	Percent	Valid Percent	Cumulative Percent
1	Valid	1.00	1	6.3	6.3	6.3
		2.00	1	6.3	6.3	12.5
		5.00	6	37.5	37.5	50.0
		6.00	3	18.8	18.8	68.8
		7.00	5	31.3	31.3	100.0
		Total	16	100.0	100.0	
2	Valid	1.00	3	8.6	8.6	8.6
		3.00	1	2.9	2.9	11.4
		4.00	3	8.6	8.6	20.0
		5.00	6	17.1	17.1	37.1
		6.00	16	45.7	45.7	82.9
		7.00	6	17.1	17.1	100.0
		Total	35	100.0	100.0	
3	Valid	3.00	1	4.3	4.3	4.3
		4.00	1	4.3	4.3	8.7
		5.00	3	13.0	13.0	21.7
		6.00	6	26.1	26.1	47.8
		7.00	12	52.2	52.2	100.0
		Total	23	100.0	100.0	

Purchase_intent

Group			Frequency	Percent	Valid Percent	Cumulative Percent
1	Valid	2.00	5	31.3	31.3	31.3
		3.00	2	12.5	12.5	43.8
		4.00	3	18.8	18.8	62.5
		5.00	3	18.8	18.8	81.3
		6.00	1	6.3	6.3	87.5
		7.00	2	12.5	12.5	100.0
		Total	16	100.0	100.0	
2	Valid	1.00	3	8.6	8.6	8.6
		2.00	1	2.9	2.9	11.4
		3.00	3	8.6	8.6	20.0
		4.00	4	11.4	11.4	31.4
		5.00	7	20.0	20.0	51.4
		6.00	9	25.7	25.7	77.1
		7.00	8	22.9	22.9	100.0
		Total	35	100.0	100.0	
3	Valid	2.00	1	4.3	4.3	4.3
		3.00	1	4.3	4.3	8.7
		4.00	3	13.0	13.0	21.7
		5.00	6	26.1	26.1	47.8
		6.00	6	26.1	26.1	73.9
		7.00	6	26.1	26.1	100.0
		Total	23	100.0	100.0	

Histogram

Image_creation_ease

Group: 1
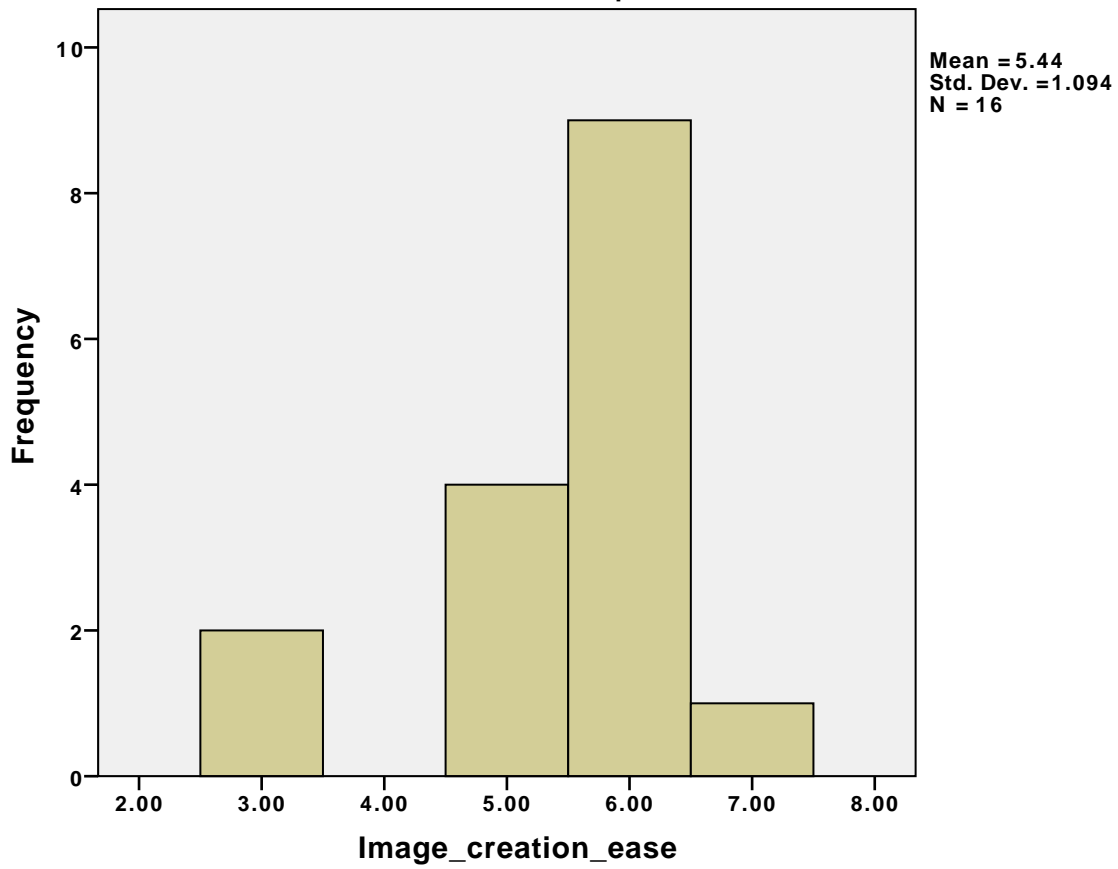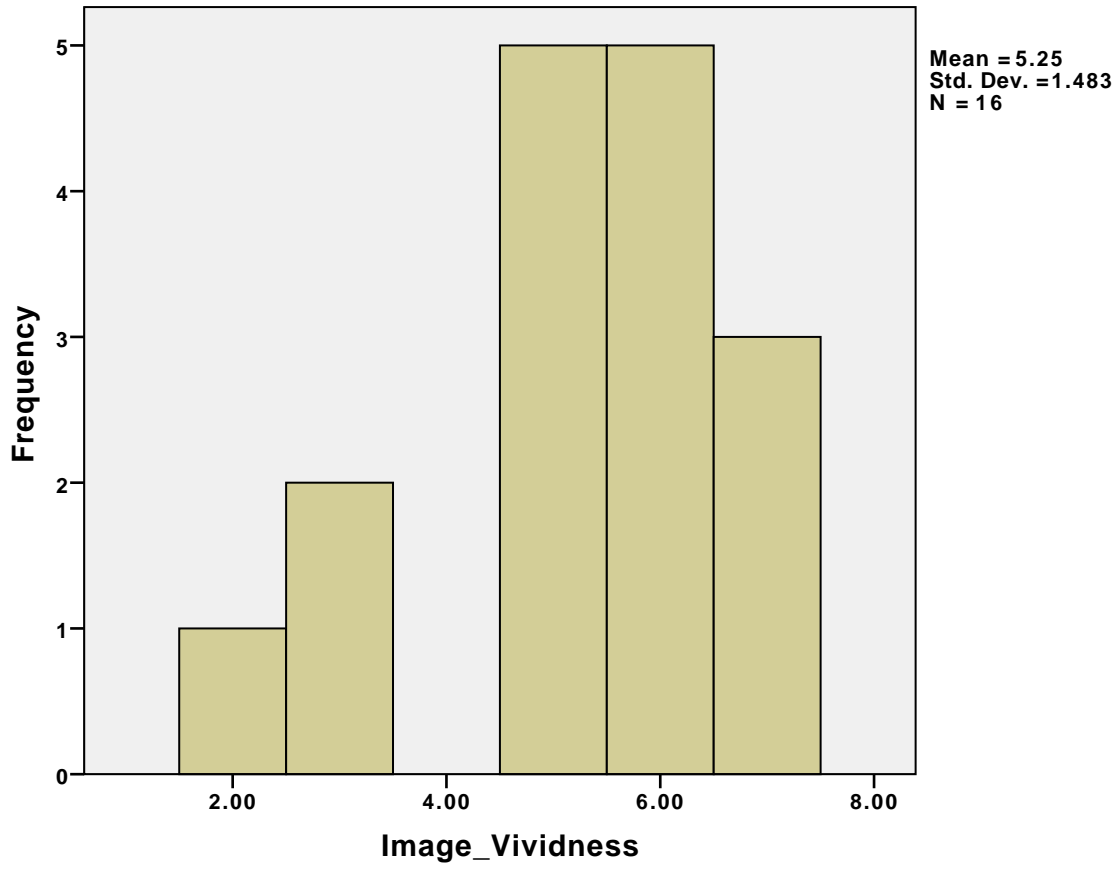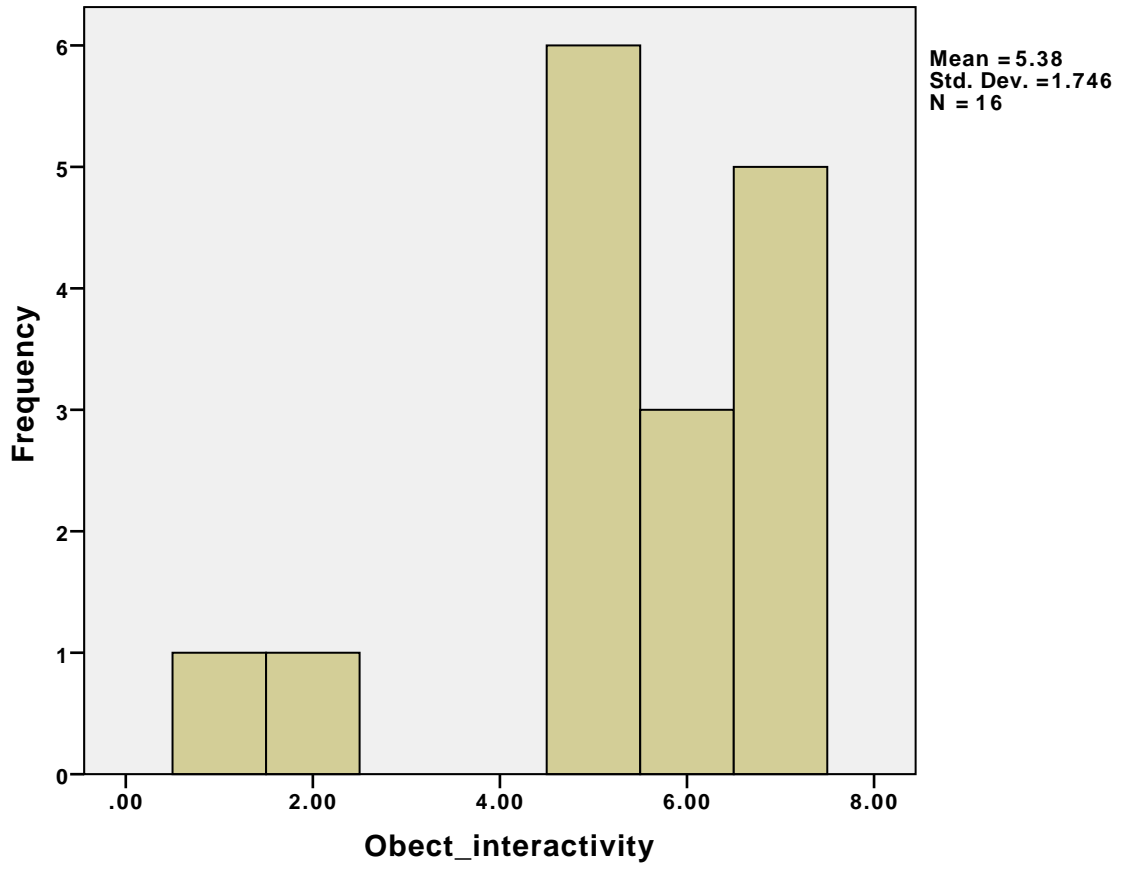
Mean = 5.44
Std. Dev. = 1.094
N = 16

Frequency

Image_creation_ease

Image_Vividness

Group: 1

Mean = 5.25
Std. Dev. = 1.483
N = 16

Frequency

Image_Vividness

Obect_interactivity

Group: 1

Mean = 5.38
Std. Dev. =1.746
N = 16

Purchase_intent

Group: 1

Mean =3.94
Std. Dev. =1.769
N = 16

Purchase_intent

Image_creation_ease

Group: 2

Mean = 6.23
Std. Dev. = 1.165
N = 35

Image_Vividness

Group: 2

Mean = 5.31
Std. Dev. = 1.568
N = 35

Obect_interactivity

Group: 2

Mean = 5.31
Std. Dev. = 1.641
N = 35

Purchase_intent

Group: 2

Mean = 5.00
Std. Dev. = 1.831
N = 35

Image_creation_ease

Group: 3

Mean = 6.09
Std. Dev. = 1.164
N = 23

Image_creation_ease

Image_Vividness

Group: 3

Mean = 5.83
Std. Dev. = 1.527
N = 23

Obect_interactivity

Group: 3

Mean = 6.17
Std. Dev. = 1.114
N = 23
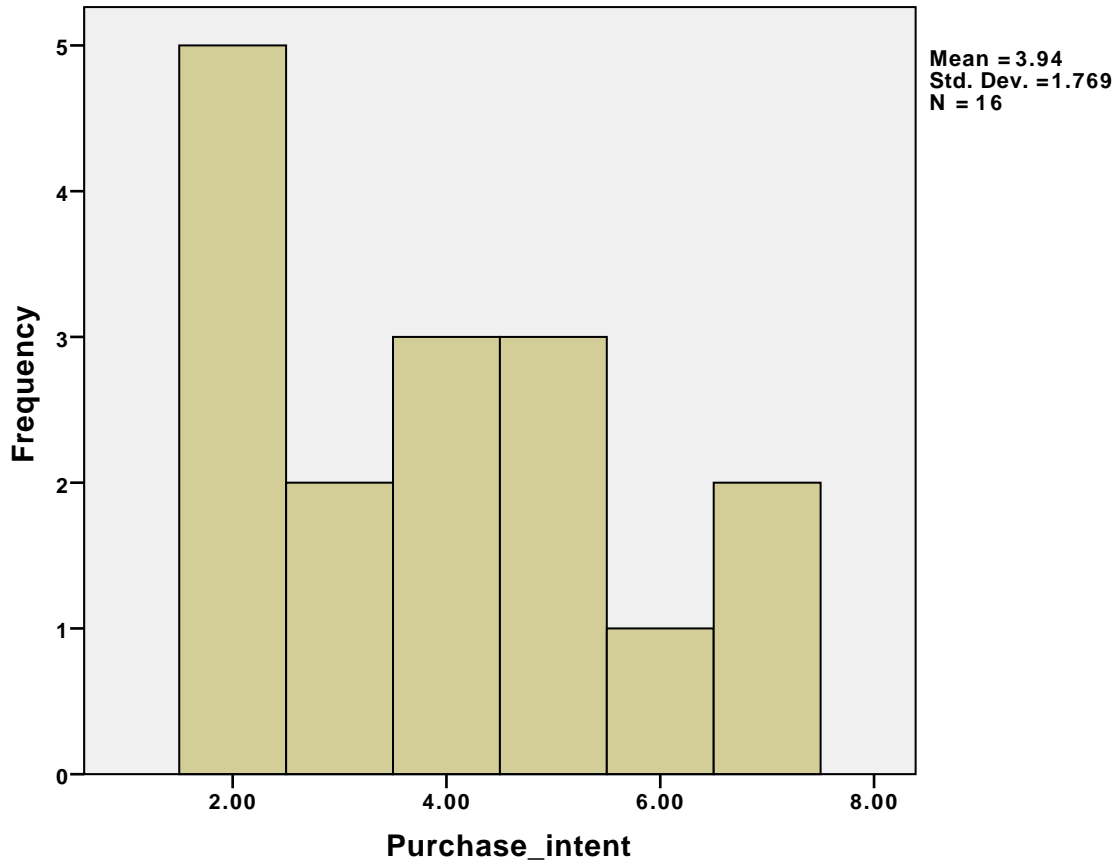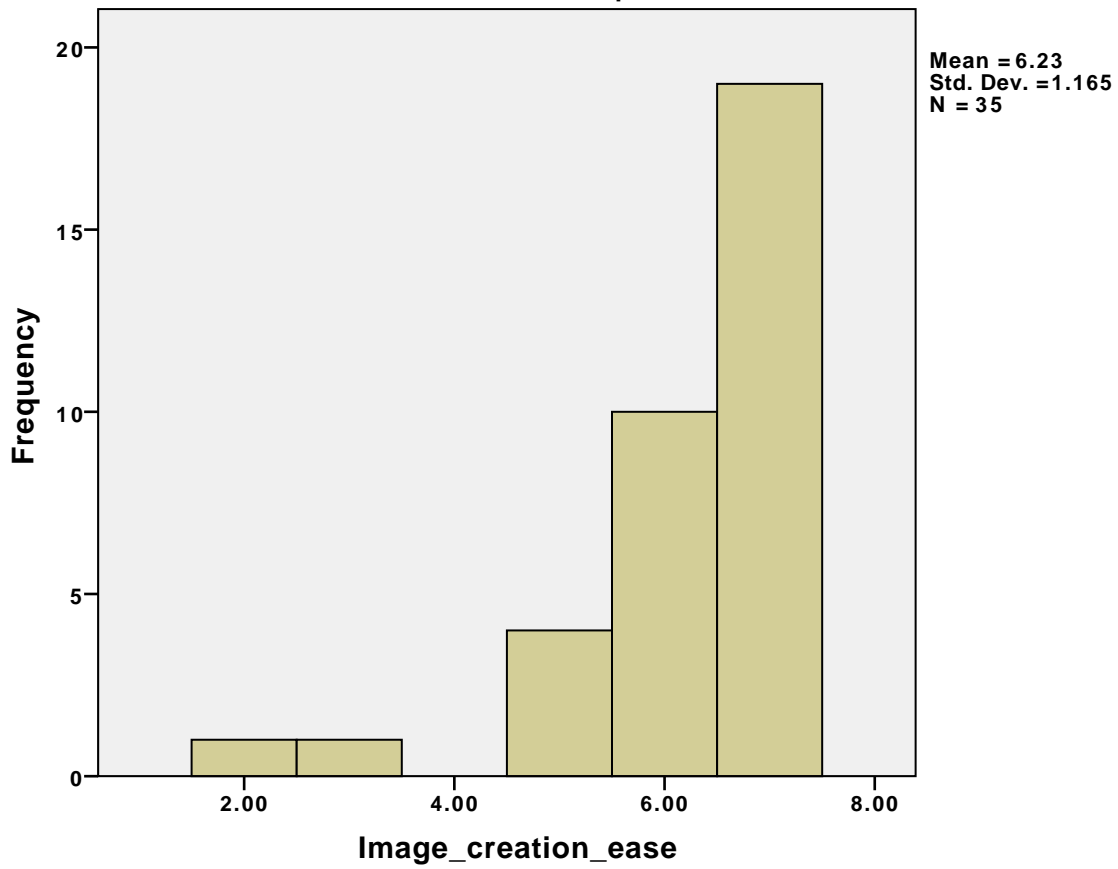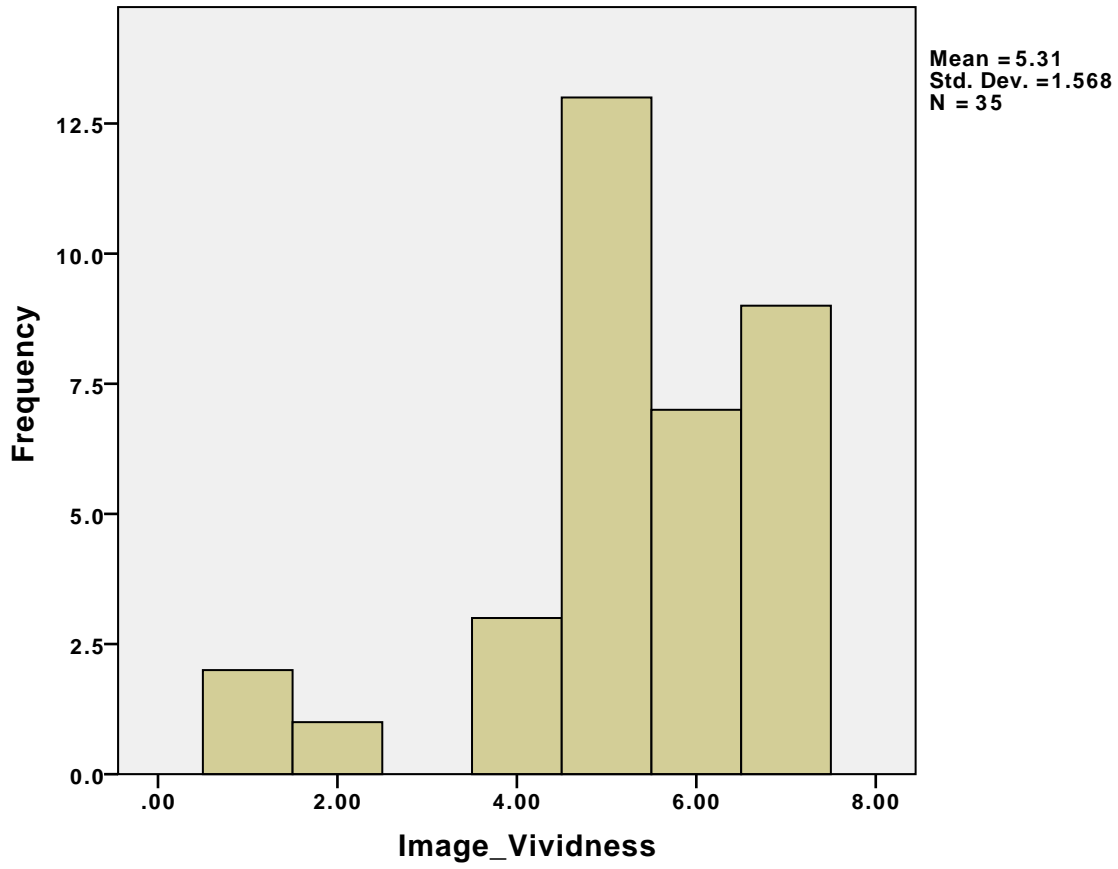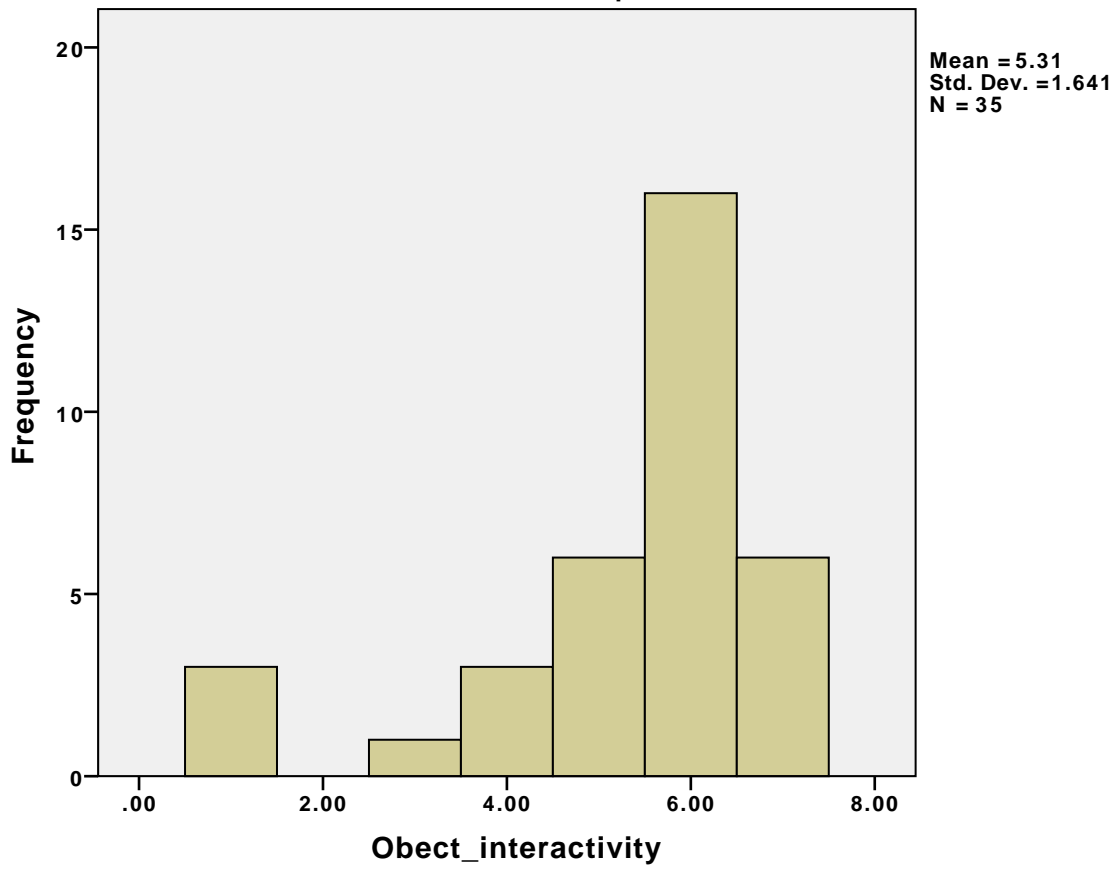
Purchase_intent
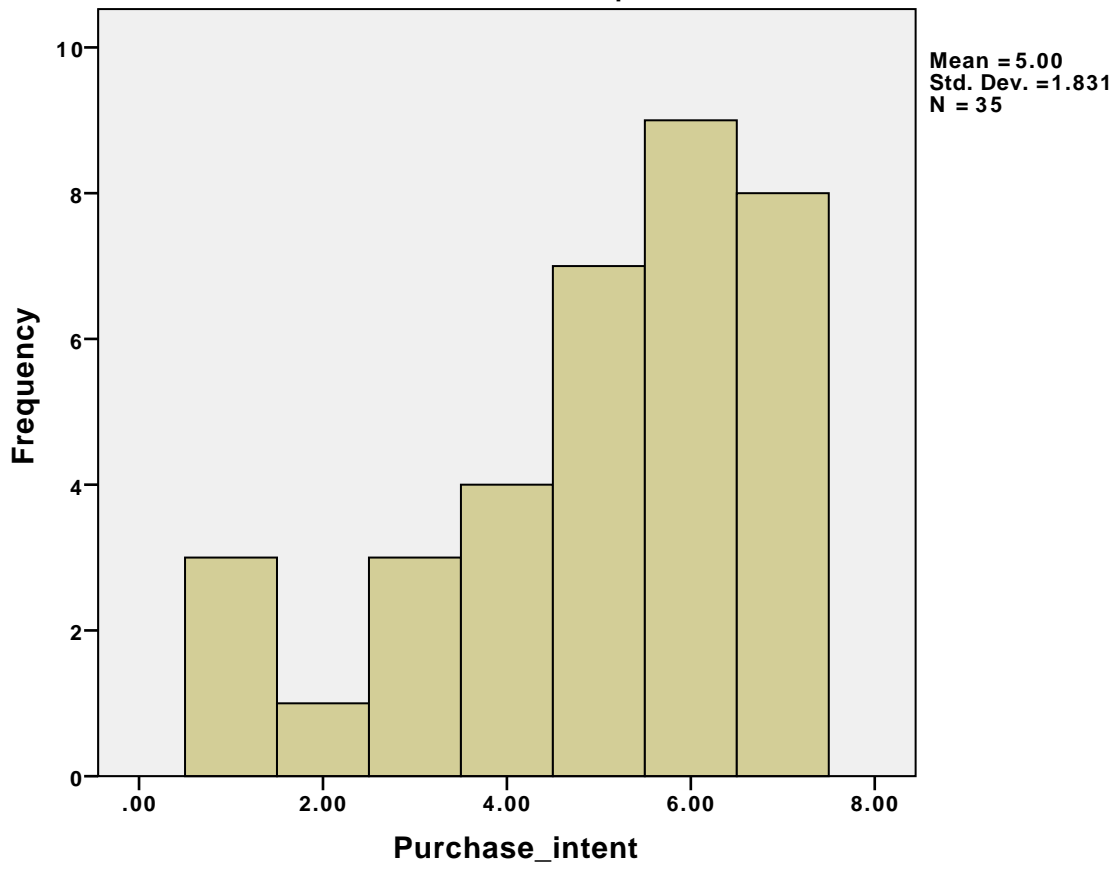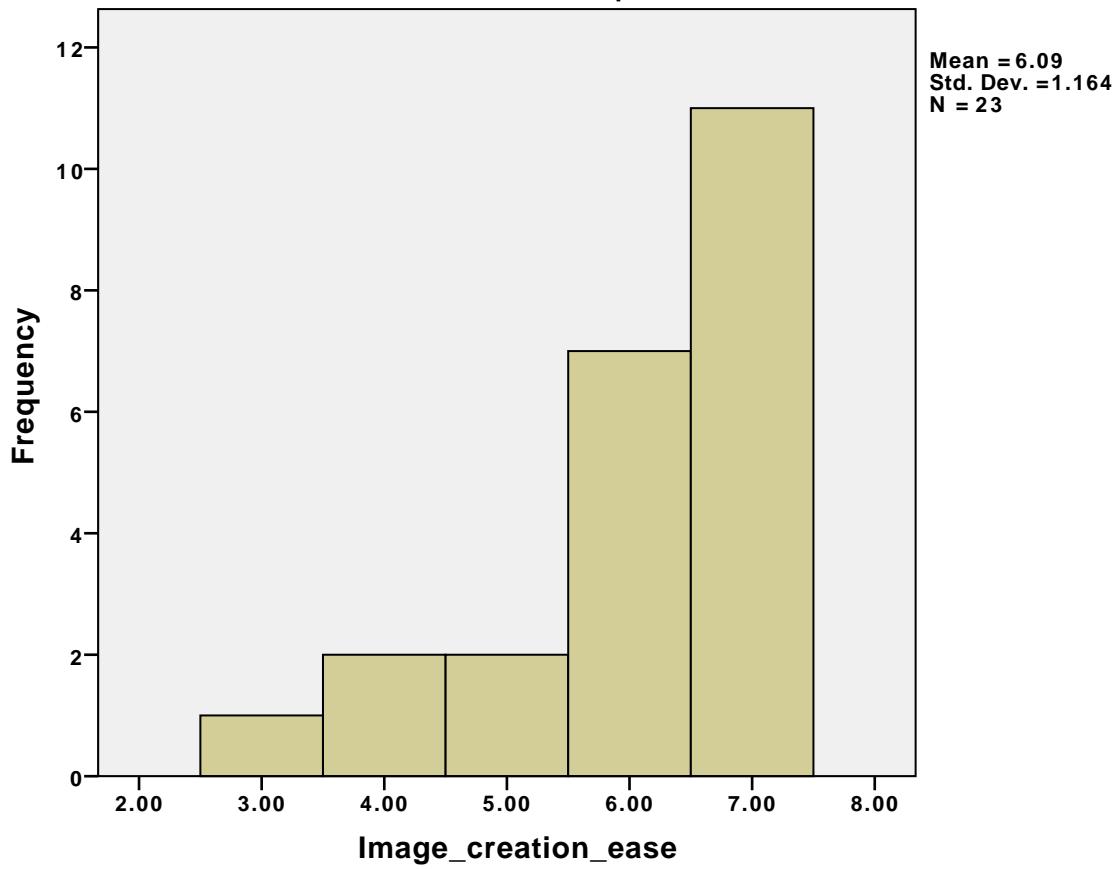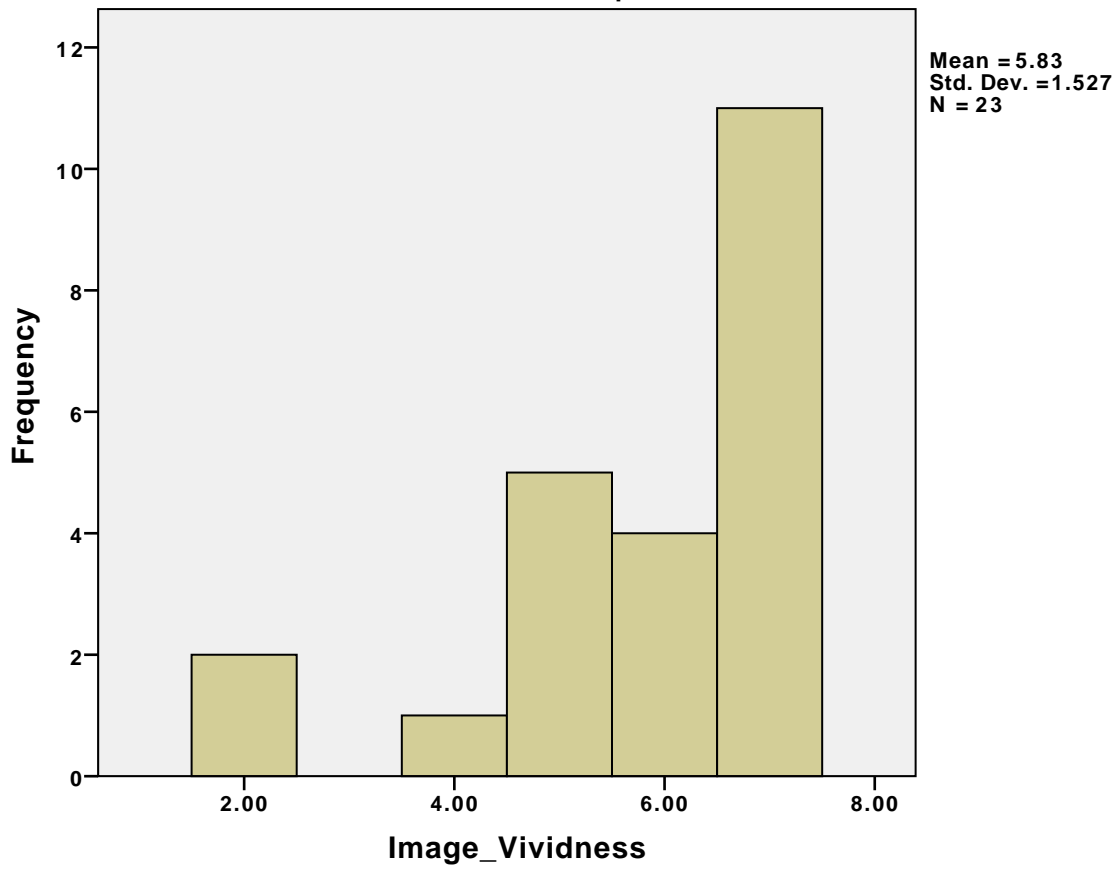
Group: 3

Mean = 5.43
Std. Dev. = 1.376
N = 23
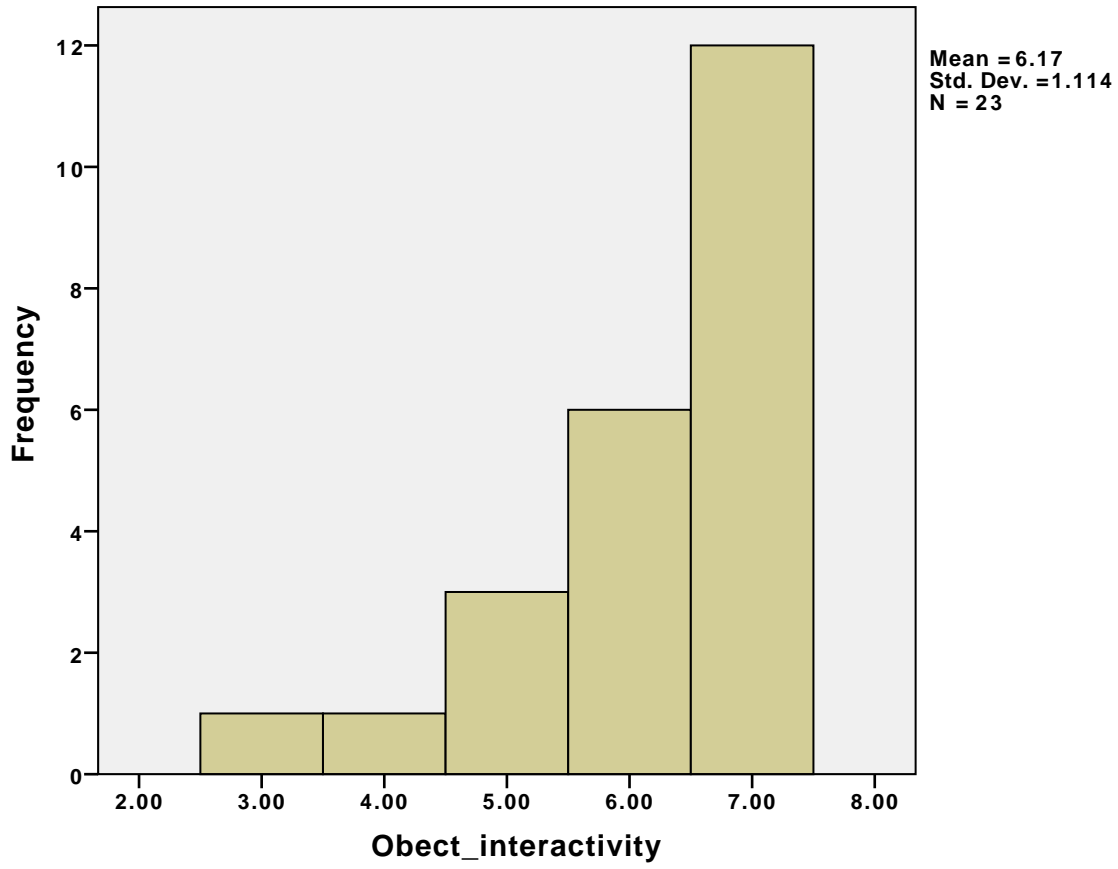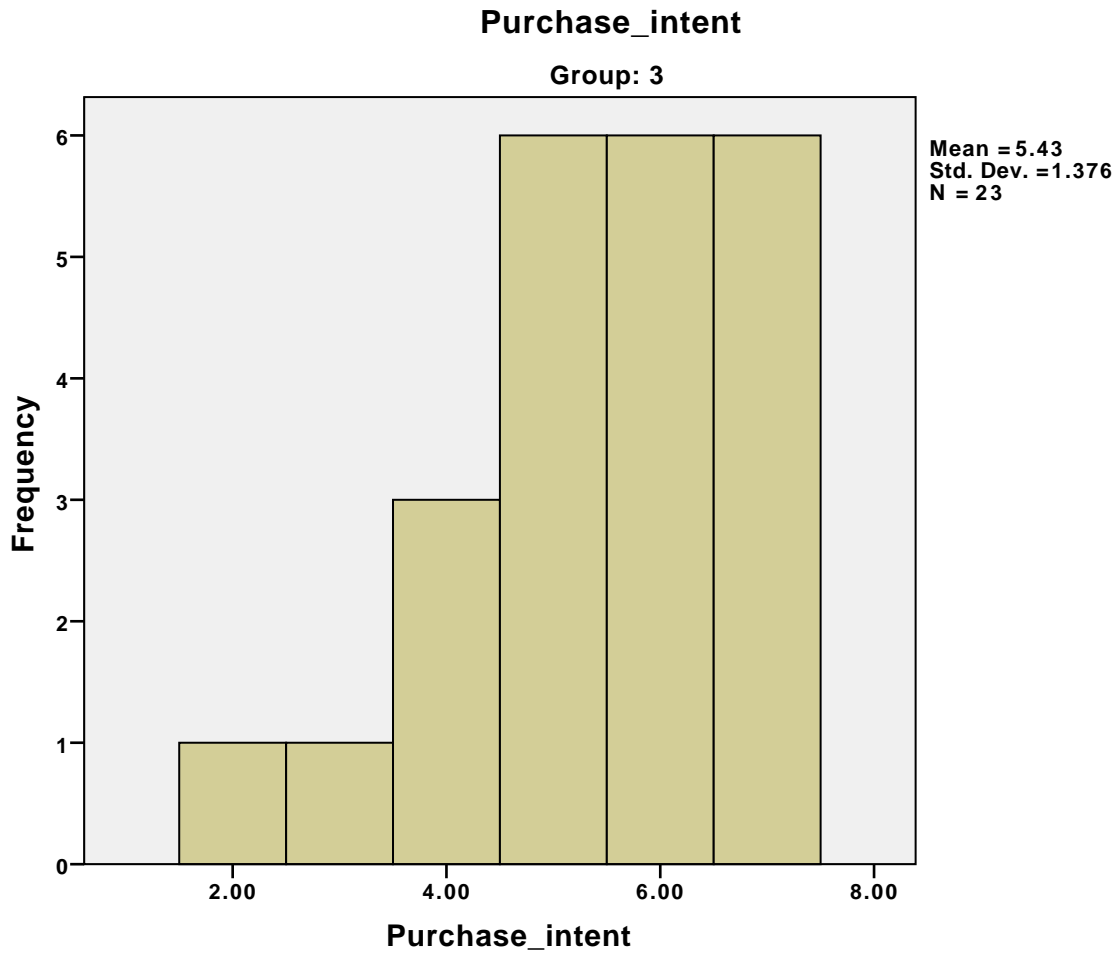
Appendix M: Presence VR+2D Analysis and Median

```
 NPAR TESTS
  /K-W=Spatial_presence Engagement Ecological_validity Negative_effects BY Gro
up(1 2)
  /MEDIAN=Spatial_presence Engagement Ecological_validity Negative_effects BY
Group(1 2)
  /STATISTICS DESCRIPTIVES QUARTILES
  /MISSING ANALYSIS.
```

NPar Tests

Notes

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	Cases Used	**Statistics for each test are based on all cases with valid data for the variable(s) used in that test.**
Syntax		**NPAR TESTS /K-W=Spatial_presence Engagement Ecological_validity Negative_effects BY Group(1 2)** **/MEDIAN=Spatial_presence Engagement Ecological_validity Negative_effects BY Group(1 2) /STATISTICS DESCRIPTIVES QUARTILES /MISSING ANALYSIS.**

Notes

Resources		
	Processor Time	00:00:00.01
	Elapsed Time	00:00:00.00
	Number of Cases Allowed[a]	314572

a. Based on availability of workspace memory.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum	Percentile. 25th
Spatial_presence	51	2.6610	1.06601	1.00	4.61	1.7200
Engagement	51	3.4973	.79982	1.15	4.77	3.0800
Ecological_validity	51	3.5373	.86947	1.20	5.00	3.0000
Negative_effects	51	1.4539	.62935	1.00	4.33	1.0000
Group	74	2.09	.725	1	3	2.00

Descriptive Statistics

	Percentiles	
	50th (Median)	75th
Spatial_presence	2.5600	3.4400
Engagement	3.6900	4.1500
Ecological_validity	3.6000	4.2000
Negative_effects	1.3300	1.6700
Group	2.00	3.00

Kruskal-Wallis Test

Ranks

	Group	N	Mean Rank
Spatial_presence	1	16	41.00
	2	35	19.14
	Total	51	
Engagement	1	16	34.00
	2	35	22.34
	Total	51	
Ecological_validity	1	16	27.69
	2	35	25.23
	Total	51	
Negative_effects	1	16	33.13
	2	35	22.74
	Total	51	

Test Statistics[a,b]

	Spatial_presence	Engagement	Ecological_validity	Negative_effects
Chi-Square	23.772	6.775	.303	5.738
df	1	1	1	1
Asymp. Sig.	.000	.009	.582	.017

a. Kruskal Wallis Test

b. Grouping Variable: Group

Median Test

Frequencies

		Group	
		1	2
Spatial_presence	> Median	13	12
	<= Median	3	23
Engagement	> Median	11	13
	<= Median	5	22
Ecological_validity	> Median	9	16
	<= Median	7	19
Negative_effects	> Median	9	11
	<= Median	7	24

Test Statistics[a]

		Spatial_presence	Engagement	Ecological_validity
N		51	51	51
Median		2.5600	3.6900	3.6000
Chi-Square		9.691	4.403	.488
df		1	1	1
Asymp. Sig.		.002	.036	.485
Yates' Continuity Correction	Chi-Square	7.903	3.226	.157
	df	1	1	1
	Asymp. Sig.	.005	.072	.692

Test Statistics[a]

		Negative_effects
N		51
Median		1.3300
Chi-Square		2.838
df		1
Asymp. Sig.		.092
Yates' Continuity Correction	Chi-Square	1.892
	df	1
	Asymp. Sig.	.169

a. Grouping Variable: Group

```
FREQUENCIES VARIABLES=Spatial_presence Engagement Ecological_validity Negative
_effects
  /STATISTICS=MEDIAN
  /HISTOGRAM
  /ORDER=ANALYSIS.
```

Frequencies

Notes

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	Weight	**<none>**
	Split File	**Group**
	N of Rows in Working Data File	**51**
Missing Value Handling	**Definition of Missing**	**User-defined missing values are treated as missing.**
	Cases Used	**Statistics are based on all cases with valid data.**
Syntax		**FREQUENCIES VARIABLES=Spatial_pres ence Engagement Ecological_validity Negative_effects /STATISTICS=MEDIAN /HISTOGRAM /ORDER=ANALYSIS.**
Resources	**Processor Time**	**00:00:01.21**
	Elapsed Time	**00:00:02.00**

Statistics

Group			Spatial_presence	Engagement	Ecological_validity	Negative_effects
1	N	Valid	16	16	16	16
		Missing	0	0	0	0
	Median		4.0300	4.1150	3.8000	1.6700
2	N	Valid	35	35	35	35
		Missing	0	0	0	0
	Median		2.1100	3.3800	3.6000	1.1700

Frequency Table

Spatial_presence

Group			Frequency	Percent	Valid Percent	Cumulative Percent
1	Valid	2.44	1	6.3	6.3	6.3
		2.56	2	12.5	12.5	18.8
		3.28	1	6.3	6.3	25.0
		3.56	1	6.3	6.3	31.3
		3.78	1	6.3	6.3	37.5
		4.00	2	12.5	12.5	50.0
		4.06	1	6.3	6.3	56.3
		4.17	2	12.5	12.5	68.8
		4.33	2	12.5	12.5	81.3
		4.44	1	6.3	6.3	87.5
		4.50	1	6.3	6.3	93.8
		4.61	1	6.3	6.3	100.0
		Total	16	100.0	100.0	
2	Valid	1.00	2	5.7	5.7	5.7
		1.11	3	8.6	8.6	14.3
		1.17	2	5.7	5.7	20.0
		1.33	1	2.9	2.9	22.9
		1.61	3	8.6	8.6	31.4
		1.72	2	5.7	5.7	37.1
		1.78	1	2.9	2.9	40.0
		2.00	1	2.9	2.9	42.9
		2.11	3	8.6	8.6	51.4
		2.33	3	8.6	8.6	60.0
		2.44	1	2.9	2.9	62.9
		2.56	1	2.9	2.9	65.7

Spatial_presence

Group		Frequency	Percent	Valid Percent	Cumulative Percent
	2.61	1	2.9	2.9	68.6
	2.72	1	2.9	2.9	71.4
	2.78	1	2.9	2.9	74.3
	2.83	3	8.6	8.6	82.9
	3.00	2	5.7	5.7	88.6
	3.06	1	2.9	2.9	91.4
	3.17	1	2.9	2.9	94.3
	3.28	1	2.9	2.9	97.1
	3.44	1	2.9	2.9	100.0
	Total	35	100.0	100.0	

Engagement

Group			Frequency	Percent	Valid Percent	Cumulative Percent
1	Valid	2.62	1	6.3	6.3	6.3
		2.85	1	6.3	6.3	12.5
		3.23	1	6.3	6.3	18.8
		3.31	1	6.3	6.3	25.0
		3.62	1	6.3	6.3	31.3
		3.92	2	12.5	12.5	43.8
		4.08	1	6.3	6.3	50.0
		4.15	1	6.3	6.3	56.3
		4.23	3	18.8	18.8	75.0
		4.38	2	12.5	12.5	87.5
		4.46	1	6.3	6.3	93.8
		4.77	1	6.3	6.3	100.0
		Total	16	100.0	100.0	
2	Valid	1.15	1	2.9	2.9	2.9
		1.31	1	2.9	2.9	5.7
		1.69	1	2.9	2.9	8.6
		2.23	1	2.9	2.9	11.4
		2.62	1	2.9	2.9	14.3
		2.69	1	2.9	2.9	17.1
		2.77	1	2.9	2.9	20.0
		2.85	3	8.6	8.6	28.6
		3.08	1	2.9	2.9	31.4
		3.15	2	5.7	5.7	37.1

Engagement

Group		Frequency	Percent	Valid Percent	Cumulative Percent
	3.23	3	8.6	8.6	45.7
	3.31	1	2.9	2.9	48.6
	3.38	1	2.9	2.9	51.4
	3.46	1	2.9	2.9	54.3
	3.62	1	2.9	2.9	57.1
	3.69	2	5.7	5.7	62.9
	3.77	2	5.7	5.7	68.6
	3.85	1	2.9	2.9	71.4
	3.92	3	8.6	8.6	80.0
	4.00	1	2.9	2.9	82.9
	4.15	2	5.7	5.7	88.6
	4.23	2	5.7	5.7	94.3
	4.38	1	2.9	2.9	97.1
	4.46	1	2.9	2.9	100.0
	Total	35	100.0	100.0	

Ecological_validity

Group			Frequency	Percent	Valid Percent	Cumulative Percent
1	Valid	2.00	1	6.3	6.3	6.3
		2.20	2	12.5	12.5	18.8
		3.00	1	6.3	6.3	25.0
		3.40	2	12.5	12.5	37.5
		3.60	1	6.3	6.3	43.8
		3.80	2	12.5	12.5	56.3
		4.00	1	6.3	6.3	62.5
		4.20	2	12.5	12.5	75.0
		4.40	4	25.0	25.0	100.0
		Total	16	100.0	100.0	
2	Valid	1.20	1	2.9	2.9	2.9
		1.40	1	2.9	2.9	5.7
		2.00	1	2.9	2.9	8.6
		2.40	2	5.7	5.7	14.3
		2.80	1	2.9	2.9	17.1
		3.00	4	11.4	11.4	28.6
		3.20	2	5.7	5.7	34.3
		3.40	2	5.7	5.7	40.0

Ecological_validity

Group		Frequency	Percent	Valid Percent	Cumulative Percent
	3.60	5	14.3	14.3	54.3
	3.80	4	11.4	11.4	65.7
	4.00	4	11.4	11.4	77.1
	4.20	3	8.6	8.6	85.7
	4.40	2	5.7	5.7	91.4
	5.00	3	8.6	8.6	100.0
	Total	35	100.0	100.0	

Negative_effects

Group			Frequency	Percent	Valid Percent	Cumulative Percent
1	Valid	1.00	3	18.8	18.8	18.8
		1.17	1	6.3	6.3	25.0
		1.33	3	18.8	18.8	43.8
		1.67	3	18.8	18.8	62.5
		1.83	3	18.8	18.8	81.3
		2.17	1	6.3	6.3	87.5
		3.33	1	6.3	6.3	93.8
		4.33	1	6.3	6.3	100.0
		Total	16	100.0	100.0	
2	Valid	1.00	17	48.6	48.6	48.6
		1.17	2	5.7	5.7	54.3
		1.33	5	14.3	14.3	68.6
		1.50	4	11.4	11.4	80.0
		1.67	3	8.6	8.6	88.6
		1.83	1	2.9	2.9	91.4
		2.00	1	2.9	2.9	94.3
		2.33	1	2.9	2.9	97.1
		2.50	1	2.9	2.9	100.0
		Total	35	100.0	100.0	

Histogram

Spatial_presence

Group: 1
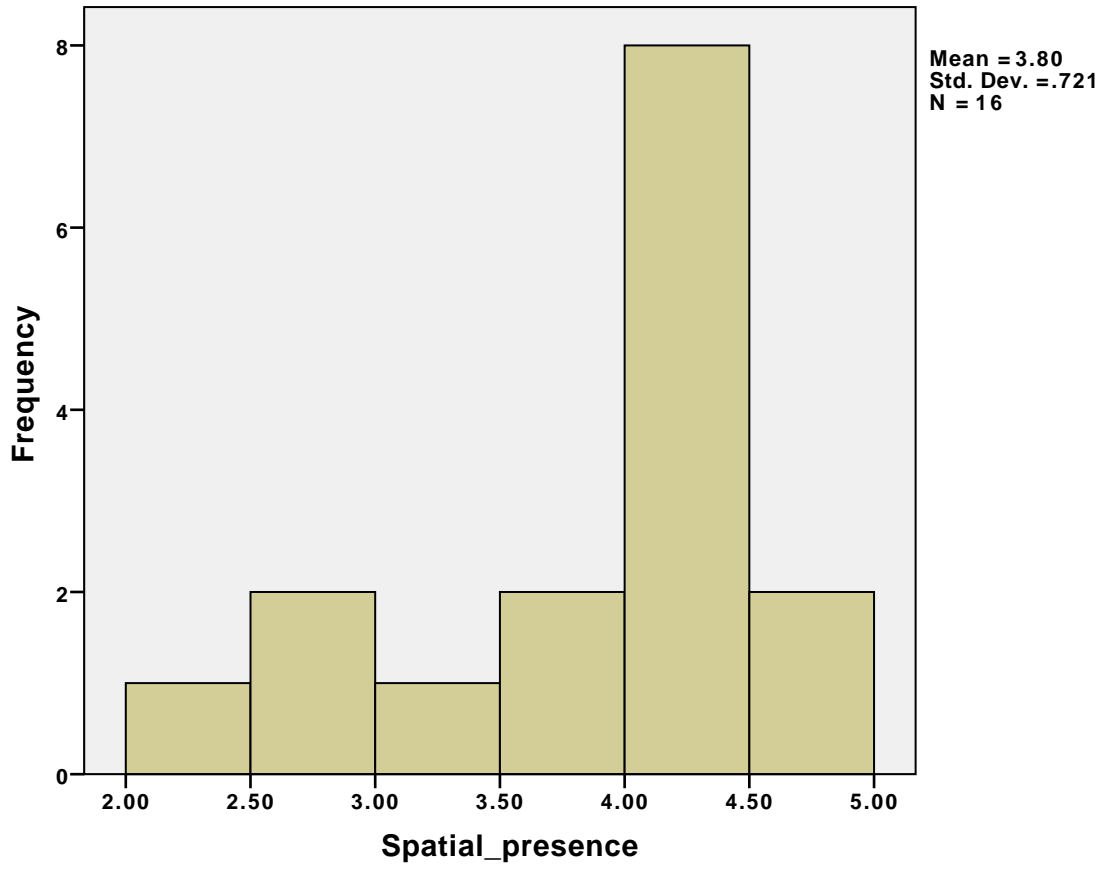
Mean = 3.80
Std. Dev. = .721
N = 16

Engagement

Group: 1
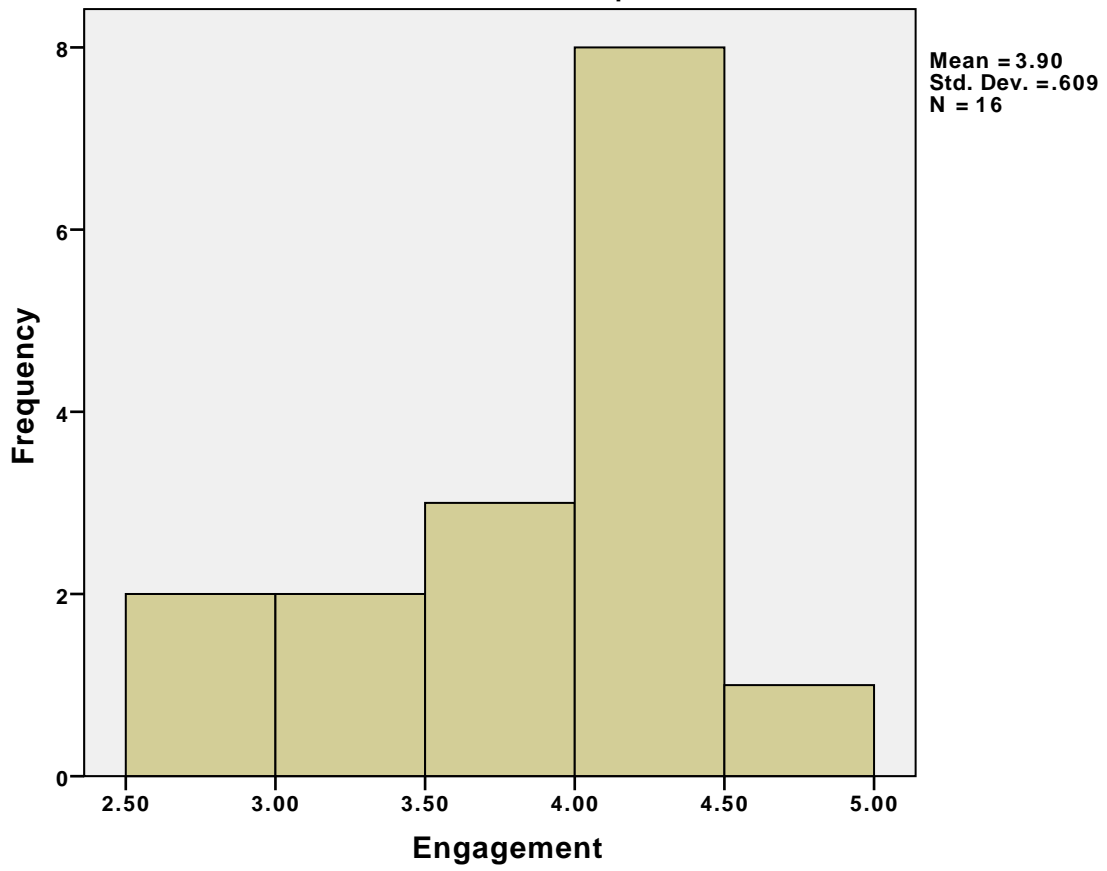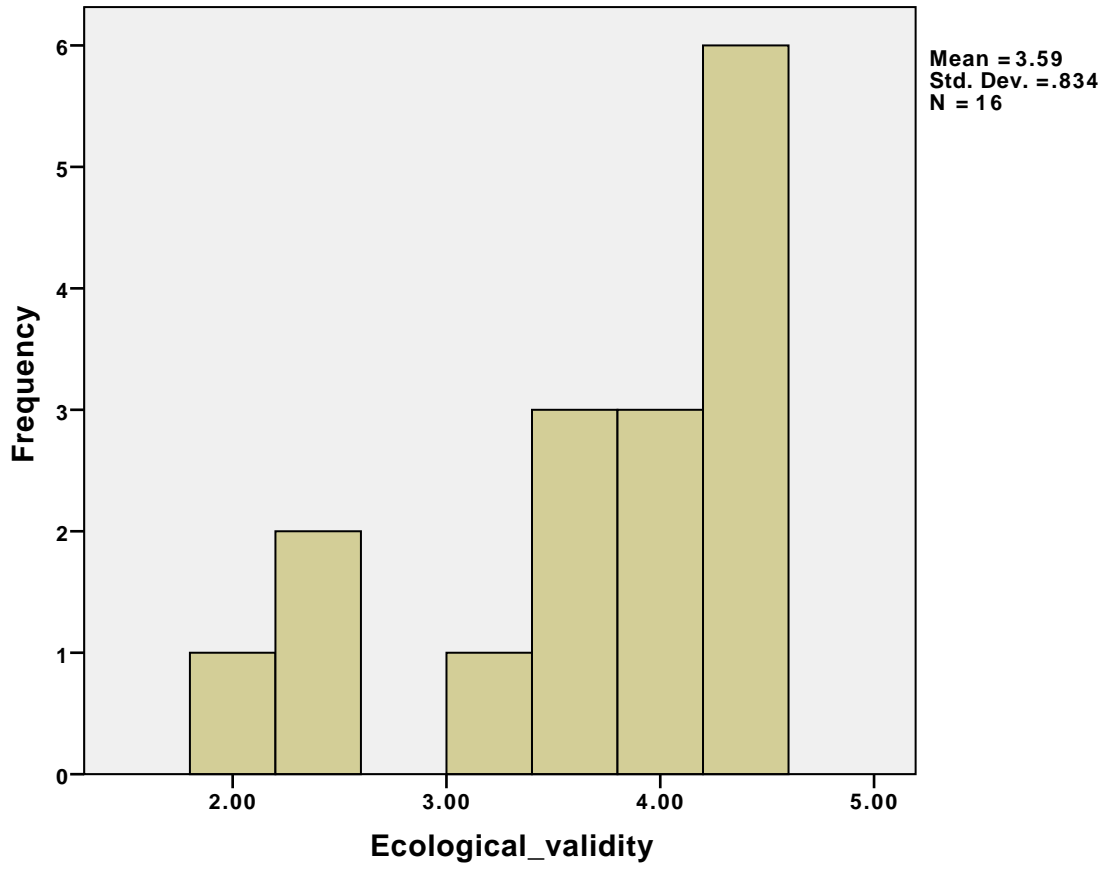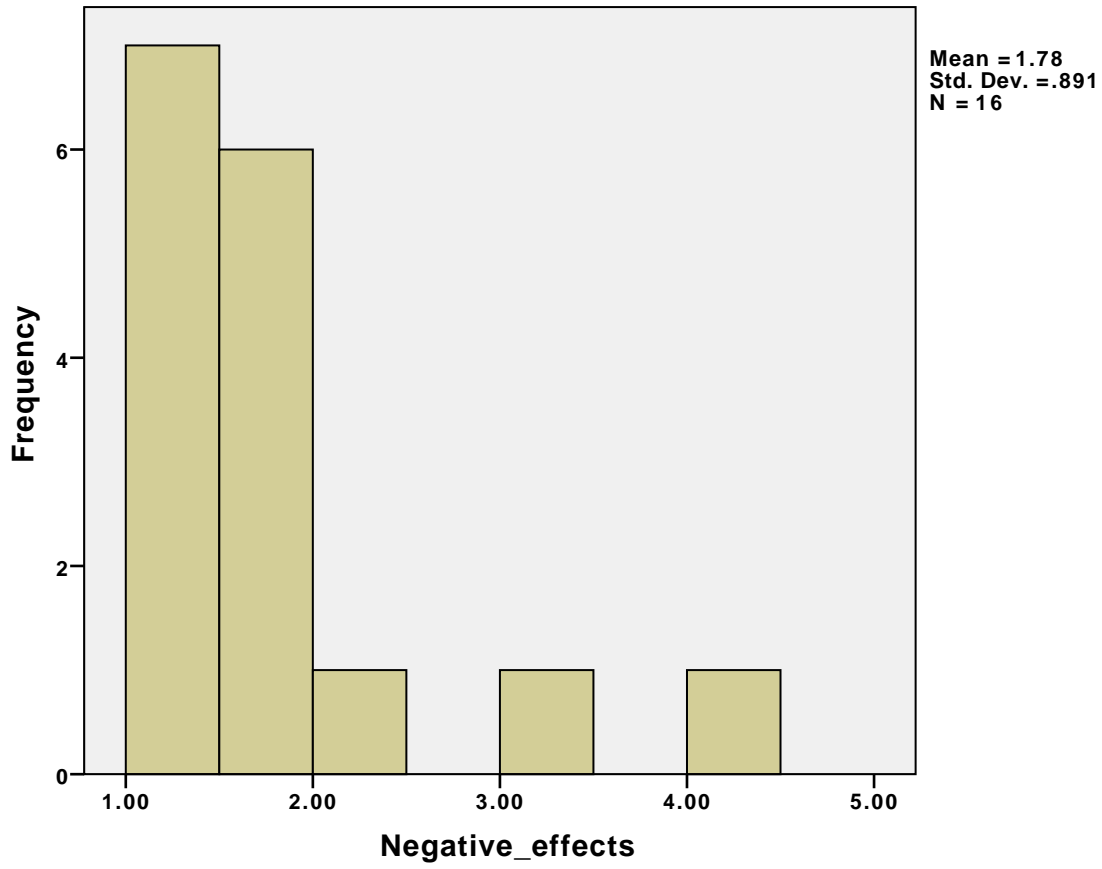
Mean = 3.90
Std. Dev. = .609
N = 16

Ecological_validity

Group: 1

Mean = 3.59
Std. Dev. =.834
N = 16

Negative_effects

Mean = 1.78
Std. Dev. =.891
N = 16

Spatial_presence

Group: 2

Mean = 2.14
Std. Dev. = .744
N = 35

Engagement

Group: 2

Mean = 3.31
Std. Dev. =.816
N = 35

Ecological_validity

Group: 2

Mean = 3.51
Std. Dev. = .896
N = 35
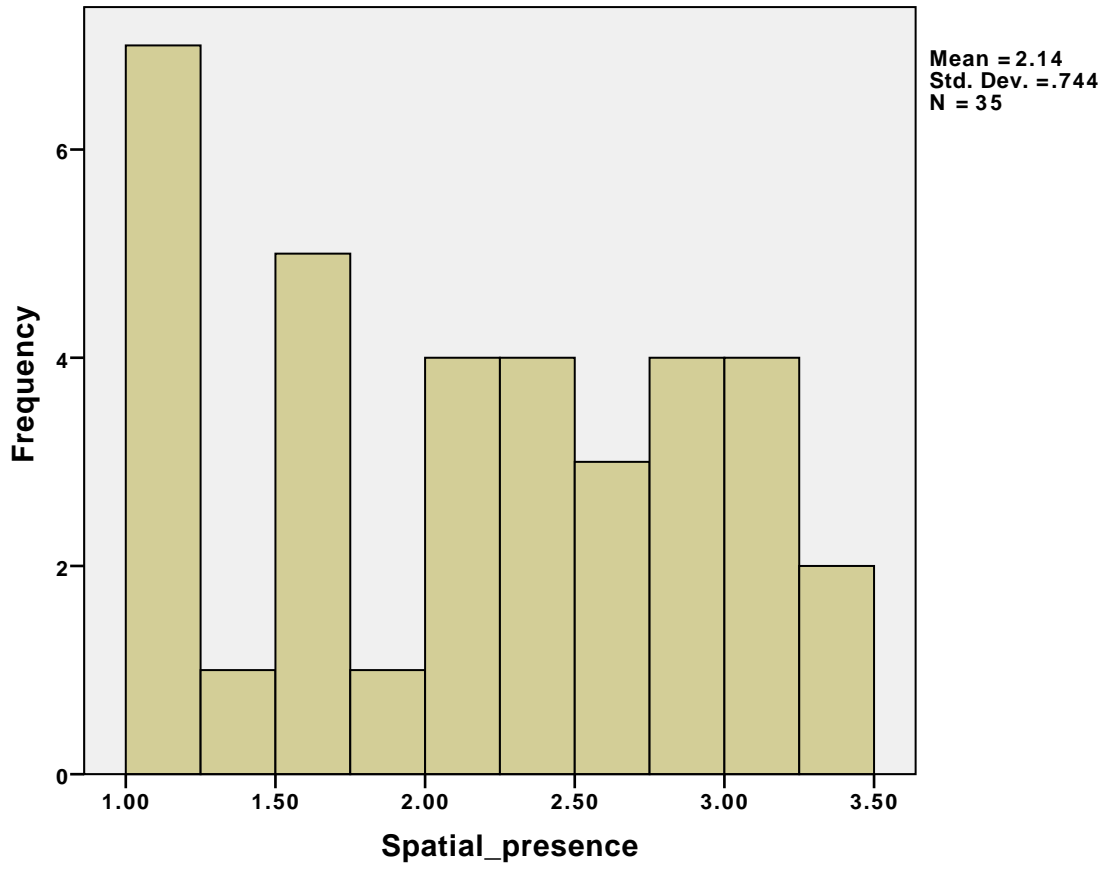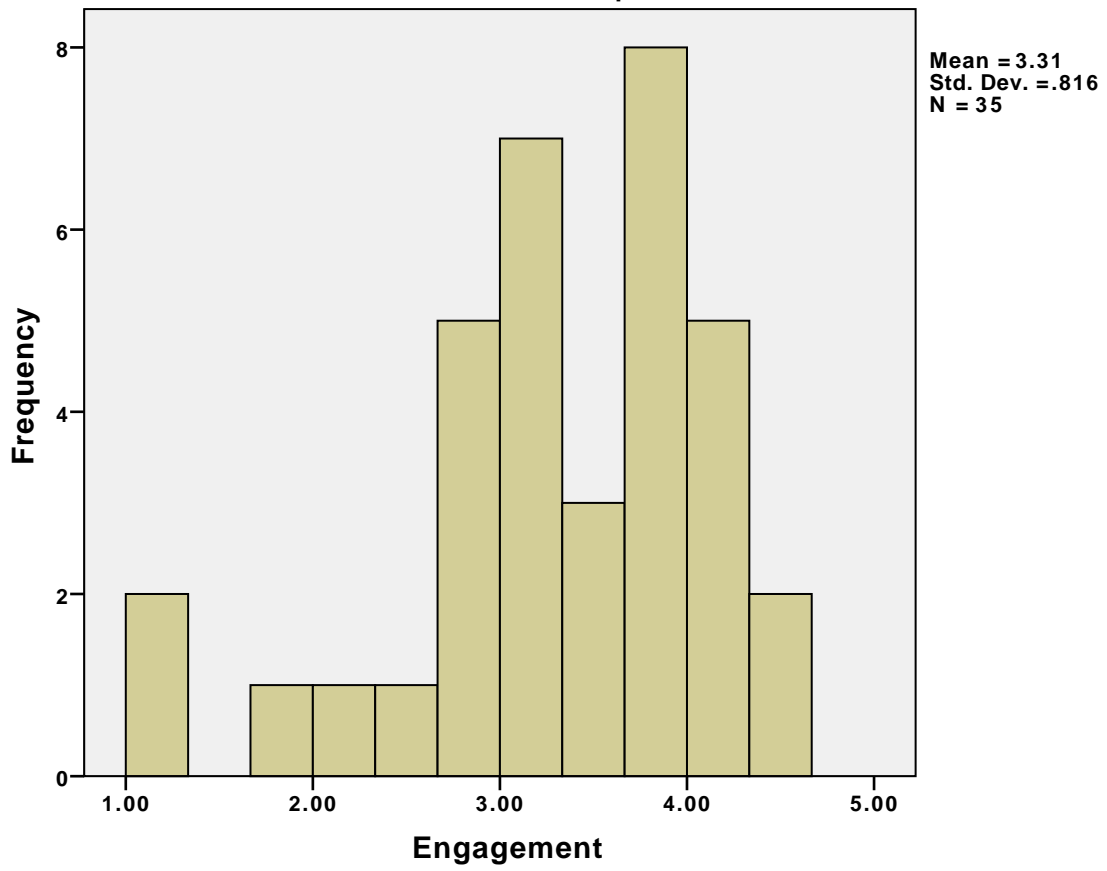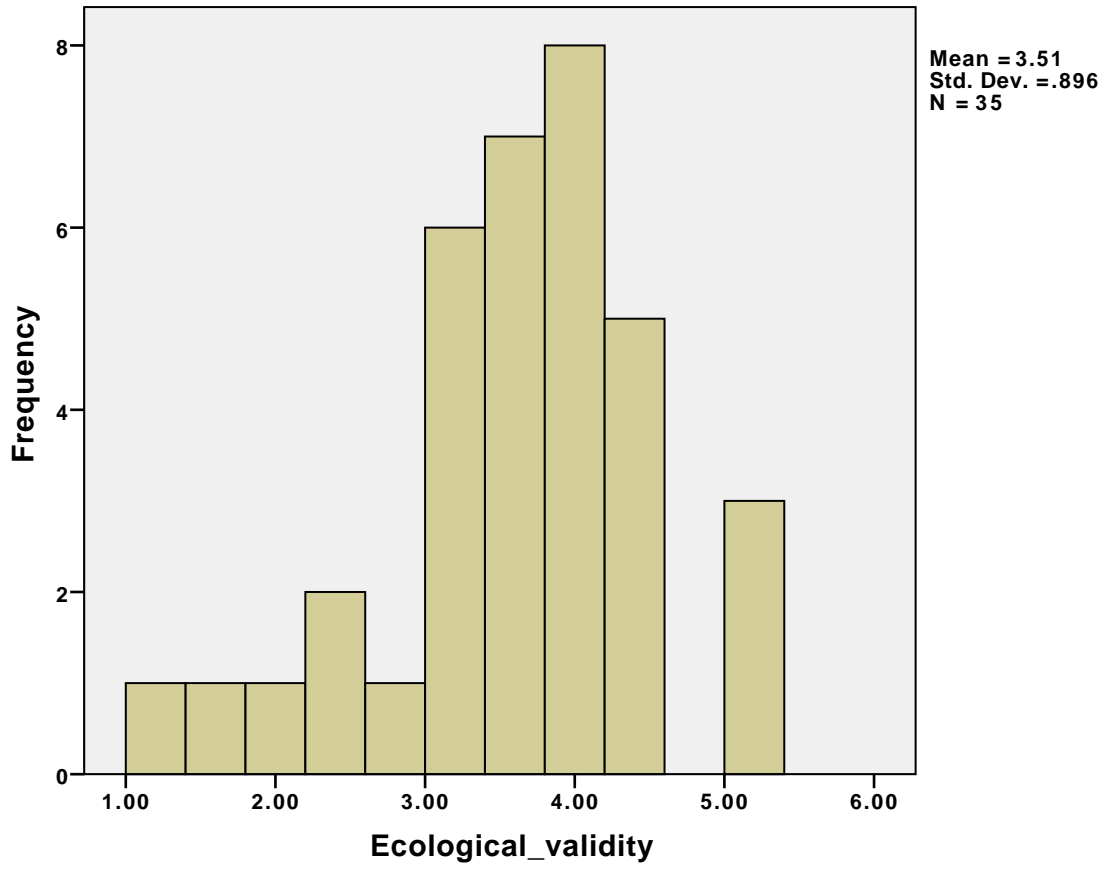
Negative_effects

Group: 2

Mean = 1.30
Std. Dev. = .399
N = 35
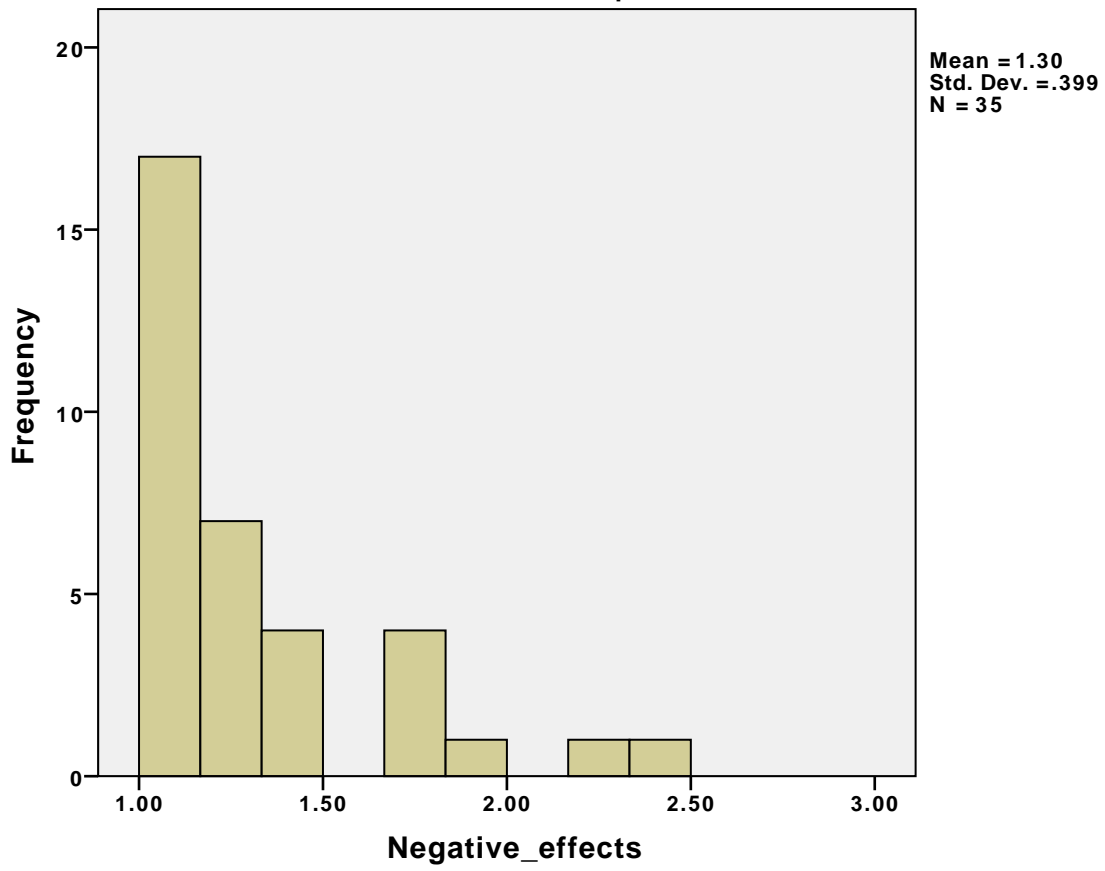
Appendix N: Kruskal-Wallis Test

```
 USE ALL.
COMPUTE filter_$=(Group = 1 | Group = 3).
VARIABLE LABELS filter_$ 'Group = 1 | Group = 3 (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
FILTER OFF.
USE ALL.
EXECUTE.
NPAR TESTS
  /K-W=Image_creation_easeImage_VividnessObect_interactivityPurchase_intent
 BY Group(2 3)
  /STATISTICS DESCRIPTIVES QUARTILES
  /MISSING ANALYSIS.
```

NPar Tests

Notes

Output Created		**30-MAR-2018 20:00…**
Comments		
Input	**Data**	**/Users/asozanschi/Desktop/SPSS.sav**
	Active Dataset	**DataSet1**
	Filter	**<none>**
	Weight	**<none>**
	Split File	**<none>**
	N of Rows in Working Data File	**74**
Missing Value Handling	**Definition of Missing**	**User-defined missing values are treated as missing.**
	Cases Used	**Statistics for each test are based on all cases with valid data for the variable(s) used in that test.**
Syntax		**NPAR TESTS /K-W=Image_creation_ease Image_Vividness Obect_interactivity Purchase_intent BY Group(2 3) /STATISTICS DESCRIPTIVES QUARTILES /MISSING ANALYSIS.**

Notes

Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00
	Number of Cases Allowed[a]	314572

a. Based on availability of workspace memory.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum	Percentile. 25th
Image_creation_ease	74	6.0135	1.17617	2.00	7.00	6.0000
Image_Vividness	74	5.4595	1.53667	1.00	7.00	5.0000
Obect_interactivity	74	5.5946	1.55201	1.00	7.00	5.0000
Purchase_intent	74	4.9054	1.75303	1.00	7.00	4.0000
Group	74	2.09	.725	1	3	2.00

Descriptive Statistics

	Percentiles	
	50th (Median)	75th
Image_creation_ease	6.0000	7.0000
Image_Vividness	6.0000	7.0000
Obect_interactivity	6.0000	7.0000
Purchase_intent	5.0000	6.0000
Group	2.00	3.00

Kruskal-Wallis Test

Ranks

	Group	N	Mean Rank
Image_creation_ease	2	35	30.40
	3	23	28.13
	Total	58	
Image_Vividness	2	35	26.79
	3	23	33.63
	Total	58	
Obect_interactivity	2	35	25.31
	3	23	35.87
	Total	58	
Purchase_intent	2	35	28.31
	3	23	31.30
	Total	58	

Test Statistics[a,b]

	Image_creation_ease	Image_Vividness	Obect_interactivity	Purchase_intent
Chi-Square	.300	2.473	5.949	.455
df	1	1	1	1
Asymp. Sig.	.584	.116	.015	.500

a. Kruskal Wallis Test

b. Grouping Variable: Group

```
NPAR TESTS
 /K-W=Image_creation_easeImage_VividnessObect_interactivityPurchase_intent
BY Group(1 3)
 /STATISTICS DESCRIPTIVES QUARTILES
 /MISSING ANALYSIS.
```

NPar Tests

Notes

Output Created		30-MAR-2018 20:03…
Comments		
Input	Data	/Users/asozanschi/Desktop/SPSS.sav
	Active Dataset	DataSet1
	Filter	Group = 1 | Group = 3 (FILTER)
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	39
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each test are based on all cases with valid data for the variable(s) used in that test.
Syntax		NPAR TESTS /K-W=Image_creation_ease Image_Vividness Obect_interactivity Purchase_intent BY Group(1 3) /STATISTICS DESCRIPTIVES QUARTILES /MISSING ANALYSIS.
Resources	Processor Time	00:00:00.01
	Elapsed Time	00:00:00.00
	Number of Cases Allowed[a]	314572

a. Based on availability of workspace memory.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum	Percentile. 25th
Image_creation_ease	39	5.8205	1.16691	3.00	7.00	5.0000
Image_Vividness	39	5.5897	1.51689	2.00	7.00	5.0000
Obect_interactivity	39	5.8462	1.44256	1.00	7.00	5.0000
Purchase_intent	39	4.8205	1.69941	2.00	7.00	4.0000
Group	39	2.18	.997	1	3	1.00

Descriptive Statistics

	Percentiles 50th (Median)	75th
Image_creation_ease	6.0000	7.0000
Image_Vividness	6.0000	7.0000
Obect_interactivity	6.0000	7.0000
Purchase_intent	5.0000	6.0000
Group	3.00	3.00

Kruskal-Wallis Test

Ranks

	Group	N	Mean Rank
Image_creation_ease	1	16	15.44
	3	23	23.17
	Total	39	
Image_Vividness	1	16	16.94
	3	23	22.13
	Total	39	
Obect_interactivity	1	16	16.63
	3	23	22.35
	Total	39	
Purchase_intent	1	16	14.38
	3	23	23.91
	Total	39	

Test Statistics[a,b]

	Image_creatio n_ease	Image_Vividne ss	Obect_interacti vity	Purchase_inten t
Chi-Square	4.837	2.117	2.662	6.834
df	1	1	1	1
Asymp. Sig.	.028	.146	.103	.009

a. Kruskal Wallis Test

b. Grouping Variable: Group

```
NPAR TESTS
 /K-W=Image_creation_easeImage_VividnessObect_interactivityPurchase_intent
BY Group(1 2)
 /STATISTICS DESCRIPTIVES QUARTILES
 /MISSING ANALYSIS.
```

NPar Tests

Notes

Output Created		**30-MAR-2018 19:54…**
Comments		
Input	**Data**	**/Users/asozanschi/Desktop/SPSS.sav**
	Active Dataset	**DataSet1**
	Filter	**<none>**
	Weight	**<none>**
	Split File	**<none>**
	N of Rows in Working Data File	**74**
Missing Value Handling	**Definition of Missing**	**User-defined missing values are treated as missing.**
	Cases Used	**Statistics for each test are based on all cases with valid data for the variable(s) used in that test.**
Syntax		**NPAR TESTS /K-W=Image_creation_ease Image_Vividness Obect_interactivity Purchase_intent BY Group(1 2) /STATISTICS DESCRIPTIVES QUARTILES /MISSING ANALYSIS.**
Resources	**Processor Time**	**00:00:00.00**
	Elapsed Time	**00:00:00.00**
	Number of Cases Allowed[a]	**314572**

a. Based on availability of workspace memory.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum	Percentile. 25th
Image_creation_ease	74	6.0135	1.17617	2.00	7.00	6.0000
Image_Vividness	74	5.4595	1.53667	1.00	7.00	5.0000
Obect_interactivity	74	5.5946	1.55201	1.00	7.00	5.0000
Purchase_intent	74	4.9054	1.75303	1.00	7.00	4.0000
Group	74	2.09	.725	1	3	2.00

Descriptive Statistics

	Percentiles 50th (Median)	75th
Image_creation_ease	6.0000	7.0000
Image_Vividness	6.0000	7.0000
Obect_interactivity	6.0000	7.0000
Purchase_intent	5.0000	6.0000
Group	2.00	3.00

Kruskal-Wallis Test

Ranks

	Group	N	Mean Rank
Image_creation_ease	1	16	17.47
	2	35	29.90
	Total	51	
Image_Vividness	1	16	25.69
	2	35	26.14
	Total	51	
Obect_interactivity	1	16	26.47
	2	35	25.79
	Total	51	
Purchase_intent	1	16	19.97
	2	35	28.76
	Total	51	

Test Statistics[a,b]

	Image_creation_ease	Image_Vividness	Obect_interactivity	Purchase_intent
Chi-Square	8.683	.011	.025	3.946
df	1	1	1	1
Asymp. Sig.	.003	.916	.874	.047

a. Kruskal Wallis Test

b. Grouping Variable: Group

```
NPAR TESTS
 /K-W=Image_creation_easeImage_VividnessObect_interactivityPurchase_intent
BY Group(1 3)
 /STATISTICS DESCRIPTIVES QUARTILES
 /MISSING ANALYSIS.
```

NPar Tests

Notes

Output Created		30-MAR-2018 19:44…
Comments		
Input	Data	/Users/asozanschi/Desk top/SPSS.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	74
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each test are based on all cases with valid data for the variable(s) used in that test.
Syntax		NPAR TESTS /K-W=Image_creation_ease Image_Vividness Obect_interactivity Purchase_intent BY Group(1 3) /STATISTICS DESCRIPTIVES QUARTILES /MISSING ANALYSIS.
Resources	Processor Time	00:00:00.01
	Elapsed Time	00:00:00.00
	Number of Cases Allowed[a]	314572

a. Based on availability of workspace memory.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum	Percentile. 25th
Image_creation_ease	74	6.0135	1.17617	2.00	7.00	6.0000
Image_Vividness	74	5.4595	1.53667	1.00	7.00	5.0000
Obect_interactivity	74	5.5946	1.55201	1.00	7.00	5.0000
Purchase_intent	74	4.9054	1.75303	1.00	7.00	4.0000
Group	74	2.09	.725	1	3	2.00

Descriptive Statistics

	Percentiles 50th (Median)	75th
Image_creation_ease	6.0000	7.0000
Image_Vividness	6.0000	7.0000
Obect_interactivity	6.0000	7.0000
Purchase_intent	5.0000	6.0000
Group	2.00	3.00

Kruskal-Wallis Test

Ranks

	Group	N	Mean Rank
Image_creation_ease	1	16	24.41
	2	35	42.30
	3	23	39.30
	Total	74	
Image_Vividness	1	16	34.13
	2	35	34.93
	3	23	43.76
	Total	74	
Obect_interactivity	1	16	34.59
	2	35	33.10
	3	23	46.22
	Total	74	
Purchase_intent	1	16	25.84
	2	35	39.07
	3	23	43.22
	Total	74	

Test Statistics[a,b]

	Image_creation_ease	Image_Vividness	Obect_interactivity	Purchase_intent
Chi-Square	8.899	3.059	5.999	6.742
df	2	2	2	2
Asymp. Sig.	.012	.217	.050	.034

a. Kruskal Wallis Test

b. Grouping Variable: Group

Appendix O: Spearman Correlation

```
  GET
    FILE='/Users/asozanschi/Desktop/SPSS Results/SPSS.sav'.
DATASET NAME DataSet1 WINDOW=FRONT.
NONPAR CORR
    /VARIABLES=Image_creation_ease Image_Vividness Obect_interactivity Purchase_
intent
      Spatial_presence Engagement Ecological_validity Negative_effects
    /PRINT=SPEARMAN TWOTAIL NOSIG
    /MISSING=PAIRWISE.
```

Nonparametric Correlations

Notes

Output Created		**03-APR-2018 18:35:…**
Comments		
Input	**Data**	**/Users/asozanschi/Desktop/SPSS Results/SPSS.sav**
	Active Dataset	**DataSet1**
	Filter	**<none>**
	Weight	**<none>**
	Split File	**<none>**
	N of Rows in Working Data File	**74**
Missing Value Handling	**Definition of Missing**	**User-defined missing values are treated as missing.**
	Cases Used	**Statistics for each pair of variables are based on all the cases with valid data for that pair.**
Syntax		**NONPAR CORR** **/VARIABLES=Image_creation_ease Image_Vividness Obect_interactivity Purchase_intent Spatial_presence Engagement Ecological_validity Negative_effects /PRINT=SPEARMAN TWOTAIL NOSIG /MISSING=PAIRWISE.**

Notes

Resources		
Resources	**Processor Time**	**00:00:00.01**
	Elapsed Time	**00:00:00.00**
	Number of Cases Allowed	**285975 cases** [a]

a. Based on availability of workspace memory

[DataSet1] /Users/asozanschi/Desktop/SPSS Results/SPSS.sav

Correlations

			Image_creation_ease	Image_Vividness
Spearman's rho	**Image_creation_ease**	**Correlation Coefficient**	1.000	.487[**]
		Sig. (2-tailed)	.	.000
		N	74	74
	Image_Vividness	**Correlation Coefficient**	.487[**]	1.000
		Sig. (2-tailed)	.000	.
		N	74	74
	Obect_interactivity	**Correlation Coefficient**	.293[*]	.401[**]
		Sig. (2-tailed)	.011	.000
		N	74	74
	Purchase_intent	**Correlation Coefficient**	.637[**]	.453[**]
		Sig. (2-tailed)	.000	.000
		N	74	74
	Spatial_presence	**Correlation Coefficient**	.039	.301[*]
		Sig. (2-tailed)	.786	.032
		N	51	51
	Engagement	**Correlation Coefficient**	.351[*]	.524[**]
		Sig. (2-tailed)	.012	.000
		N	51	51
	Ecological_validity	**Correlation Coefficient**	.343[*]	.598[**]
		Sig. (2-tailed)	.014	.000
		N	51	51
	Negative_effects	**Correlation Coefficient**	-.278[*]	-.420[**]
		Sig. (2-tailed)	.048	.002
		N	51	51

Correlations

			Obect_interactivity	Purchase_intent
Spearman's rho	Image_creation_ease	Correlation Coefficient	.293[*]	.637[**]
		Sig. (2-tailed)	.011	.000
		N	74	74
	Image_Vividness	Correlation Coefficient	.401[**]	.453[**]
		Sig. (2-tailed)	.000	.000
		N	74	74
	Obect_interactivity	Correlation Coefficient	1.000	.450[**]
		Sig. (2-tailed)	.	.000
		N	74	74
	Purchase_intent	Correlation Coefficient	.450[**]	1.000
		Sig. (2-tailed)	.000	.
		N	74	74
	Spatial_presence	Correlation Coefficient	.362[**]	.157
		Sig. (2-tailed)	.009	.270
		N	51	51
	Engagement	Correlation Coefficient	.431[**]	.403[**]
		Sig. (2-tailed)	.002	.003
		N	51	51
	Ecological_validity	Correlation Coefficient	.395[**]	.486[**]
		Sig. (2-tailed)	.004	.000
		N	51	51
	Negative_effects	Correlation Coefficient	-.318[*]	-.423[**]
		Sig. (2-tailed)	.023	.002
		N	51	51

Correlations

			Spatial_presence	Engagement
Spearman's rho	Image_creation_ease	Correlation Coefficient	.039	.351[*]
		Sig. (2-tailed)	.786	.012
		N	51	51
	Image_Vividness	Correlation Coefficient	.301[*]	.524[**]
		Sig. (2-tailed)	.032	.000
		N	51	51
	Obect_interactivity	Correlation Coefficient	.362[**]	.431[**]
		Sig. (2-tailed)	.009	.002
		N	51	51
	Purchase_intent	Correlation Coefficient	.157	.403[**]
		Sig. (2-tailed)	.270	.003
		N	51	51
	Spatial_presence	Correlation Coefficient	1.000	.779[**]
		Sig. (2-tailed)	.	.000
		N	51	51
	Engagement	Correlation Coefficient	.779[**]	1.000
		Sig. (2-tailed)	.000	.
		N	51	51
	Ecological_validity	Correlation Coefficient	.569[**]	.654[**]
		Sig. (2-tailed)	.000	.000
		N	51	51
	Negative_effects	Correlation Coefficient	.133	-.129
		Sig. (2-tailed)	.352	.367
		N	51	51

Correlations

			Ecological_validity	Negative_effects
Spearman's rho	Image_creation_ease	Correlation Coefficient	.343[*]	-.278[*]
		Sig. (2-tailed)	.014	.048
		N	51	51
	Image_Vividness	Correlation Coefficient	.598[**]	-.420[**]
		Sig. (2-tailed)	.000	.002
		N	51	51
	Obect_interactivity	Correlation Coefficient	.395[**]	-.318[*]
		Sig. (2-tailed)	.004	.023
		N	51	51
	Purchase_intent	Correlation Coefficient	.486[**]	-.423[**]
		Sig. (2-tailed)	.000	.002
		N	51	51
	Spatial_presence	Correlation Coefficient	.569[**]	.133
		Sig. (2-tailed)	.000	.352
		N	51	51
	Engagement	Correlation Coefficient	.654[**]	-.129
		Sig. (2-tailed)	.000	.367
		N	51	51
	Ecological_validity	Correlation Coefficient	1.000	-.325[*]
		Sig. (2-tailed)	.	.020
		N	51	51
	Negative_effects	Correlation Coefficient	-.325[*]	1.000
		Sig. (2-tailed)	.020	.
		N	51	51

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix P: Difference between correlation coefficients - z

GROUP	N		Purchase_intent
1	16	Image_creation_ease	0.655
	16	Image_Vividness	1.033
	16	Obect_interactivity	0.962
	16	Purchase_intent	0
	16	Spatial_presence	0.693
	16	Engagement	0.556
	16	Ecological_validity	0.626
	16	Negative_effects	0.829
2	35	Image_creation_ease	0.583
	35	Image_Vividness	0.442
	35	Obect_interactivity	0.326
	35	Purchase_intent	0
	35	Spatial_presence	0.536
	35	Engagement	0.717
	35	Ecological_validity	0.536
	35	Negative_effects	0.208
3	23	Image_creation_ease	0.785
	23	Image_Vividness	0.192
	23	Obect_interactivity	0.436
	23	Purchase_intent	0
	23	Spatial_presence	
	23	Engagement	
	23	Ecological_validity	
	23	Negative_effects	

Correlations

Group				Image_creation_ease	Image_Vividness
1	Spearman's rho	Image_creation_ease	Correlation Coefficient	1.000	.732**
			Sig. (2-tailed)		0.001
			N		16
		Image_Vividness	Correlation Coefficient		1.000
			Sig. (2-tailed)		
			N		
		Obect_interactivity	Correlation Coefficient		
			Sig. (2-tailed)		
			N		
		Purchase_intent	Correlation Coefficient		
			Sig. (2-tailed)		
			N		
		Spatial_presence	Correlation Coefficient		
			Sig. (2-tailed)		
			N		
		Engagement	Correlation Coefficient		
			Sig. (2-tailed)		
			N		
		Ecological_validity	Correlation Coefficient		
			Sig. (2-tailed)		
			N		
		Negative_effects	Correlation Coefficient		
			Sig. (2-tailed)		
			N		
2	Spearman's rho	Image_creation_ease	Correlation Coefficient	1.000	.618**
			Sig. (2-tailed)		0.000
			N		35
		Image_Vividness	Correlation Coefficient		1.000
			Sig. (2-tailed)		
			N		
		Obect_interactivity	Correlation Coefficient		
			Sig. (2-tailed)		
			N		
		Purchase_intent	Correlation Coefficient		
			Sig. (2-tailed)		
			N		
		Spatial_presence	Correlation Coefficient		
			Sig. (2-tailed)		
			N		
		Engagement	Correlation Coefficient		
			Sig. (2-tailed)		
			N		
		Ecological_validity	Correlation Coefficient		

Correlations

Group				Image_creation_ease	Image_Vividness
			Sig. (2-tailed)		
			N		
		Negative_effects	Correlation Coefficient		
			Sig. (2-tailed)		
			N		
3	Spearman's rho	Image_creation_ease	Correlation Coefficient	1.000	0.251
			Sig. (2-tailed)		0.247
			N		23
		Image_Vividness	Correlation Coefficient		1.000
			Sig. (2-tailed)		
			N		
		Obect_interactivity	Correlation Coefficient		
			Sig. (2-tailed)		
			N		
		Purchase_intent	Correlation Coefficient		
			Sig. (2-tailed)		
			N		
		Spatial_presence	Correlation Coefficient		
			Sig. (2-tailed)		
			N		
		Engagement	Correlation Coefficient		
			Sig. (2-tailed)		
			N		
		Ecological_validity	Correlation Coefficient		
			Sig. (2-tailed)		
			N		
		Negative_effects	Correlation Coefficient		
			Sig. (2-tailed)		
			N		

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Obect_interactivity	Purchase_intent	Spatial_presence	Engagement	Ecological_validity	Negative_effects
.717**	.573*	.807**	.585*	.603*	-.691**
0.002	0.020	0.000	0.017	0.013	0.003
16	16	16	16	16	16
.751**	.774**	.813**	.638**	.890**	-.704**
0.001	0.000	0.000	0.008	0.000	0.002
16	16	16	16	16	16
1.000	.744**	.644**	.621*	.639**	-.732**
	0.001	0.007	0.010	0.008	0.001
	16	16	16	16	16
	1.000	.600*	.505*	.554*	-.679**
		0.014	0.046	0.026	0.004
		16	16	16	16
	.600*	1.000	.769**	.832**	-.645**
			0.000	0.000	0.007
			16	16	16
	.505*		1.000	.701**	-.578*
				0.002	0.019
				16	16
	.554*			1.000	-.663**
					0.005
					16
	-.679**				1.000

Obect_interactivity	Purchase_intent	Spatial_presence	Engagement	Ecological_validity	Negative_effects
0.247	.525**	.415*	.617**	.345*	0.012
0.153	0.001	0.013	0.000	0.042	0.945
35	35	35	35	35	35
.375*	.416*	.342*	.508**	.462**	-0.309
0.026	0.013	0.044	0.002	0.005	0.071
35	35	35	35	35	35
1.000	0.315	.434**	.360*	0.279	-0.144
	0.066	0.009	0.034	0.104	0.408
	35	35	35	35	35
	1.000	.491**	.613**	.492**	-0.207
		0.003	0.000	0.003	0.233
		35	35	35	35
	.491**	1.000	.760**	.698**	-0.005
			0.000	0.000	0.976
			35	35	35
	.613**		1.000	.628**	-0.155
				0.000	0.373
				35	35
	.492**			1.000	-0.243

Obect_interactivity	Purchase_intent	Spatial_presence	Engagement	Ecological_validity	Negative_effects
					0.160
					35
	-0.207				1.000
0.229	.670**				
0.293	0.000				
23	23				
0.112	0.191				
0.610	0.382				
23	23				
1.000	0.408				
	0.053				
	23				
	1.000				