The Power of Nudges: A Comparative Study of How Different Behavioral Cues Influence Purchase Intention

Daniel Marques

Dissertation written under the supervision of

Professor Daniel Fernandes

Dissertation submitted in partial fulfilment of requirements for the MSc in Management with specialization in Strategic Marketing, at the Universidade Católica Portuguesa, 01.01.2026.

Abstract

Title: "The Power of Nudges: A Comparative Study of How Different Behavioral Cues Influence Purchase Intention"

Author: Daniel Marques

This dissertation studies the comparative effectiveness of five of the most commonly used nudges in advertising on consumer purchase intention; Social Proof, Scarcity, Framing, Emotional Appeal and Moral Norms. While prior research has researched individual nudges in isolation, few studies have compared their performance under similar and controlled conditions or explored demographic conditions as moderators. To address this gap, a quantitative experimental design was employed using an online survey with 129 participants. Each participant evaluated advertisements for two product types (functional and symbolic), each incorporating all of the different nudges. Data was analyzed using SPSS, employing reliability tests, repeated-measures ANOVA, post-hoc comparisons, and mixed-design ANOVA.

Results reveal that nudge effectiveness varies significantly across contexts. Framing emerged as the most effective for functional products, while Emotional Appeal dominated for symbolic products. Scarcity consistently underperformed, challenging common marketing assumptions. On the other hand, Moral Norms demonstrated a stable, moderate effect across both product types. Social Proof showed context dependency, ranking higher for functional products. Age exhibited a small moderating effect for one product type, while gender had no significant influence.

Findings contribute to behavioral economics and advertising literature by offering a comparative perspective on nudges and highlighting their context-dependent nature. Managerially, the study underscores the need for tailored strategies: benefit-oriented framing for functional goods and emotionally charged narratives for symbolic products. Limitations include hypothetical scenarios and a restricted product range, suggesting future research should explore real-world scenarios, greater samples, and long-term effects.

Keywords: Nudges, Behavioral Economics, Advertising, Purchase Intention, Experimental Design.

Sumário

Título: "O Poder dos Nudges: Um Estudo Comparativo sobre Como Diferentes Pistas Comportamentais Influenciam a Intenção de Compra"

Autor: Daniel Marques

Esta dissertação analisa a eficácia comparativa de cinco nudges utilizados em publicidade na intenção de compra do consumidor: Prova Social, Escassez, Framing, Apelo Emocional e Normas Morais. Embora estudos anteriores tenham estudado nudges individualmente, poucos os compararam sob condições controladas ou avaliaram fatores demográficos como moderadores. Foi realizado um estudo experimental quantitativo através de um inquérito online com 129 participantes. Cada participante avaliou anúncios de dois tipos de produtos (funcional e simbólico), cada um incorporando diferentes nudges. Os dados foram analisados no SPSS, incluindo testes de fiabilidade, ANOVA de medidas repetidas, comparações post-hoc e ANOVA de desenho misto.

Os resultados mostram que a eficácia dos nudges varia consoante o contexto. O Framing foi o mais eficaz para produtos funcionais, enquanto o Apelo Emocional dominou nos produtos simbólicos. A Escassez apresentou desempenho fraco, desafiando pressupostos comuns do marketing. As Normas Morais revelaram um efeito moderado e consistente, e a Prova Social mostrou dependência do contexto. A idade teve um pequeno efeito moderador num produto, enquanto o género não apresentou influência significativa.

Este estudo contribui para a literatura de economia comportamental e publicidade, oferecendo uma perspetiva comparativa e destacando a natureza contextual dos nudges. Do ponto de vista prático, recomenda-se o uso de mensagens orientadas para benefícios em produtos funcionais e narrativas emocionais em produtos simbólicos. Limitações incluem cenários hipotéticos e uma gama restrita de produtos, sugerindo futuras investigações em contextos reais, amostras mais amplas e efeitos a longo prazo.

Palavras-chave: Nudges, Economia Comportamental, Publicidade, Intenção de Compra, Desenho Experimental.

Acknowledgements

I would like to express my sincere gratitude to Professor Daniel Fernandes for his guidance, support, and insightful feedback throughout the development of this thesis.

I would like to thank all the people who answered and participated in my survey. Without their help, this dissertation would not be possible.

Finally, I would also like to thank my parents, to whom this thesis is ultimately dedicated. Their unconditional love, sacrifices, and unwavering belief in me have been the foundation of my entire academic journey. They supported me not only during this master's degree but throughout every step that led me here, through challenges, doubts, and moments of growth.

Disclaimer on the Use of Artificial Intelligence

Artificial intelligence tools (such as OpenAI's ChatGPT and similar applications) were used in a supportive capacity during the preparation of this dissertation. Specifically, AI was employed for:

- Rephrasing and improving clarity of text passages.
- Assisting with language refinement and grammar checks.
- Generating standardized visual materials for advertisements used in the study.

All uses of AI were limited to language and methodological assistance. The intellectual content, theoretical framework, research design, data analysis, and conclusions presented in this dissertation are entirely the author's own work. AI tools were not used to generate original arguments, data, or literature sources. All references cited were identified, verified, and incorporated by the author.

This disclosure is made in accordance with academic integrity guidelines requiring transparency about the use of artificial intelligence in scholarly work.

Table of Contents

Abstract ... 3
Sumário ... 4
Acknowledgements ... 5
Disclaimer on the Use of Artificial Intelligence ... 6
Table of Contents ... 7
Table of Figures ... 10
Table of Tables ... 11
Table of Abbreviations ... 13
Glossary ... 14
1 Introduction ... 15
1.1 Background ... 15
1.2 Problem Statement ... 15
1.2.1 Research Objectives and Questions ... 16
1.2.1.1 Research Objectives ... 16
1.2.1.2 Research Questions ... 16
1.3 Relevance ... 16
1.4 Research Methods ... 17
1.5 Dissertation Outline ... 18
2 Literature Review & Theoretical Foundations ... 18
2.1 Ethical considerations of Nudging ... 19
2.2 Types of Nudges Studied ... 19
2.2.1 Social Proof ... 20
2.2.2 Scarcity ... 20
2.2.3 Framing ... 21
2.2.4 Emotional Appeal ... 21
2.2.5 Moral Norms ... 22
2.3 Conceptual Framework ... 23
2.4 Hypotheses ... 23
3 Methodology ... 24
3.1 Research Approach ... 25

3.2 Data Collection 25
3.2.1 Data Type and Collection Method 25
3.2.2 Sampling 26
3.3 Variables 26
3.3.1 Independent Variables 26
3.3.2 Dependent Variables 27
3.3.3 Controlled Variables 27
3.3.4 Moderators 27
3.3.5 Visualization of Variables 27
3.4 Questionnaire Design 28
3.5 Data Analysis 29
4 Results 30
4.1 Data Cleaning 30
4.2 Sample Characterization 32
4.3 Data Reliability: Cronbach's Alpha 32
4.3.1 Interpretation Guidelines 32
4.3.2 Reliability Scores 33
4.4 Composite Scores 34
4.5 Descriptive Statistics 35
4.6 Assumption Testing 35
4.6.1 Normality: Shapiro-Wilk Test 36
4.6.2 Sphericity: Mauchly's Test 36
4.7 Hypothesis Testing 37
4.7.1 Effect of Nudge Type on Purchase Intention 37
4.7.2 Comparison of Nudge Effectiveness (H2 and H3) 38
4.7.3 Moderating Effects of Age and Gender (H4) 40
4.7.4 Further Analysis 42
4.8 Key Findings and Discussion 44
5 Conclusions 45
5.1 Main Findings 45
5.2 Theoretical Implications 47

5.3 Managerial Implications 49
5.4 Limitations and Recommendations for Future Studies 50
Bibliography 52
Appendix 56
Appendix A: Development of Advertisement Images 56
Appendix B: Questionnaire 59
Appendix C: Statistical Output 62
C.1 Data Screening and Sample Overview 62
C.2 Reliability Analysis (Cronbach's Alpha) 62
C.2.1 Product A 62
C.2.2 Product B 63
C.3 Descriptives for Composite variables 64
C.4 Assumption Testing 65
C.4.1 Normality: Shapiro-Wilk Test 65
C.4.2 Sphericity: Mauchly's Test 71
C.5 Repeated-Measures ANOVA 73
C.5.1 Product A 73
C.5.2 Product B 74
C.6 Post-hoc Comparisons 75
C.6.1 Estimated Marginal Means 75
C.6.2 Bonferroni Pairwise Comparisons 76
C.7 Mixed-Design ANOVA: Moderation Analysis 79
C.7.1 Product A 79
C.7.2 Product B 80
C.8 Repeated-Measures ANOVA: Age Groups 81
C.8.1 Product A 81
C.8.2 Product B 85

Table of Figures

Figure 1: Proposition of Relationship Between Variables and Moderators.
Figure 2: AI-generated advertisement for product A: Social Proof
Figure 3: AI-generated advertisement for product A: Scarcity
Figure 4: AI-generated advertisement for product A: Framing
Figure 5: AI-generated advertisement for product A: Emotional Appeal
Figure 6: AI-generated advertisement for product A: Moral Norms
Figure 7: AI-generated advertisement for product B: Social Proof
Figure 8: AI-generated advertisement for product B: Scarcity
Figure 9: AI-generated advertisement for product B: Framing
Figure 10: AI-generated advertisement for product B: Emotional Appeal
Figure 11: AI-generated advertisement for product B: Moral Norms
Figure 12: Survey flow randomizer for questions 1 to 10
Figure 13: Visualization of survey questions (Q1 - Q10)
Figure 14: Demographics: Age
Figure 15: Normality: Q-Plot for Composite Variable: A_SP_INT
Figure 16: Normality: Q-Plot for Composite Variable: A_SC_INT
Figure 17: Normality: Q-Plot for Composite Variable: A_FR_INT
Figure 18: Normality: Q-Plot for Composite Variable: A_EA_INT
Figure 19: Normality: Q-Plot for Composite Variable: A_MN_INT
Figure 20: Normality: Q-Plot for Composite Variable: B_SP_INT
Figure 21: Normality: Q-Plot for Composite Variable: B_SC_INT
Figure 22: Normality: Q-Plot for Composite Variable: B_FR_INT
Figure 23: Normality: Q-Plot for Composite Variable: B_EA_INT
Figure 24: Normality: Q-Plot for Composite Variable: B_MN_INT

Table of Tables

Table 1: Visualisation of Variables
Table 2: Statistical tests used
Table 3: Coding of Independent Variables
Table 4: Coding of Dependent Variables
Table 5: Coding of Controlled Variables
Table 6: Cronbach's Alpha Interpretation Guidelines
Table 7: Cronbach's Alpha for product A
Table 8: Cronbach's Alpha for product B
Table 9: Coding of Composite Scores
Table 10: Descriptive Statistics of Composite Variables
Table 11: Shapiro-Wilk Test on Composite Scores
Table 12: Mean Purchase Intention Scores for Product A
Table 13: Mean Purchase Intention Scores for Product B
Table 14: Ranking of Nudges by Product (Mean Purchase Intention Score)
Table 15: Mean Purchase Intention scores per age group for Product A
Table 16: Reliability: Social Proof Product A
Table 17: Reliability: Scarcity Product A
Table 18: Reliability: Framing Product A
Table 19: Reliability: Emotional Appeal Product A
Table 20: Reliability: Moral Norms Product A
Table 21: Reliability: Social Proof Product A
Table 22: Reliability: Scarcity Product A
Table 23: Reliability: Framing Product A
Table 24: Reliability: Emotional Appeal Product A
Table 25: Reliability: Moral Norms Product A
Table 26: Descriptive Statistics for Composite Variables
Table 27: Normality: Shapiro-Wilk
Table 28: Mauchly's Test of Sphericity Product A
Table 29: Mauchly's Test of Sphericity Product B

Table 30: Descriptive Statistics for Product A
Table 31: Repeated-Measures ANOVA: Tests of Within-Subjects Product A
Table 32: Descriptive Statistics Product B
Table 33: Repeated-Measures ANOVA: Tests of Within-Subjects Product B
Table 34: Estimated Marginal Means Product A
Table 35: Estimated Marginal Means Product B
Table 36: Bonferroni Pairwise Comparisons Product A
Table 37: Bonferroni Pairwise Comparisons Product B
Table 38: Mixed-Design ANOVA: Tests of Within-Subjects Product A
Table 39: Mixed-Design ANOVA: tests of Between-Subjects Product A
Table 40: Mixed-Design ANOVA: Tests of Within-Subjects Product B
Table 41: Mixed-Design ANOVA: tests of Between-Subjects Product B
Table 42: Tests of Within-Subjects Effects NUDGE and AGE_GROUP Product A
Table 43 and 44: Multivariate tests NUDGE and AGE_GROUP Product A
Table 45: Estimated Marginal Means Age Groups Product A
Table 46: Pairwise Comparisons product A
Table 47: Tests of Within-Subjects Effetcs NUDGE and AGE_GROUP Product B
Table 48 and 49: Multivariate tests NUDGE and AGE_GROUP Product B
Table 50: Estimated Marginal Means Age Groups Product B
Table 51: Pairwise Comparisons product B

Table of Abbreviations

RO: Research Objective

RQ: Research Question

AI: Artificial Intelligence

H: Hypothesis

SPSS: Statistical Package for the Social Sciences

Glossary

Nudge: A subtle intervention that influences decision-making without restricting options or changing economic incentives.

Choice Architecture: The way options are presented to influence decisions.

Bounded Rationality: The idea that people make decisions within limits of time, information, and cognitive capacity.

Heuristics: Mental shortcuts used for quick decision-making.

System 1 / System 2 Thinking: Fast, intuitive thinking vs. slow, analytical thinking (Dual-Process Theory).

Prospect Theory: Theory explaining how people perceive gains and losses differently.

Social Proof: Influence based on what others do or approve of.

Scarcity: Perceived rarity increases value and urgency.

Framing: Presenting information to emphasize gains or losses.

Emotional Appeal: Using emotions to influence decisions.

Moral Norms: Encouraging behavior aligned with social or ethical standards.

ANOVA: A statistical test comparing means across groups.

Cronbach's Alpha: A measure of internal consistency/reliability.

Likert Scale: A rating scale used to measure attitudes or opinions.

Composite Score: An average of multiple related items to represent a construct.

Bonferroni Correction: Adjustment for multiple comparisons to reduce Type I error.

Partial Eta Squared ($\eta^2 p$): Effect size measure in ANOVA.

Sphericity: Assumption in repeated-measures ANOVA about equal variances of differences.

Shapiro-Wilk Test: Test for normality of data distribution.

1 Introduction

1.1 Background

We live in an overly saturated advertising landscape where individuals are exposed to around 6000 advertisements per day (Apt Visuals Solutions, 2025), yet only a small fraction have an actual impact on their behavior. It is no longer about “the best product”. Consumers want to be seen, heard, and understood and, in the midst of all this, feel something. Understanding what truly motivates and drives behavior has become one of the main challenges for companies and brands. The marketing landscape is no longer just about how many people see your ad; it's about how many people relate and are engaged by what you are communicating.

Marketing strategies, over time, have increasingly incorporated more insights from behavioral economics. One of these insights is the concept of Nudge. These can be defined as subtle, low-cost interventions that drive the decision-making without restricting options and freedom of choice (Thaler & Sunstein, 2008).

Without even noticing it, consumers are being manipulated by brands, through advertising, to feel certain ways and, as a consequence, behave in certain manors.

1.2 Problem Statement

While there is extensive research on nudges in marketing and advertising (Congiu & Moscati, 2022) , these tend to focus on a single nudge at a time. Analysis has shown that the effectiveness of nudges changes significantly across different types (Hummel & Maedche, 2019), which highlights the need for comparative studies under similar conditions

I identified a lack of a research study that examines and compares the most common nudges against each other, while also attempting to understand how these nudges work under different demographics.

While individual research is extremely relevant to this study, there is a gap between understanding how these nudges work and understanding how they compare against each other in a real-world scenario.

1.2.1 Research Objectives and Questions

Building on this problem, this dissertation attempts to examine which are the most effective nudges used in advertising by brands to attract, retain, and drive long-term consumption from consumers. Furthermore, this dissertation also attempts to understand how the effects of these nudges vary between different ages and genders.

1.2.1.1 Research Objectives

RO1:Determine the relative effectiveness of 5 of the most commonly used nudges in advertising.

RO2: Assess how different nudges compare when they are applied in similar conditions.

RO3: Assess which are the nudges that are most effective in driving long-term consumption.

RO4:Understand how the effect of different nudges varies between different ages and genders.

1.2.1.2 Research Questions

RQ1: Which types of nudges are most effective in influencing purchase intention and likelihood to purchase in an advertising context?

RQ2: How does the effectiveness of different nudges vary across demographic groups, specifically age and gender?

RQ3: Which nudges perform consistently across different product types and which are context-dependent?

1.3 Relevance

Understanding nudges and their effect is crucial for academic research and real-world marketing strategies.

From an academic perspective, this dissertation helps close the gap between theoretical behavioral economics and real-life marketing communication. While there are studies that examine the different types of nudges and their effect on consumption, there is a lack of studies that put many nudges under the same microscope. It is one thing to study a nudge by itself; it is completely different to compare how they perform. Comparatively, nudges are understudied. By testing

nudges in a controlled experimental design, we gain a comparative perspective that inevitably enhances the theoretical understanding we have of how subtle behavioral interventions impact consumption in the long-term. Not only does this paper propose to study, in a comparative way, how nudges perform when they are tested against each other, it also attempts to understand how different demographics react to different nudges. Does age and gender matter in an advertising context ? Do companies need to deploy different strategies and nudges when targeting different audiences?

From a managerial perspective, this research is highly relevant for brands, companies, managers and marketers that seek to create winning strategies. Nudges offer a way for companies to gain an edge. Through small, cost-effective and non-coercive interventions, brands can leverage cognitive bias rather than solely relying on the product itself (Thaler & Sunstein, 2008).

Finally, this paper holds societal and ethical relevance. As nudges become more popular in the world of marketing and communication, it is important to understand the effects and implications they have on consumers and responsible marketing.

1.4 Research Methods

In an attempt to answer the research questions, this study uses a quantitative experimental research design by using an online survey experiment as its primary data collection method. This approach allows for testing of the proposed relationships between the different types of nudges (independent variable), the purchase intention and likelihood to purchase (dependent variables), and the moderators (age and gender).

Prior to this, extensive research and literature review were conducted to highlight key theoretical concepts relevant to this research.

Data was collected through an online survey on Qualtrics. All data gathered was analyzed using the SPSS data analysis platform. Reliability Tests (Cronbach's Alpha), ANOVA assumption tests (Shapiro-Wilk and Muchly's tests), Repeated-Measures ANOVA, Post-hoc Pairwise comparisons with Bonferroni adjustments, Mixed-design repeated-measures ANOVA, Estimated Marginal Means and partial eta squared tests were conducted.

1.5 Dissertation Outline

The rest of this dissertation follows the following structure: A complete and extensive background research was conducted to identify and define relevant theories and frameworks. Here, all the relevant theories are defined and explained, as well as all the nudges covered by this study. Then, hypotheses are formed and explained, followed by the experimental design. Finally, results are presented and discussed.

2 Literature Review & Theoretical Foundations

The Nudge Theory, first introduced by Thaler & Sunstein (2008), is embedded in behavioral economics and cognitive psychology. It argues that people have limited time, information, and cognitive capacity to make rational decisions, and so, they are forced to operate within limits (what is called bounded rationality).

Deeply rooted in the Nudge Theory (Thaler & Sunstein, 2008) is the concept of choice architecture. This refers to the way options are arranged and presented and how it can influence behavior. For example, options that are set as default (pre-selected) act as a subtle guide for consumers without removing their freedom of choice (Johnson et al., 2012). Another way choice architecture presents itself is in decoys options. Here, an inferior option is added to make others seem like the right option. This is very common in the food industry. For example, a company might sell 3 sizes of drinks. The biggest one tends to only be a little more expensive than the smallest one. By doing this, the consumer thinks he or she will gain more by only spending a little more. In this case, the smallest option is used as a decoy to influence consumers to buy the largest.

Recent analysis shows that nudges have a small to moderate impact on behaviour. Also, nudges that change the way choices are presented and structured have greater impact than the one that only presents information (Mertens et al., 2022).

Instead of analyzing each option carefully, with time and a rational line of thought, individuals rely on heuristics, mental shortcuts, to make quick decisions. Therefore, a nudge can be defined as “any aspect of the choice architecture that alters people’s behavior in a predictable way without forbidding any options or significantly changing their economic incentives” (Thaler & Sunstein, 2008).

This is based on the Prospect theory (Kahneman &Tversky, 1979) and later strengthened by the Dual-process models of cognition theory (Kahneman, 2011). The Prospect theory (Kahneman &Tversky, 1979) states that people don't act rationally. Gains and losses are valued and perceived differently and are influenced by how a choice is framed. The Dual-process models of cognition theory (Kahneman, 2011) states that humans have two systems of thinking. System 1 is fast, intuitive and automatic. On the other hand, System 2 is slow and analytical. Nudges are meant to target system 1. Their purpose is to trigger intuitive, fast responses from consumers, instead of allowing them to make careful, rational decisions. Evidence from research shows that nudges that target System 1 are more effective than those that target System 2 (Van Gestel et al., 2021).

The understanding that advertising attempts to subtly nudge consumers rather than radically change their behavior predates the Nudge Theory. Barnard and Ehrenberg (1997) highlighted that most advertising efforts don't completely change consumer preferences. Instead, they provide consumers a gentle reminder of the brands they already consume and gives them a "nudge" to keep choosing that brand. In an advertising context, this involves structuring the way brands present their products or services in a way that they are more likely to be chosen by consumers.

Overally, existing research shows that nudges, when used in marketing and advertising, are capable of measurably affecting attention, attraction and retention of consumers towards consumption.

2.1 Ethical considerations of Nudging

Even though nudges are designed to influence behavior, they are fundamentally different from other techniques that could be found to be coercive and manipulative. Nudges, while attempting to influence a certain type of behavior, preserve the freedom of choice. This makes them an ethically preferable choice for companies to use in their strategies. Nudges, when used in an ethical way, emphasize trust, fairness and alignment with what is standard consumer welfare (Genco, 2025; Zervas & Triantari, 2025).

2.2 Types of Nudges Studied

Even though there are many different types of nudges, each with different effects, for the purpose of this research paper, I will be focusing on the most commonly used nudges. The nudges I will be studying in this paper are:

1) Social Proof
2) Scarcity
3) Framing
4) Emotional Appeal
5) Social norms

While all of these nudges aim to target different mechanisms, they all share a common goal; Influence consumption.

2.2.1 Social Proof

This type of nudge builds on the Social Norms Theory, which highlights that individuals look at the behavior of others in order to guide their own decisions (Cialdini, 2007).
In this scenario, decision-making is influenced by what others have chosen or done. This phenomenon has increased effectiveness in scenarios of uncertainty and pressure. When a consumer is unsure of a decision and/or is pressured by time, he or she is more likely to follow decisions made by previous people in his/her position. Park and McCallister (2023) that when products have positive reviews the likelihood of purchase increases significantly.
Commonly used tactics and indicators include; customer reviews, ratings, testimonials and "most-popular" tags on product descriptions. These types of signals create descriptive norms (social proof), making consumers believe that if others behave in a certain way, it must be right. Consequently, there is an increase in purchase likelihood (Eigenbrod & Janson, 2018; Jesse & Jannach, 2021).

2.2.2 Scarcity

The principle of scarcity, like in economics, operates on the principle that goods, services or products are of greater value when they are perceived as rare. Furthermore, Cialdini (2007) confirms that opportunities seem more valuable to individuals when they seem or are less available. We understand this concept through the Commodity Theory, where Brock (1968) suggests that commodities become more valuable when they are perceived as unavailable.

This type of nudge is deeply rooted in the Psychological Reactance Theory (Purnomo, 2023; Clee & Wicklund, 1980). This theory highlights that scarcity tends to threaten perceived freedom of choice that ends up triggering an increased motivation to reassert autonomy. This increased motivation increases the desire for items perceived as scarce.

Furthermore, Aggarwal, Jun and Huh (2011) highlight that both limited-quantity and limited-time messages increase purchase intentions. In the case of brands that symbolize status and/or identity, quantity-limit works best ("Only 10 units left!"). These messages are very effective at creating urgency and can lead to impulsive behavior (Tuncer, Sergeeva, Bongard-Blanchy, Distler, Doublet, & Koenig, 2024).

Scarcity manipulates the perception of consumers by making them believe the item has limited availability. By accomplishing this, the consumer gains a sense of urgency and desire for the item.

2.2.3 Framing

Framing as a nudge occurs when information is presented in a way that gains and/or losses are highlighted. This can significantly influence consumer decisions. In this scenario, information is displayed in a way where it seems to add a benefit to the consumer. For example, a brand instead of presenting a product as "10% fat" can present it as "90% fat-free". The information, presented like this, highlights the benefits of the product and, therefore, increases the likelihood to purchase. This concept is rooted in the Prospect Theory (Kahneman & Tversky, 1979). Framing happens because individuals don't evaluate the outcomes of their decisions in isolation. They compare them to a starting point. So, for example, in the scenario presented above, the consumer didn't consume 10% fat, they consumed 90% fat free.

2.2.4 Emotional Appeal

Emotional nudges appeal to emotions (joy, nostalgia, fear, etc…) in order to trigger intuitive decisions. As highlighted in the Dual-process models of cognition theory (Kahneman, 2011), intuitive and automatic decisions are triggered when thinking System 1 is targeted.

Advertisements that evoke good emotions in consumers create positive associations with the brand. On the other hand, research has proven that negative emotions such as fear, when used ethically, can also be a powerful driver of behavior (Laros & Steenkamp, 2005).

Emotional appeals directly affect behavior because it targets affective heuristics (Pham, 1998). Heuristics are mental shortcuts that individuals might take to make decisions when they find themselves in situations where they feel pressured (Tversky & Kahneman, 1974). This pressure can come in the form of limited time, limited information and/or limited cognitive resources.
This type of nudge is extremely effective because it makes decisions easier for consumers. Instead of cognitive efforts which take time and logic, consumers can rely on simple, fast and effective heuristics. This means consumers can rely on their emotions and the way they feel to make decisions, rather than logic. Research has proven that when emotions are used in marketing, there is an increase in purchase intent and brand loyalty in the long-term (Kaushik et al., 2024; Debeljak & Marič, 2024).

2.2.5 Moral Norms

Moral norm nudges tend to influence consumers by appealing to behaviors that align with the shared idea of what is "correct" or socially acceptable. There are two main mechanisms:

- Descriptive norms (what most people do)
- Injunctive norms (what most people approve of)

Nudges based on these two norms have been proven to be effective in promoting certain behaviors such as environmental and ethical consumption (Krupka & Adar, 2021; Mundt et al., 2024).
Socially desirable outcomes have been embedded in marketing and advertising to drive consumers to feel pressured to make the "right decision". Castro-Santa, Drews and van den Bergh (2023) tested the effect of low-carbon advertising messages and social norms in a large-scale online experiment and found that both green-advertising and the social-norm messaging can increase the consumption of low-carbon products.

When consumers perceive that a product is aligned with the "norm," the likelihood of them purchasing is greater. People tend to follow social norms because they want to be seen positively. This effect is rooted in the human need for social belonging. Campaigns like "be a part of the solution" or "join thousands who have made the choice to save the planet" work very well because they make people feel like they are doing the right thing.
Similarly, in e-commerce, "green" labels on products have been found to increase the selection of eco-friendly products (Mirbabaie, Marx, & Germies, 2021).

2.3 Conceptual Framework

Presented below is a conceptual model, offering visualization of the relationships between variables and moderators.

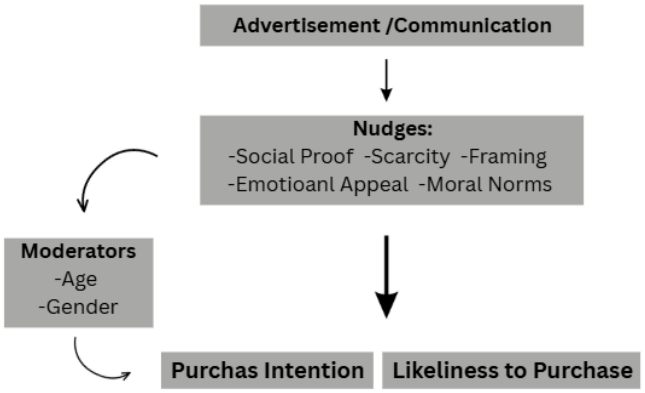

Figure 1: Proposition of relationship between variables and moderators.

2.4 Hypotheses

After conducting an extensive literature review and defining research questions, we can form the following hypotheses:

> *H1: There is a significant difference in the effectiveness of different nudges in influencing purchase intent and likelihood to purchase.*

Previous research indicates that different nudges operate through different psychological mechanisms (Thaler & Sunstein, 2008; Kahneman, 2011). Given these distinctions, it is reasonable to expect that different nudges will have different effects and, hence, different effectivenesses in influencing purchase intent and likelihood to purchase.

H2: Emotional appeals will be the most effective nudge overall compared to all other nudges.

Emotional appeals target thinking System 1 (Kahneman, 2011). This causes automatic, intuitive thinking and responses which are ideal for consumption. When this system is targeted, cognitive efforts are reduced and making decisions becomes easier.
Furthermore, research points out that emotions play a strong role in influencing purchase intention and likelihood to purchase (Pham, 1998; Kaushik et al., 2024).

H3: Moral norms will have the weakest effect on immediate purchase intent among all nudges.

While moral norms may be good at influencing consumption (Castro-Santa et al., 2023), they require cognitive thinking by consumers. This type of thinking, occurring when System 2 is triggered, (Kahneman, 2011) is not as effective at influencing consumption.

H4: The effectiveness of nudges varies significantly across demographic groups (age, gender).

Demographic factors play a big role in moderating consumer reaction to advertising (Cialdini, 2007; Park & McCallister, 2023). Due to social influence and impulsivity, younger consumers tend to respond in a stronger way to nudges such as social proof and scarcity (Nguyen & Nguyen, 2025). On the other hand, older consumers may value nudges such as moral norms.

3 Methodology

This section is dedicated to outlining the methodology applied for this research paper.

3.1 Research Approach

This dissertation follows a quantitative experimental design to examine how different nudges, when used in advertisements, influence consumer behavior. Experimental designs are especially good for experimental designs because they allow for manipulation of specific variables while controlling external factors (Malhotra et al., 2017).

Firstly, exploratory research was conducted to define the research questions, research objectives, hypotheses, variables and their relation. To achieve this, an extensive literature review was conducted. This allowed for clear definitions of key concepts, theories and underlying foundations, relevant for this research.

In order to gather the necessary data, a Qualtrics online survey was used. The aim was to present participants with visual stimuli of advertisements and record their choices. Two different types of products were chosen for the survey. Product A is a functional product (running shoes) and Product B is a more symbolic product (watch).

Finally, the data gathered in the online survey was analyzed using SPSS data analysis software. Conclusions, key insights, limitations and recommendations were derived from the testing results.

3.2 Data Collection

3.2.1 Data Type and Collection Method

The primary data for this study was collected through an online survey. This specific method was chosen because of its efficiency in reaching large and diverse audiences and, therefore, an adequate sample (Malhotra et al., 2017). The survey included experimental stimuli (advertisements made to incorporate different nudges). All the nudges were included in the advertisements and each participant was randomly shown an advertisement.

All participants were shown two product types that remained the same for all participants. After viewing the stimuli, participants were asked to record the purchase intentions and likelihood to purchase for each product.

3.2.2 Sampling

Participants were recruited through an open online survey. This means that any participants could participate regardless of demographic conditions (age and gender). Since the objective of the study is to determine which are the most effective nudges used in marketing and advertising, different age groups and genders were considered. This approach aimed to gather as many respondents as possible in order to have the largest sample possible.

The sample size for a valid analysis was based on power analysis guidelines for experimental research, aiming for a sample size of at least 100 valid responses (Hair et al., 2019).

3.3 Variables

3.3.1 Independent Variables

The independent variables (what is changed) for this study are the different nudges. These include; Social proof, Scarcity, Framing, Emotional appeal and Moral norms.

For product A (running shoe, for Social Proof, the message incorporated in the ad was "*Loved by runners worldwide"* and included a visual image of 10,000 reviews. This leverages descriptive norms to signal popularity of the product. For Scarcity, the ad featured an urgency-based text saying *"Limited Edition Release"* and *"a few left in stock"*. This was designed to provoke psychological reactance. For Framing, The image of the ad had two texts saying "*Designed to boost your performance every step*" and "*Invest in comfort that boosts performance every step*". These messages highlight the gain consumers will obtain from choosing this product. For Emotional Appeal, the ad contained a sentimental message saying *"Every step tells your story. Run with heart, not just speed".* This message aims to trigger Thinking System 1 and affective heuristics. For Moral Norms, the ad incorporated a message that appealed to injunctive norms and social responsibility. The ad read: *"Chosen by responsible consumers - 100% recyclable packaging.*"

For product B (watch), for Social Proof, the message in the ad was: "Join thousands who already enjoy wearing this watch. The watch for your everyday life". As in product A, this message leverages descriptive norms and signals popularity of the product. For Scarcity, the ad read: *"Don't miss out - Limited stock available"*. Like in product A, this signals that the product is scarce and creates urgency for the consumer. For Framing, the ad contained a message highlighting the

lifestyle benefit gained from the watch: "*A smart choice for a better lifestyle*" and "*The watch that fits your life*". For Emotional Appeal, the message presented was: *"Experience every moment to the fullest"* and *"The watch for your journey"*. This appeals to the emotional side of the consumer, making them feel like the watch is not just a mere product. Finally, for Moral Norms, the ad read: *"Make a choice for a better planet"* and *"The watch that cares about the environment"*.

3.3.2 Dependent Variables

The dependent variables (what is continuous and measured) are the purchase intent and the likelihood to purchase. These variables will change depending on the independent variable, the moderators and the controlled variables. These variables were measured using a 7-point Likert-scale.

3.3.3 Controlled Variables

The controlled variables (what will be controlled throughout the study) are the products displayed in the questionnaire and the advertisement format. All participants will see the same advertisement for the same product. The only change will be the nudge applied to each advertisement.

3.3.4 Moderators

For the purpose of this research, the moderators considered will be age and gender. Age and gender differences can have a heavy impact on the effect of different nudges.

3.3.5 Visualization of Variables

Variable	
Independent	Nudges: ● Social Proof; ● Scarcity; ● Framing; ● Emotional Appeal; ● Moral Norms
Dependent	● Purchase Intent ● Likelihood to Purchase

Controlled	Products shown to consumers (participants in the study)
Moderators	• Age • Gender

Table 1: Visualization of Variables

3.4 Questionnaire Design

The questionnaire used to gather data was designed in a way to guarantee clarity and minimize bias. The questionnaire was divided into four main blocks. In the first two blocks, participants were presented with visual images of product advertisements.

For the first block, all participants saw 5 images of product advertisements for a running shoe, each with a different nudge. For the second block, the same strategy was applied for a product advertisement of a watch. All participants saw all five images in each block. To develop the advertisements, a research about the most common messages used in each type of advertisement was conducted. The images of the advertisements were then generated using ChatGPT AI software.

To control for potential order effects and bias, the survey followed the Balances Latin Square Design. This design rotates the sequence of appearance of the different nudges, guaranteeing that each nudge is shown firstly to different participants the same amount of times (Bradley, 1958). Each participant saw all five images but the order in which the images were presented varied between participants. This way there was no order effect and bias for one of the images. Participants were then, after visualizing an image, asked to record their purchase intention and likelihood to purchase for that advertisement.

In the third block, participants were asked general questions about their consumption behavior when presented with different scenarios. All questions were presented in a 7-option likert scale (APA Dictionary of Psychology, 2023) ranging from strongly disagree to strongly agree.

The fourth and last block were demographic questions where participants were asked to state their age and gender.

3.5 Data Analysis

The quantitative data gathered in the Qualtrics survey was exported to SPPS Statistics for analysis. Before hypothesis testing was conducted, the data was cleaned in order to ensure validity and reliability. The data-cleaning process included removing any responses that were considered invalid. Furthermore, all relevant variables were coded to ensure clarity in the analysis. Descriptive statistics were conducted for all variables. Then, reliability tests were conducted to assess internal consistency of scales. Since ANOVA testing was used, assumption checks were conducted. These included normality tests and sphericity tests. Once reliability of the data was verified, composite scores were created for each variable. To address the hypotheses, Repeated-Measures ANOVA, Post-hoc Pairwise comparisons with Bonferroni adjustments, Mixed-design ANOVA and effect sizes were tested.

	Test
Reliability	Cronbach's Alpha
Assumption Checks	Shapiro-Wilk normality test Mauchlys sphericity test
H1: There is a significant difference in the effectiveness of different nudges in influencing purchase intention and likelihood to purchase.	Repeated-Measures ANOVA (within-subjects)
H2: Emotional appeals will be the most	Estimated Marginal Means and Bonferroni-

effective nudge overall compared to all other nudges.	Adjusted Pairwise Comparisons
H3: Moral norms will have the weakest effect on immediate purchase intent among all nudges.	Estimated Marginal Means Bonferroni-Adjusted Pairwise Comparisons Partial Eta Squared (η^2p) for ANOVA effects
H4: The effectiveness of nudges varies significantly across demographic groups (age, gender).	Mixed-Design ANOVA (nudge type as within-subjects factor; gender as between-subjects factor; age as covariate)
Further analysis of nudge effectiveness on different age segments	Repeated-Measures ANOVA and Simple Effetcs

Table 2: Statistical tests used

4 Results

This section is dedicated to presenting statistical techniques and procedures used to analyze the data collected in the Qualtrics online Survey. All the analysis was conducted using SPSS data analysis software.

4.1 Data Cleaning

Once the Qualtrics Survey was closed, the data gathered was uploaded to SPSS software. Before beginning the analysis, the data was screened for any invalid responses. Invalid responses included any responses that didn't have answers to all questions, outliers and responses that failed to answer the control question.

Furthermore, the variables were coded in order to make the data analysis easier. Since the participants recorded their answers in a seven-point likert scale, the answers were already coded from 1 to 7.

The independent variables were coded in the following way:

Independent Variable	**Code**
Social Proof	SP
Scarcity	SC
Framing	FR
Emotional Appeal	EA
Moral Norms	MN

Table 3: Coding of Independent Variables

The dependent variables were coded in the following way:

Dependent Variable	**Code**
“I would consider buying this product”	CB
“I am Likely to buy this product”	LB
“I would choose this product if I needed something similar“	CH

Table 4: Coding of Dependent Variables

The controlled variables were coded in the following way:

Controlled Variable	**Code**
Product 1: Shoe	A
Product 2: Watch	B

Table 5: Coding of controlled Variables

So, for example, the purchase intention for product A (shoe) when shown the Framing nudge would be coded as; A_FR_CB.

4.2 Sample Characterization

After cleaning the data, the resulting sample had N=129 participants. The age of the participants ranged from 18-70 years and the mean age was approximately 38 years. The median was 34 years and the mode 22 years.

Younger participants (18-25) accounted for 28.7% of the entire sample, while participants aged over 50 accounted for 34%. The cumulative percentage shows that 50% of the respondents were 41 years old or younger, which ensures a balanced distribution between younger and older demographics. This is ideal for this study since one of the research objectives is to determine whether age is a moderating factor on the effect that nudges have on consumers.

4.3 Data Reliability: Cronbach's Alpha

In order to assess internal reliability of the scales used to measure Purchase Intent and likelihood to purchase, Cronbach's Alpha was calculated for each question.

This test is used to evaluate if responses within a scale measure the same underlying construct (Cronbach, 1951). This test was used due to its reliability of multi-item scales.

In order to maximize reliability, Cronbach's Alpha was calculated for every variable tested in each Product type.

4.3.1 Interpretation Guidelines

Below is a table showing the interpretation of the Alpha results.

Cronbach's Alpha	Interpretation
$\alpha \geq 0.90$	Excellent
$0.80 \leq \alpha < 0.90$	Good
$0.70\ \alpha < 0.80$	Acceptable
$\alpha < 0.70$	Needs Improvement

Table 6: Cronbach's Alpha Interpretation Guidelines (adapted from Cherney et al., 2015).

4.3.2 Reliability Scores

In order to maximize reliability, Cronbach's Alpha was calculated for every dependent variable tested in each Product type.
Below are tables summarizing the results of the calculated Alpha for each construct.

Cronbach's Alpha for Product A:

Independent Variables	Dependent variables	α
Social Proof (SP)	A_SP_CB A_SP_LB A_SP_CH	0.907
Scarcity (SC)	A_SC_CB A_SC_LB A_SC_CH	0.938
Framing (FR)	A_FR_CB A_FR_LB A_FR_CH	0.930
Emotional Appeal (EA)	A_EA_CB A_EA_LB A_EA_CH	0.930
Moral Norms (MN)	A_MN_CB A_MN_LB A_MN_CH	0.935

Table 7: Cronbach's Alpha for product A

Cronbach's Alpha for Product B:

Independent Variables	Dependent variables	α
Social Proof (SP)	B_SP_CB B_SP_LB B_SP_CH	0.958
Scarcity (SC)	B_SC_CB B_SC_LB B_SC_CH	0.955
Framing (FR)	B_FR_CB B_FR_LB B_FR_CH	0.949

Emotional Appeal (EA)	B_EA_CB B_EA_LB B_EA_CH	0.949
Moral Norms (MN)	A_MN_CB A_MN_LB A_MN_CH	0.962

Table 8: Cronbach's Alpha for product B

As we can see in the tables above, and compared to table 5, all the reliability scores were excellent ($\alpha \geq 0.90$).

4.4 Composite Scores

Since the reliability tests if the scale values were all reliable, we can create composite scores for each of the variables. Composite scores were calculated by averaging the answers to the three questions for each nudge for each product. Now, every participant has 10 composite scores (2 products x 5 nudges). This approach is justified by the high consistency demonstrated by Cronbach's Alpha results.

The composite variables were coded as Product_Nude_INT. For example, Scarcity for product A would be A_SC_INT. The same method was applied to the rest of the scores.

Below is a table of the coding of the 10 composite scores:

Product	Nudge	Composite score code
A	Social Proof	A_SP_INT
A	Scarcity	A_SC_INT
A	Framing	A_FR_INT
A	Emotional Appeal	A_EA_INT
A	Moral Norms	A_MN_INT
B	Social Proof	B_SP_INT
B	Scarcity	B_SC_INT

B	Framing	B_FR_INT
B	Emotional Appeal	B_EA_INT
B	Moral Norms	B_MN_INT

Table 9: Coding of Composite Scores

4.5 Descriptive Statistics

Descriptive statistics were computed for all composite variables. Table 8 shows the mean, standard deviation and range for each nudge type.

Product	Nudge	Mean	Standard Deviation	Minimum	Maximum
A	Social Proof	4.4625	1.47803	1	7
A	Scarcity	3.6382	1.56792	1	6.33
A	Framing	4.6899	1.49140	1	7
A	Emotional Appeal	4.1163	1.62535	1	7
A	Moral Norms	4.2041	1.54015	1	7
B	Social Proof	3.7726	1.55679	1	7
B	Scarcity	3.6382	1.58390	1	6.67
B	Framing	4.0155	1.54889	1	7
B	Emotional Appeal	4.0956	1.53839	1	7
B	Moral Norms	3.9147	1.61712	1	7

Table 10: Descriptive Statistics of Composite Variables

4.6 Assumption Testing

Before proceeding with the ANOVA testing, it is essential that underlying assumptions are met. Testing for these assumptions ensures high validity and reliability of the results of the tests.

4.6.1 Normality: Shapiro-Wilk Test

Normality was verified by using the Shapiro-Wilk test. This test is recommended for small to medium samples (Razali & Wah, 2011). Essentially, this test examines if the data follows a normal distribution. This test is relevant because tests, such as ANOVA, assume a normal distribution.

	Shapiro-Wilk		
	Statistic	**df**	**Sig.**
A_SP_INT	0.965	129	0.002
A_SC_INT	0.945	129	<0.001
A_FR_INT	0.941	129	<0.001
A_EA_INT	0.964	129	0.002
A_MN_INT	0.960	129	<0.001
B_SP_INT	0.946	129	<0.001
B_SC_INT	0.946	129	<0.001
B_FR_INT	0.961	129	<0.001
B_EA_INT	0.955	129	<0.001
B_MN_INT	0.950	129	<0.001

Table 11: Shapiro-Wilk Test on Composite Scores

Although there is a violation of normality for all composite purchase intention variables ($p < .05$), the results are still appropriate for ANOVA testing due to large sample size and the use of composite variables derived from Likert-Scale items.

4.6.2 Sphericity: Mauchly's Test

Since this study uses a repeated measures design, where the survey participants evaluated multiple nudges, the assumption of sphericity was tested using Mauchly's Test.

For product A, the Test indicated that the assumption of sphericity was met ($p = .182$), and therefore, the standard ANOVA results were used. On the other hand, for product B, the

assumption of sphericity was violated (p = .001) and, therefore, a Greenhouse-Geisser correction had to be applied, as recommended for repeated measures (Field, 2018).

4.7 Hypothesis Testing

This section is dedicated to presenting the statistical analyses conducted in order to evaluate the validity or invalidity of the hypotheses formulated in previous sections (see 2.4). After verifying ANOVA assumptions, repeated-measures analyses were conducted to examine the hypotheses and interpret the results.

4.7.1 Effect of Nudge Type on Purchase Intention

H1: There is a significant difference in the effectiveness of different nudges in influencing purchase intent and likelihood to purchase.

To test H1, repeated-measures analyses of variance were conducted separately for product A and product B.

For product A, ANOVA assumptions were checked (see 6.4.1). The Shapiro-Wilk tests indicated a violation of normality for all composite variables ($p < .05$). However, in this scenario, given the large sample size (N=129) and the robustness of ANOVA to this type of violations in repeated-measure designs, standard ANOVA results were used without any corrections. The assumption of sphericity was met (see section 4.6.2), therefore, standard repeated-measures ANOVA results were used (Razali & Wah, 2011). After running the test, the analysis revealed a statistically significant effect of nudge type on purchase intention.

$$F(4,512) = 16.45,\ p < .001,\ \eta^2p = .114.$$

For product B, the Shapiro-Wilk test for Normality indicated a violation of normality ($p < .05$) but, like in product A, the analysis proceeded with standard ANOVA results (Razali & Wah, 2011). Mauchly's Test indicated a violation of the Sphericity assumption ($p = .001$). In this case, Greenhouse-Geisser corrected results were applied. The corrected repeated ANOVA revealed a statistically significant effect of nudge type on purchase intention.

$$F(3.47, 443.97) = 5.33,\ p<.001,\ \eta^2p = .040.$$

Although the effect size was greater in product A, the results indicate, nonetheless, that different nudges have significantly different effects on purchase intention.

Overall, these findings support H1, demonstrating that the nudge type does, in fact, have a significant effect on purchase intention across both products. For both products the p-value was smaller than .001. This means that the likelihood that these differences occurred by chance is smaller than 0.1% (Field, 2018).

The F-Statistic values (16.45 for product A and 5.33 for product B) are high. This shows us that the differences between nudges is greater than the random differences within each group.

The low p-values and the high F-values tells us that the effect on the different nudges is real and statistically significant.

4.7.2 Comparison of Nudge Effectiveness (H2 and H3)

H2: Emotional appeals will be the most effective nudge overall compared to all other nudges.

H3: Moral norms will have the weakest effect on immediate purchase intent among all nudges.

In order to examine H2 and H3, the estimated marginal means and Bonferroni-adjusted pairwise comparisons from the repeated-measures ANOVAs were analysed for product A and B. This is done because ANOVA alone doesn't tell us which specific nudges differ from each other (Field, 2018). The estimated marginal means gives us the average score for each nudge (Maxwell & Delaney, 2004). Bonferroni-adjusted pairwise comparisons were used because, in this case, where multiple nudges are compared, the risk of type 1 error (false positives) increases. Bonferroni correction adjusts the significance level to control this. The Bonferroni correction controls error rate by adjusting the significance threshold. Essentially, this means that each individual test is held to a stricter criterion in order to be considered significant.

For product A, Framing had the highest mean purchase intention score (M = 4.69), while Scarcity had the lowest (M = 3.64).

The mean purchase intention scores were as follows; Framing (M = 4.69) > Social Proof (M = 4.463) > Moral Norms (M = 4.204) > Emotional Appeal (M = 4.116) > Scarcity (M = 3.638). Bonferroni-adjusted pairwise comparisons indicated that framing generated significantly higher purchase intention than scarcity (p < .001), emotional appeal (p = .001), and moral norms (p =

.010). These results suggest that framing was the most effective nudge for Product A, whereas scarcity was the least effective.

Below is a table presenting the mean values (M) for purchase intention for each nudge for product A.

Nudge Type	Mean Purchase Intention Score
Social Proof	4.46
Scarcity	3.64
Framing	4.69
Emotional Appeal	4.12
Moral Norms	4.20

Table 12: Mean Purchase Intention Scores for Product A

For Product B, Emotional Appeal yielded the highest mean purchase intention ($M = 4.10$), closely followed by Framing ($M = 4.02$), while Scarcity produced the lowest mean score ($M = 3.64$) again. The mean purchase intention scores were as follows; Emotional Appeal (M = 4.096) > Framing (M = 4.016) > Moral Norms (M = 3.915) > Social Proof (M = 3.773) > Scarcity (M = 3.638). Pairwise comparisons showed us that Emotional Appeal and Framing both generated significantly higher purchase intention than Scarcity ($p = .004$ and $p = .009$, respectively). Differences between the remaining nudges were not statistically significant.

Below is a table presenting the mean values (M) for purchase intention for each nudge for product A.

Nudge Type	Mean Purchase Intention Score
Social Proof	3.77
Scarcity	3.64
Framing	4.02
Emotional Appeal	4.10
Moral Norms	3.91

Table 13: Mean Purchase Intention Scores for Product B

Furthermore, below is a table visualizing the order in which nudges were ranked by product:

Rank	Product A	Product B
1	Framing	Emotional Appeal
2	Social Proof	Framing
3	Moral Norms	Moral Norms
4	Emotional Appeal	Social Proof
5	Scarcity	Scarcity

Table 14: Ranking of Nudges by Product (Mean Purchase Intention Score)

The findings partially support H2, as Emotional Appeal was found to be the most effective nudge for Product B, but not for Product A. H3 is not supported, as Moral Norms were not consistently the least effective nudge. In both cases, Moral Norms had the third highest mean. Instead, Scarcity produced the lowest purchase intention across both products.

4.7.3 Moderating Effects of Age and Gender (H4)

*H4**:** The effectiveness of nudges varies significantly across demographic groups (age, gender).*

While the previous analyses examined if different nudges have different effects on purchase intention, it is also relevant to assess whether these effects change across different demographics. Testing for moderation, therefore, allows for a better understanding of whether nudges are equally effective across different consumer segments.

To examine H4, mixed-design analyses of variance (ANOVAs) were conducted (separately for Product A and Product B). In these analyses, nudge type was specified as the within-subjects factor, gender was specified as a between-subjects factor, and age was included as a covariate. This approach is appropriate for identifying moderation effects, which are reflected in statistically significant interaction terms between the within-subjects factor (nudge type) and the demographic

variables (Field, 2018). In the context of ANOVA, the F-statistic represents the ratio of explained variance to unexplained variance, indicating whether the observed differences between conditions are greater than would be expected by chance. The p-value indicates the probability of observing the obtained results if there is, in fact, no true effect, with values below .05 typically considered statistically significant. Finally, partial eta squared (η^2p) gives us a measure of effect size, indicating the proportion of variance in the dependent variable that is attributable to a given effect, after accounting for other variables in the model. These were reported with conventional benchmarks (Cohen, 1988; Lakens, 2013).

For Product A, the interaction between nudge type and age was found to be statistically significant.

$$F(3.83, 482.72) = 2.67, p = .034, \eta^2p = .021$$

The significant F-statistic indicates that the variance in purchase intention, explained by the interaction between nudge type and age, was greater than would be expected by chance. The p-value ($p < .05$) confirms that this interaction effect is statistically significant. Although the effect size was small (indicated by the partial eta squared value) it suggests that age plays a moderating role in how consumers respond to different nudges for Product A.

In contrast, the interaction between nudge type and gender was not statistically significant ($p > .05$). This non-significant result indicates that the effectiveness of the nudges did not differ in a meaningful way between male and female participants for this product, as reflected by both the F-statistic and the small effect size.

For Product B, neither the interaction between nudge type and age nor the interaction between nudge type and gender reached statistical significance ($p > .05$). In both these cases, the F-statistics indicated that the variance explained by the interaction terms was comparable to unexplained variance, and the associated p-values exceeded the conventional significance threshold. The corresponding partial eta squared (η^2p) values were small, suggesting that age and gender accounted for only a small proportion of variance in purchase intention for Product B. These results indicate neither age nor gender affected the effect of nudges on purchase intention.

Taken together, the results only partially support H4. Age was found to moderately affect the effect of nudges on purchase intention for Product A, but not for Product B. On the other hand, gender did not significantly affect nudge effectiveness for the products.

This suggests that demographic moderators such as age and gender may affect the effectiveness of nudges in certain contexts, but these effects are not universal and may depend on product characteristics.

4.7.4 Further Analysis

Since the analysis of age as a moderator was found to be inconclusive, further analysis was conducted to further analyse the effect of age as a moderator for the effect of the nudges on purchase intention.

To deepen the analysis, ages were categorized into three groups: Young (18-29 years), Adults (30-49 years) and Seniors (50+ years). By doing this segmentation, we can analyse which age groups were most affected by the nudges. While the mixed-design ANOVA tests conducted in the previous sections tested the interactions between the different nudge types and age, this approach allows us to reveal which age segments respond best to specific nudge types.

Assuming the assumption checks previously conducted for this data set, a mixed repeated-measures ANOVA was performed to examine the effect of different age segments on nudge effectiveness.

For product A, the interaction between nudge type and age group was found to be significant.

$$F(8, 504) = 2.32, p = .019, \eta^2p = .036$$

Furthermore, the interaction between nudge type and age group was also found to be significant.

$$F(8, 504) = 2.32, p = .019, \eta^2p = .036$$

These results indicate that nudge type effectiveness varies across different age groups. Multivariate tests confirmed these differences.

Below is a table visualizing the different mean purchase intention scores for each nudge type by age group:

Age Group	Social Proof	Scarcity	Framing	Emotional Appeal	Moral Norms
18-29	4.46	3.56	4.91	3.81	4.10
30-49	4.44	4.05	4.54	3.94	4.26
50+	4.47	3.50	4.56	4.49	4.27

Table 15: Mean Purchase Intention scores per age group for Product A

For the age segment (18-29), Framing and Social Proof generated the highest purchase intention, while Scarcity and Emotional Appeal were the least effective. For the age segment of 30-49, there was a more uniform response, with no significant differences between nudge types. For the age Segment 50+, Framing and Moral Norms had the best performance, while Scarcity was the weakest.

For product B, the effect of nudge type was also found to be significant:

$$F(3.46, 435.69) = 4.27, p = .004, \eta^2p = .033$$

On the other hand, the interaction between nudge type and age group was not found to be significant ($p = .291$ and $\eta^2p = .019$).

$$F(6.92, 435.69) = 1.22, p = .291, \eta^2p = .019$$

This means that the probability that the observed differences happened occasionally was 29% (much higher than the usual threshold of 5%) and that the interaction explains only 1.9% of variance, which is insignificant.

Overall, for product B, nudges do influence the purchase intention, but their effectiveness did not differ significantly across age groups.

4.8 Key Findings and Discussion

The results of the statistical analysis provided many important insights on how different types of nudges influence consumer purchase intention and likelihood to purchase.

The first big finding is that different nudges do, in fact, have different effects on purchase intention and likelihood to purchase. Proven by the analysis of the repeated-measures variances, we can identify that different nudges had different effects on consumers. The same products, when advertised with different nudges, generated significantly different levels of purchase intention. Essentially, this means that the physiological mechanisms included in advertisements truly matter. Consumers don't respond uniformly to stimuli. Instead, the way they react is framed by the way the message is presented.

The second major finding is that, contrary to what was hypothesized, Emotional Appeal was not the best-performing nudge in all categories. For product A (running shoes), Framing was the best-performer. This suggests that consumers, when evaluating functional products, value clear, benefit-oriented messaging. A clear message of what the consumer gains by purchasing that product is the way to go. On the other hand, for product B (watch), Emotional Appeal outperformed the other nudges. This indicated that, for symbolic products, consumers value emotional narratives. Messages that provoke emotions and make consumers feel a certain way are essential.

The third major finding is that Social Proof, while still an effective nudge, is very context dependent. It was ranked second for product A and fourth for product B. This could suggest that consumers, when faced with uncertainty, react better to popularity signals. This aligns with the Social Norms Theory, where consumers look at the behavior of others in order to guide their own decisions (Cialdini, 2007). On the other hand, in scenarios where consumers are not faced with certain pressures (like in the case of buying a product such as a watch), personal meaning and emotional resonance dominate the decision-making process.

The fourth finding challenges an assumption that is very common in marketing. Scarcity was found to underperform all the other nudges in both products. One explanation for this result is the experimental context: participants were not exposed to real-life situations where real-time pressure

or exclusivity was a factor. This reduced the physiological reactance, usually triggered by this effect. Also, this could be explained by the fact that only consumer products were used in the study. If other types of products were used then results may differ. Finally, consumers who are more self-aware of purchasing could find these tactics to be manipulative or deceiving, reducing their purchase intention for that product.

The fifth finding is that Moral Norms performed better than expected. Contrary to H3, Moral Norms did not underperform all the other nudges. In both products it ranked as the third most effective. This suggests that ethical, moral and socially responsible messaging is valued by consumers. This can be explained by the increased popularity in conscious consumption.

Finally, contrary to H4, nudge effectiveness did not vary significantly across different demographic groups. Age proved to have a small moderating effect and gender proved to not significantly influence the nudge effect on purchase intention. Again, if the study employed different products, tailored for different age groups and genders, the results could have been different.

Furthermore, the analysis conducted in section 4.7.4, different nudges only had significant different effects for product A. For product B, the interaction between nudge and age group was not found to be significant.

5 Conclusions

5.1 Main Findings

RQ1*: Which types of nudges are most effective in influencing purchase intention and likelihood to purchase in an advertising context?*

Based on the research and the analysis, we can confirm that different nudges have significantly different effects on consumers' purchase intention and likelihood to purchase. The Repeated-measures ANOVA revealed a strong effect of nudge type for both product A and B ($p < .001$). In the case of product A (running shoe), Framing was found to be the most effective nudge and Scarcity the least effective. For product B, Emotional Appeal was found to be the most effective out of all the nudges, while Scarcity was, once again, ranked last. These findings highlight the importance of physiological mechanisms (nudges) in advertising.

***RQ2**: How does the effectiveness of different nudges vary across demographic groups, specifically age and gender?*

Mixed-design ANOVA revealed that demographics (age and gender) had only a small, but significant, moderating effect for product A (running shoe). The results suggest that younger and older consumers respond slightly differently to different nudges in the context of certain products. On the other hand, this was not observed for product B. Gender did not hold a significant moderation on the effect of nudges. This occurred for both product A and B. Overall, in this study, demographics played a limited role in shaping nudge effectiveness on purchase intention.

***RQ3:** Which nudges perform consistently across different product types and which are context-dependent?*

The research gives us clear indication that nudge effectiveness is highly dependent on the context. The study found that Scarcity consistently underperformed. It was ranked as least effective for both product A and B. This suggests that urgency-based tactics may not be the universal answer to advertising. Also, this result challenges the common assumption that scarcity always drives purchase intention. On the other hand, this result could be explained by the fact that the participants in the survey were not actually exposed to an "urgent" scenario. In a real-life situation, where consumers are faced with real-time pressure to purchase, results could have been different. Also, Scarcity effects could be more effective in situations where luxury goods or limited editions are being considered.

Furthermore, Moral Norms were found to have a consistent moderate effect. It consistently ranked third for both product A and B. This suggests that socially acceptable messages have a reliable, though not dominant, effect on influencing purchase intention. Even though consumers value these types of messages, they don't override messages that engage consumers emotionally and that focus on the benefits of consumption.

On the other hand, Framing, Emotional Appeal and Social Proof were found to be the least consistent nudges. Framing was the top-performer for product A (running shoes), but ranked second for product B (watch). Emotional Appeal was the Best performer for product B, but ranked fourth for product A (running shoes). Social Proof was ranked second for product A, but dropped down to fourth for product B (watch).

From these results, we can conclude that Framing holds a dominance for functional products. When consumers are considering buying a product, in which there are performance expectations, highlighting the benefits is highly valued. Rational Framing messages help reduce the cognitive effort by highlighting tangible gains obtained from purchasing that product. On the other hand, Emotional Appeal proved to be highly successful for symbolic products. Under normal circumstances, consumers don't purchase watches under pressured situations. Here, consumers value narratives in messaging that provoke emotions, making the watch much more than a mere accessory. Furthermore, Social Proofs drop from second place for product A to fourth place to product B indicates popularity messaging is more important when consumers have performance related concerns. When in doubt, consumers reveal to rely on what others have decided to make. This aligns with the Social Norms Theory, which highlights that individuals look at the behavior of others to guide their decisions (Cialdini, 2007).

Overall, nudges are not universally effective. They are context dependent. Their impact depends on factors such as context: product type and the situation which the consumer faces.

In conclusion, the results of the research align with the underlying theories. For products where performance is an important factor Framing and Social proof were dominant. The benefits of the product, as well as indications of what other people have previously decided, play a major role in driving purchase intention. On the other hand, for products that hold a more symbolic value, appealing to the emotional side of consumers has a stronger impact (see table 12). It is important to highlight that Framing effects were highly valued in both scenarios. From this result, we can conclude that advertising messages have a highly positive universal effect on consumers. Seeing obtainable gains and tangible benefits of consuming a certain product, consumers are immediately driven to choose that product.

5.2 Theoretical Implications

This research contributes to the theoretical understanding of underlying theories. For Nudge Theory and its application, this study provided empirical evidence on the comparative effectiveness of different nudges under controlled conditions. While previous research examined different nudges in isolation, this research offers a comparative perspective. This research bridges the gap between understanding how different nudges work and how they compare against each other.

Firstly, the findings reinforce the principles of Choice Architecture (Thaler & Sunstein, 2008) and Dual-Process Models of Cognition (Kahneman, 2011). Nudges that target System 1 thinking (such as Emotional Appeal), were more effective for symbolic products (product B: watch). On the other hand, nudges that involved framing of messages performed better for functional products (product A: running shoes). This supports the proposition that decisions made by consumers are shaped by cognitive shortcuts, and that the type of product has an effect on which cognitive system dominates.

Secondly, this research extends the Prospect Theory (Kahneman & Tversky, 1979). The study proved that Framing effects are still highly influential across different contexts. This confirms that value gain-oriented messages are a consistent driver for purchase intention. However, the observed variability in the results for Emotional Appeal and Social proof highlight that heuristic-based nudges are context-dependent. These include: symbolism, situation and perceived risk.

Thirdly, the underperforming result of Scarcity challenges the assumption that urgency-based nudges have a universal effect in increasing purchase intention. This indicated that the Psychological Reactance Theory (Purnomo, 2023; Clee & Wicklund, 1980) may not always apply in low-pressure contexts. In this case, this suggests a boundary condition for Scarcity effects.

Finally, the low effect of moderators (age and gender) on purchase intention can suggest that nudge effectiveness is more dependent on the context, type of product and product characteristics than on consumer demographics.

Furthermore, the absence of age moderation for product B indicates that symbolic products (like watches) may have similar decision-making processes across different age groups. This results indicates that when a product is associated with lifestyle or identity, consumers tend to respond to behavioral cues in a uniform way.

On the other hand, product A demonstrated clear age-related differences in responding to behavior cues in advertising. This reinforces the idea that moderating factors such as age play a key role in influencing responses to nudges in contexts where the product is utilitarian.

Overall, this research presents an advance by highlighting the interaction between nudge type, context, product type and product characteristics. Also, it identifies conditions under which certain nudges fail or succeed to drive purchase intention.

5.3 Managerial Implications

The results of this research provide actionable insights for brand marketers and companies. Firstly, the high performance of Framing effects for functional products suggests that companies who manufacture and sell these types of products should focus on clear, value-gain-oriented messages. These types of companies should highlight the tangible gains such as improvement in performance or cost-saving. Consumers, when purchasing these products prefer to rely on cognitive shortcuts to make rational decisions.

Secondly, the high results of Emotional Appeal suggests that companies that promote products associated with identity, status, lifestyle or luxury show focus on emotionally-charged narratives. Storytelling that creates certain feelings for consumers are the key to deepening connections with consumers and driving purchase intention.

Thirdly, the underperformance of Scarcity across both product types challenges common assumptions for marketers. This result suggests that brands need context-specific marketing strategies. Urgency-based tactics may only be very effective in certain scenarios, where consumers are faced with real-time pressure or situations of exclusivity (such as luxury goods). This study found that using Scarcity messages in low-pressure situations risks consumer skepticisms and, therefore, reduces purchase intention.

Fourthly, Moral Norms, while not the most powerful driver on consumption, proved to have a stable, moderate effect across both product types. This suggests that, by incorporating socially-responsible and socially-acceptable messages, companies can enhance their brand perception. Conscious consumption is an ever-growing factor in today's society. As this standard, presented by consumers, grows, companies need to adapt in order to meet consumer demands.

Finally, demographic factors such as age and gender played a minimal role in moderating the effect of nudges. It is important to consider that, for certain products, different aged consumers reacted differently to behavioral cues. The study showed that brand targeting younger consumers should emphasize Framing effects and Social Proof, while campaigns tailored to older consumers should focus on a combination of Framing Effect and Moral Norms.

As stated before, this suggests that context, type of product and product characteristics play a secondary role in moderating the effect of nudges on purchase intention. Managers and marketers should focus on context-specific strategies over “one-size-fits-all” approaches. This involves

tailoring each communication effort with different nudges, for different products, for different consumers.

5.4 Limitations and Recommendations for Future Studies

While this study provides valuable insights into the comparative effectiveness of nudges in an advertising context, there are a few limitations that limit the research.

Firstly, the research and data gathering were done using an online survey. This presents hypothetical scenarios for participants, rather than real-world scenarios. This may limit some of the results since participants weren't faced with time pressure or financial consequences. As mentioned before, this could explain the underperforming results of Scarcity.

Secondly, this research focussed on the five main nudges used by marketers and companies. Even though there are others that might not be as relevant, it would be interesting to include them in future studies.

Thirdly, the research focused on two product types (functional and symbolic). While this allowed for a valid comparison, results cannot be generalized to other products. Future research should expand the product categories, allowing for a wider comparison of the nudge effects.

Fourthly, the sample for the research was drawn from an open online survey. Although it was open and had diverse ages and genders, the sample may not have been representative of the global consumer population. Cultural, social, and socioeconomic factors could have a significant influence on how different consumers respond to different nudge types. This limitation could explain the low moderating effect of demographics on the effect of nudges. A larger, more diverse sample could provide different results.

Furthermore, this study measured immediate purchase intention and likelihood to purchase. While intention is a strong predictor, studying the long-term effects of nudges could be very valuable for companies that are trying to create long-term relations with their customers. The aim of the research was to study the effect of different nudges and how they perform against each other, but studying those effects in the long-term could be useful.

Finally, the advertisements used in the experiment were AI-generated and, therefore, standardized. This ensured control of the experiment but may not necessarily reflect the creativity, complexity and depth of real-world campaigns.

As a whole, a future study could be conducted in a similar manner where consumers are faced with real products, with real advertisements designed by real marketing teams. Also, the study could incorporate longitudinal designs where the same participants were tested at different time periods. This, combined with a larger and more diverse sample, would provide very accurate results on the effect of different nudges on purchase intention for different demographics and how these effects sustain in the long term.

Bibliography

Aggarwal, P., Jun, S. Y., & Huh, J. H. (2011). Scarcity messages: A consumer competition perspective. *Journal of Advertising, 40*(3), 19–30. https://doi.org/10.2753/JOA0091-3367400302

American Psychological Association. (2023). *Likert scale*. In *APA dictionary of psychology*. https://dictionary.apa.org/likert-scale

Apt Visuals Solutions. (2025, November 17). *How many ads do we see a day?* https://aptvisuals.com/how-many-ads-do-we-see-a-day/

Barnard, N. R., & Ehrenberg, A. S. C. (1997). Advertising: Strongly persuasive or nudging? *Journal of Advertising Research, 37*(1), 21–32.

Bradley, J. V. (1958). Complete counterbalancing of immediate sequential effects in a Latin square design. *Journal of the American Statistical Association, 53*(282), 525–528.

Brock, T. C. (1968). Implications of commodity theory for value change. In A. G. Greenwood (Ed.), *Psychological foundations of attitudes* (pp. 243–275). Academic Press.

Castro-Santa, J., Drews, S., & van den Bergh, J. C. J. M. (2023). Nudging low-carbon consumption through advertising and social norms. *Journal of Behavioral and Experimental Economics, 102*, 101956. https://doi.org/10.1016/j.socec.2022.101956

Cherney, M. A., et al. (2015). Supplemental digital content for: Reliability and validity of measures of upper extremity function. *Journal of Bone and Joint Surgery, 97*(14), e67. https://cdn-links.lww.com/permalink/bot/a/bot_2015_07_14_cherney_1_sdc10.pdf

Cialdini, R. B. (2007). *Influence: The psychology of persuasion* (Rev. ed.). Harper Business.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.

Congiu, L., & Moscati, I. (2022). A review of nudges: Definitions, justifications, effectiveness. *Journal of Economic Surveys, 36*(1), 188–213. https://doi.org/10.1111/joes.12453

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*(3), 297–334.

Eigenbrod, L., & Janson, A. (2018). How digital nudges influence consumers – Experimental investigation in the context of retargeting. In *ECIS 2018 Research-in-Progress Papers* (Paper 50). Association for Information Systems. https://aisel.aisnet.org/ecis2018_rip/50

Field, A. (2018). *Discovering statistics using IBM SPSS statistics* (5th ed.). Sage Publications.

Genco, S. (2025, May 22). *Crafting ethical nudges for good: The psychology of persuasion*. USA Biz Growth Strategies. https://usa-biz-growth.com/crafting-ethical-nudges-for-good

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (8th ed.). Cengage Learning.

Hummel, D., & Maedche, A. (2019). How effective is nudging? A quantitative review on the effect sizes and limits of empirical nudging studies. *Journal of Behavioral and Experimental Economics, 80*, 47–58. https://doi.org/10.1016/j.socec.2019.03.005

Jesse, M., Jannach, D., & Gula, B. (2021). Digital nudging for online food choices. *Frontiers in Psychology, 12*, Article 729589. https://doi.org/10.3389/fpsyg.2021.729589

Johnson, E. J., Shu, S. B., Dellaert, B. G. C., Fox, C., Goldstein, D. G., Häubl, G., … Weber, E. U. (2012). Beyond nudges: Tools of a choice architecture. *Marketing Letters, 23*(3), 487–504.

Kaushik, M., Choudhary, S., & Choudhary, M. (2024). Impact of emotional marketing on consumer decision making: A review. *International Journal of Finance & Marketing Research*. https://www.ijfmr.com/papers/2024/2/13659.pdf

Kahneman, D. (2011). *Thinking, fast and slow*. Farrar, Straus and Giroux.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47*(2), 263–291.

Krůpka, E. K., & Adar, E. (2021). Social nudges for behavior change. *University of Michigan School of Information*.

Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: A practical primer for t-tests and ANOVAs. *Frontiers in Psychology, 4*, 863.

Malhotra, N. K., Birks, D. F., & Wills, P. (2017). *Marketing research: An applied approach* (5th ed.). Pearson.

Maxwell, S. E., & Delaney, H. D. (2004). *Designing experiments and analyzing data: A model comparison perspective* (2nd ed.). Lawrence Erlbaum Associates.

Mertens, S., Herberz, M., Hahnel, U. J. J., & Brosch, T. (2022). The effectiveness of nudging: A meta-analysis of choice architecture interventions across behavioral domains. *Proceedings of the National Academy of Sciences of the United States of America, 119*(1), e2107346118. https://doi.org/10.1073/pnas.2107346118

Mirbabaie, M., Marx, J., & Germies, J. (2021). Conscious commerce – Digital nudging and sustainable e-commerce purchase decisions. In *ACIS 2021 Proceedings* (Paper 14). Australasian Conference on Information Systems. https://aisel.aisnet.org/acis2021/14

Mundt, D., Batzke, M. C. L., Bläsing, T. M., Gomer Deaño, S., & Helfers, A. (2024). Effectiveness and context dependency of social norm interventions. *Frontiers in Psychology, 15*, 1392296. https://doi.org/10.3389/fpsyg.2024.1392296

Nguyen, D. N., & Nguyen, D. V. (2025). FOMO and the impulsive purchasing behavior of young people. *European Journal of Business and Management Research, 10*(3), 41–47.

Park, S., & McCallister, J. (2023). The effects of social proof marketing tactics on nudging consumer purchase. *Journal of Student Research, 12*(3). https://doi.org/10.47611/jsrhs.v12i3.4887

Pham, M. T. (1998). Representativeness, relevance, and the use of feelings in decision making. *Journal of Consumer Research, 25*(2), 144–159.

Purnomo, A. (2023). Scarcity marketing and consumer reactance: A review. *Journal of Marketing Theory and Practice, 31*(2), 150–169.

Razali, N. M., & Wah, Y. B. (2011). Power comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors and Anderson-Darling tests. *Journal of Statistical Modeling and Analytics, 2*(1), 21–33.

Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving decisions about health, wealth, and happiness*. Yale University Press.

Tuncer, R., Sergeeva, A., Bongard-Blanchy, K., Distler, V., Doublet, S., & Koenig, V. (2024). Running out of time(rs): Effects of scarcity cues on perceived task load, perceived benevolence and user experience on e-commerce sites. *Behaviour & Information Technology, 43*(11), 2281–2299. https://doi.org/10.1080/0144929X.2023.2242966

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science, 185*(4157), 1124–1131.

Van Gestel, L. C., Adriaanse, M. A., & De Ridder, D. T. D. (2021). Do nudges make use of automatic processing? *Comprehensive Results in Social Psychology, 5*(1–3), 4–24. https://doi.org/10.1080/23743603.2020.1808456

Zervas, I., & Triantari, S. (2025). Trust and ethical influence in organizational nudging: Insights from human resource and marketing practice. *Journal of Theoretical and Applied Electronic Commerce Research, 20*(3), 176. https://doi.org/10.3390/jtaer20030176

Appendix

Appendix A: Development of Advertisement Images

The Images of the advertisements used in the Qualtrics online survey were generated on AI image generation software.

Product A: Running Shoes

Figure 2: AI generated advertisement for product A: Social Proof

Figure 3: AI generated advertisement for product A: Scarcity

Figure 4: AI generated advertisement for product A: Framing

Figure 5: AI generated advertisement for product A: Emotional Appeal

Figure 6: AI generated advertisement for product A: Moral Norms

Product B: Watch

Figure 7: AI generated advertisement for product B: Social Proof

Figure 8: AI generated advertisement for product B: Scarcity

Figure 9: AI generated advertisement for product B: Framing

Figure 10: AI generated advertisement for product B: Emotional Appeal

Figure 11: AI generated advertisement for product B: Moral Norms

Appendix B: Questionnaire

Introduction and Consent

"Thank you for taking the time to participate. This survey is part of the research for a masters thesis at Católica Lisbon university. The main aim of this survey is to study the effects of nudges in advertising. It will take no longer than 5-7 minutes to complete."

"Do you agree with taking this survey?"

"Yes" → Continue with survey
"No" → End Survey

Section 1: Instructions
"In the next questions you will see different ads for the same products with different slogans."
Block 1 and 2

Section 2: Questions

Participants were shown all 5 advertisements, containing each different nudge, for both products (total of 10 images). The images were presented in a random order.
Below is a figure visualizing the survey flow that randomized questions 1 to 5 and 6 to 10.

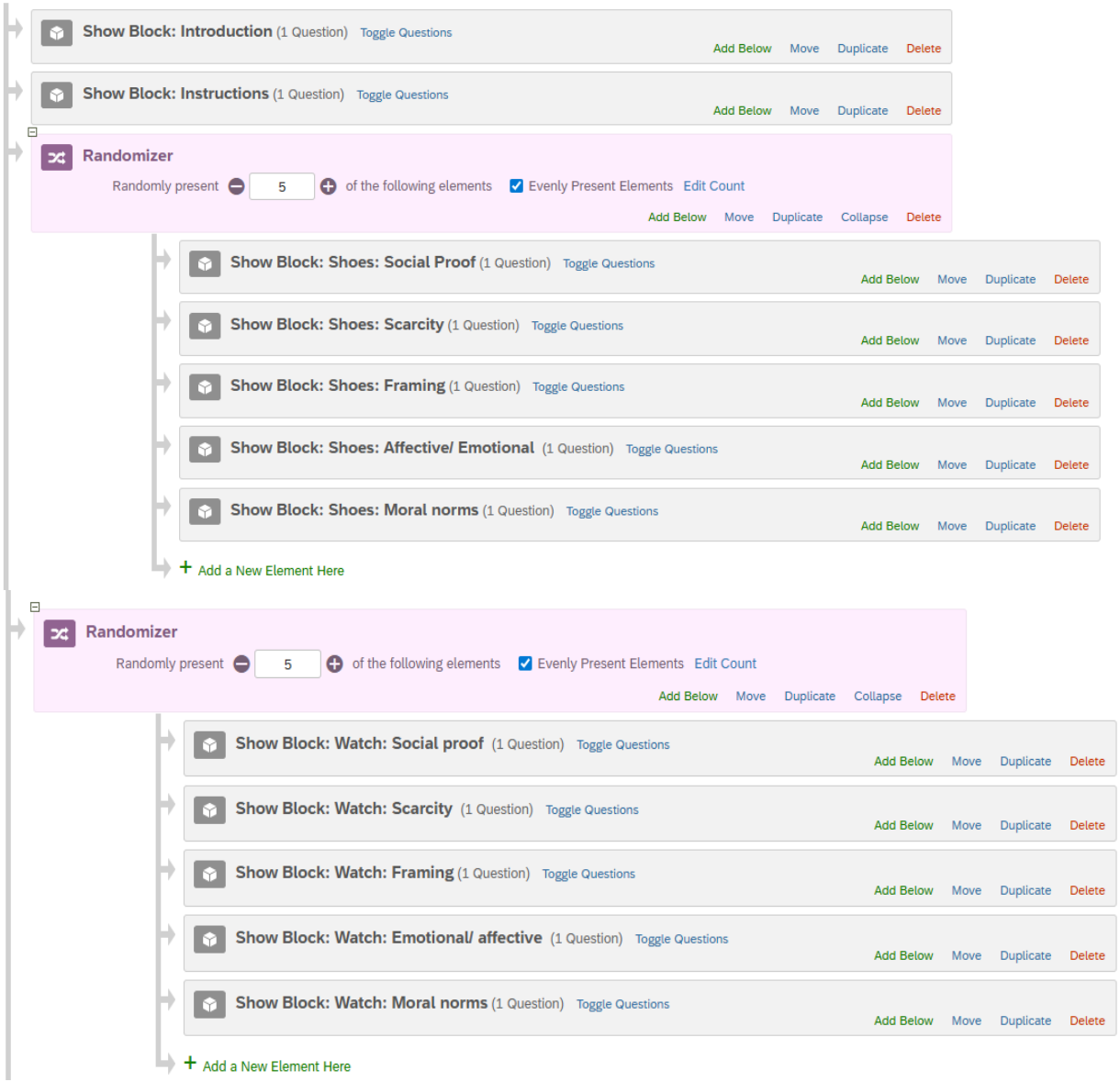

Figure 12: Survey flow randomizer for questions 1 to 10

For each image, participants were asked 3 questions. All 10 images had the same 3 questions.

Q1 - Q10
Q1-10 A: “I would consider buying this product.”
Q1-10 B: “I am likely to purchase this product.”
Q1-10 C: “I would choose this product if I needed something similar.”
Participants were asked to record their answers on a 7-point Likert Scale:

“Strongly disagree”; “Disagree”; Somewhat disagree”; Neither agree nor disagree”; Somewhat agree”; Agree”, Strongly disagree”

Below is a figure visualizing how the questions were formatted. Questions 1 through 10 had the same format. In each question the advertisement changed for each nudge.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I would consider buying this product.	○	○	○	○	○	○	○
I am likely to purchase this product.	○	○	○	○	○	○	○
I would choose this product if I needed something similar.	○	○	○	○	○	○	○

Figure 13: Visualization of survey questions (Q1 - Q10)

Quality Control

To ensure quality of the answers, a quality control question was added to the survey between Block 1 and 2.

Q11: “For quality control purposes type the number 5.”

Participants were asked to type the number “5” in an open text box.

Section 3: Demographics

To record the moderating variables, participants were asked 2 questions.

Q12: “What is your Gender”

Participants were presented a multiple choice question with 3 options:
“Male”
“Female”
“Prefer not say”

Q13: "What is your age?"

Participants were asked to record their age.

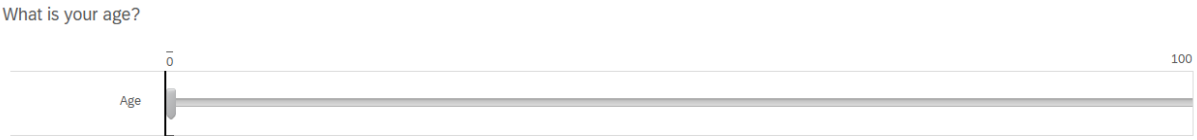

Figure 14: Demographics: Age

Section 4: End of survey

At the end of the survey, the following message was displayed:

"We thank you for your time spent taking this survey. Your response has been recorded."

Appendix C: Statistical Output

C.1 Data Screening and Sample Overview

C.2 Reliability Analysis (Cronbach's Alpha)

C.2.1 Product A

Reliability Statistics

Cronbach's Alpha	N of Items
.907	3

Table 16: Reliability: Social Proof Product A

Reliability Statistics

Cronbach's Alpha	N of Items
.938	3

Table 17: Reliability: Scarcity Product A

Reliability Statistics	
Cronbach's Alpha	N of Items
.930	3

Table 18: Reliability: Framing Product A

Reliability Statistics	
Cronbach's Alpha	N of Items
.935	3

Table 19: Reliability: Emotional Appeal Product A

Reliability Statistics	
Cronbach's Alpha	N of Items
.932	3

Table 20: Reliability: Moral Norms Product A

C.2.2 Product B

Reliability Statistics	
Cronbach's Alpha	**N of Items**
.958	**3**

Table 21: Reliability: Social Proof Product B

Reliability Statistics	
Cronbach's Alpha	N of Items
.955	3

Table 22: Reliability: Scarcity Product B

Reliability Statistics	
Cronbach's Alpha	N of Items
.949	3

Table 23: Reliability: Framing Product B

Reliability Statistics	
Cronbach's Alpha	N of Items
.949	3

Table 24: Reliability: Emotional Appeal Product B

Reliability Statistics	
Cronbach's Alpha	N of Items
.962	3

Table 25: Reliability: Moral Norms Product B

C.3 Descriptives for Composite variables

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
A_SP_INT	129	1.00	7.00	4.4625	1.47803
A_SC_INT	129	1.00	6.33	3.6382	1.56792
A_FR_INT	129	1.00	7.00	4.6899	1.49140
A_EA_INT	129	1.00	7.00	4.1163	1.62535
A_MN_INT	129	1.00	7.00	4.2041	1.54015
B_SP_INT	129	1.00	7.00	3.7726	1.55679
B_SC_INT	129	1.00	6.67	3.6382	1.58390
B_FR_INT	129	1.00	7.00	4.0155	1.54889
B_EA_INT	129	1.00	7.00	4.0956	1.53839
B_MN_INT	129	1.00	7.00	3.9147	1.61712
Valid N (listwise)	129				

Table 26: Descriptive Statistics for Composite Variables

C.4 Assumption Testing

C.4.1 Normality: Shapiro-Wilk Test

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
A_SP_INT	.099	129	.003	.965	129	.002
A_SC_INT	.133	129	<.001	.945	129	<.001
A_FR_INT	.133	129	<.001	.941	129	<.001
A_EA_INT	.102	129	.002	.964	129	.002
A_MN_INT	.116	129	<.001	.960	129	<.001
B_SP_INT	.139	129	<.001	.946	129	<.001
B_SC_INT	.125	129	<.001	.946	129	<.001
B_FR_INT	.108	129	<.001	.961	129	<.001
B_EA_INT	.119	129	<.001	.955	129	<.001
B_MN_INT	.149	129	<.001	.950	129	<.001
a. Lilliefors Significance Correction						

Table 27: Normality: Shapiro-Wilk

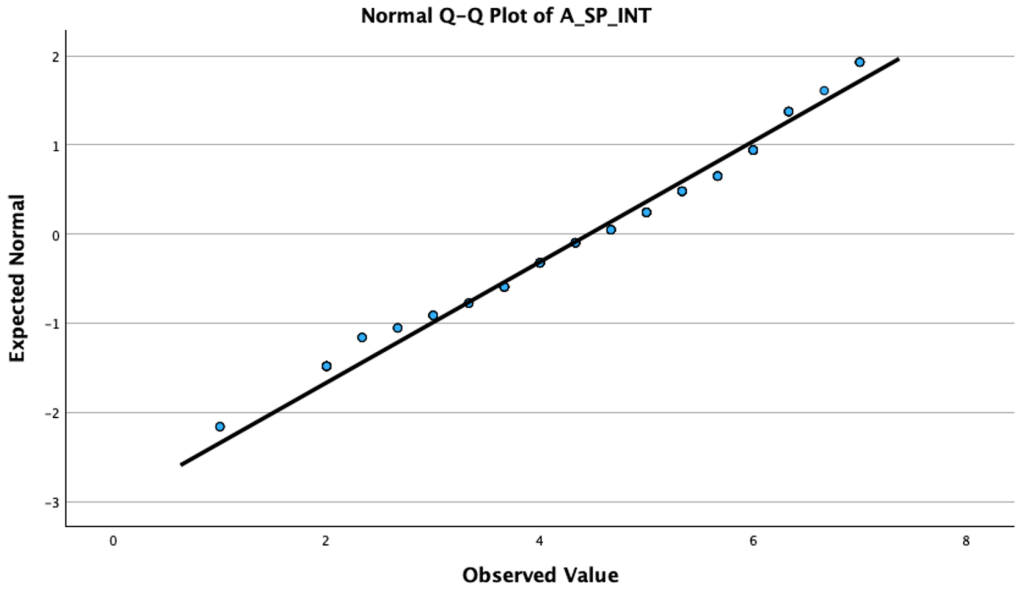

Figure 15: Normality: Q-Plot for composite variable: A_SP_INT

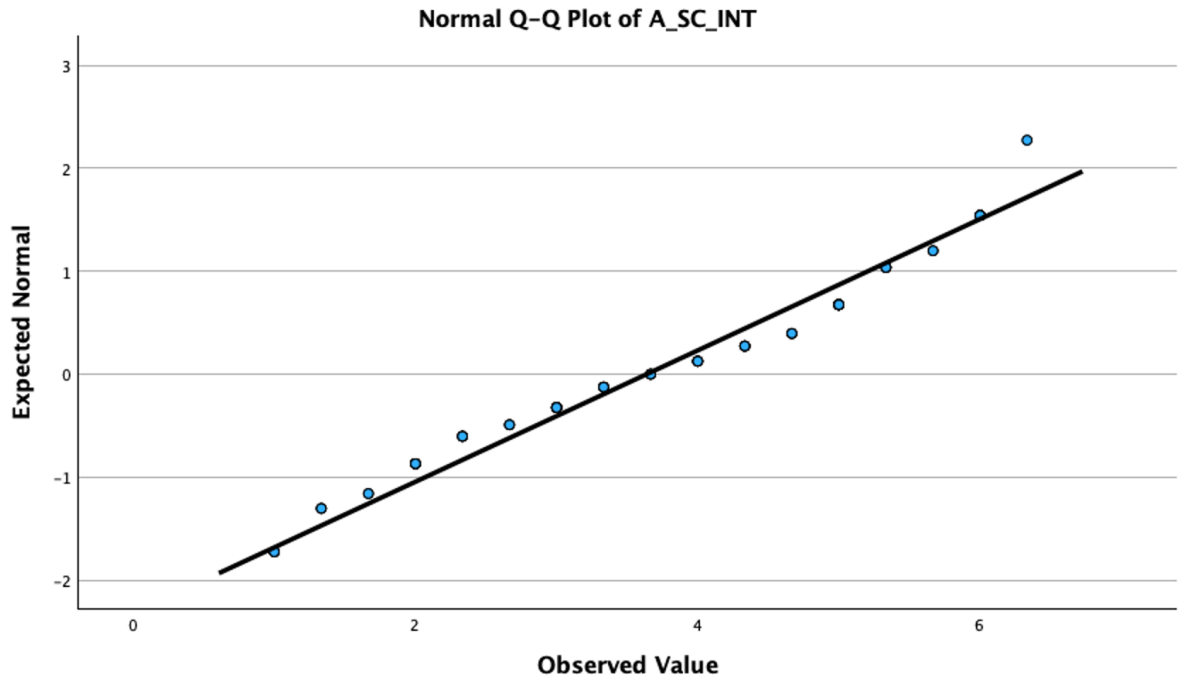

Figure 16: Normality: Q-Plot for composite variable: A_SC_INT

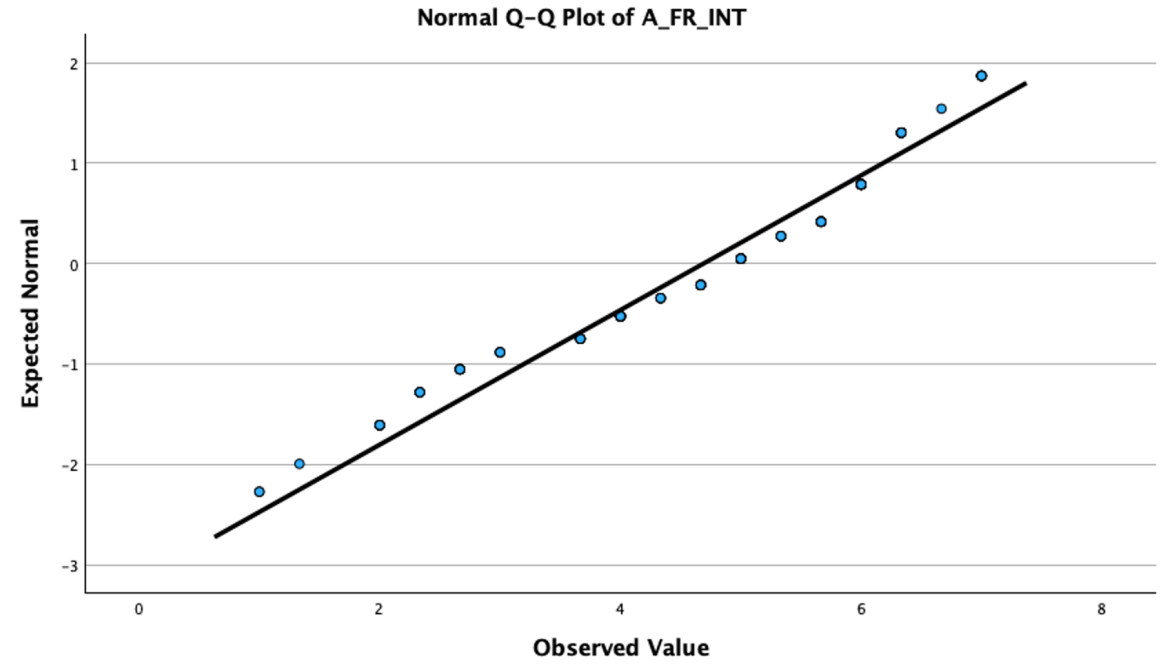

Figure 17: Normality: Q-Plot for composite variable: A_FR_INT

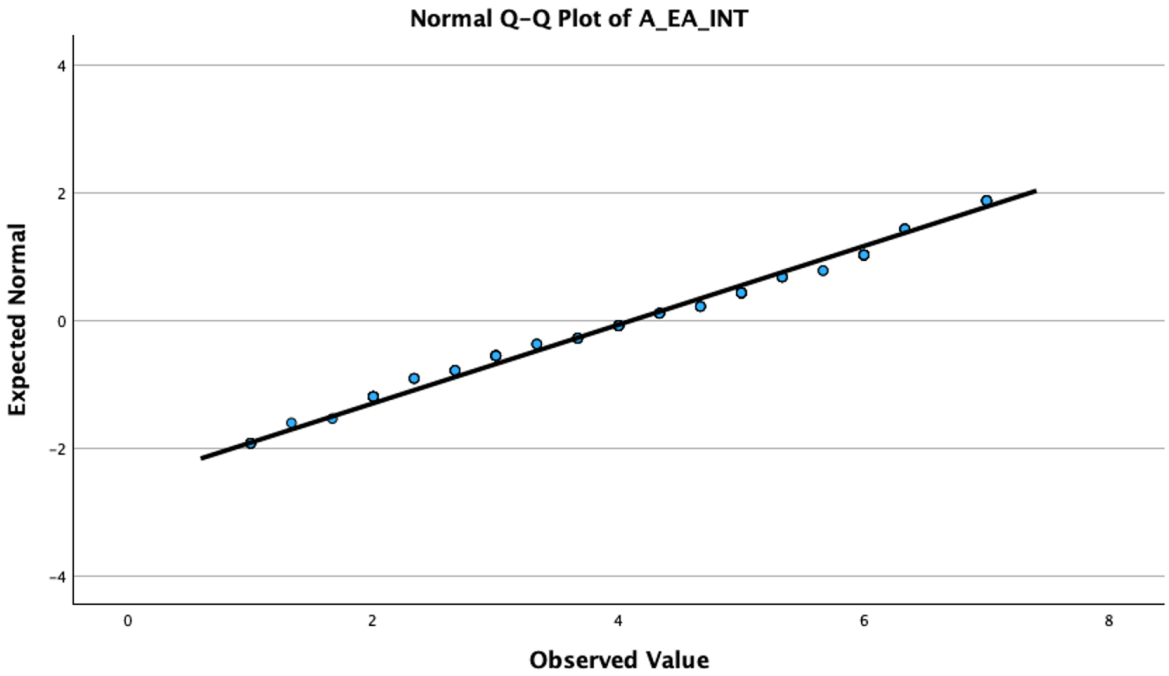

Figure 18: Normality: Q-Plot for composite variable: A_EA_INT

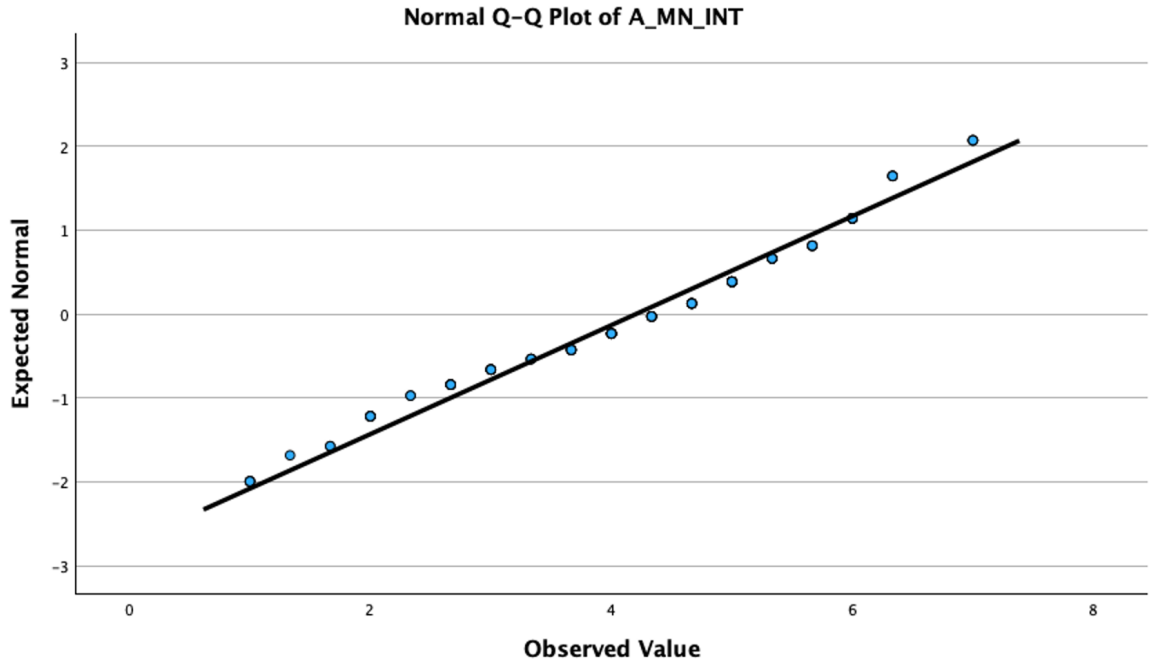

Figure 19: Normality: Q-Plot for composite variable: A_MN_INT

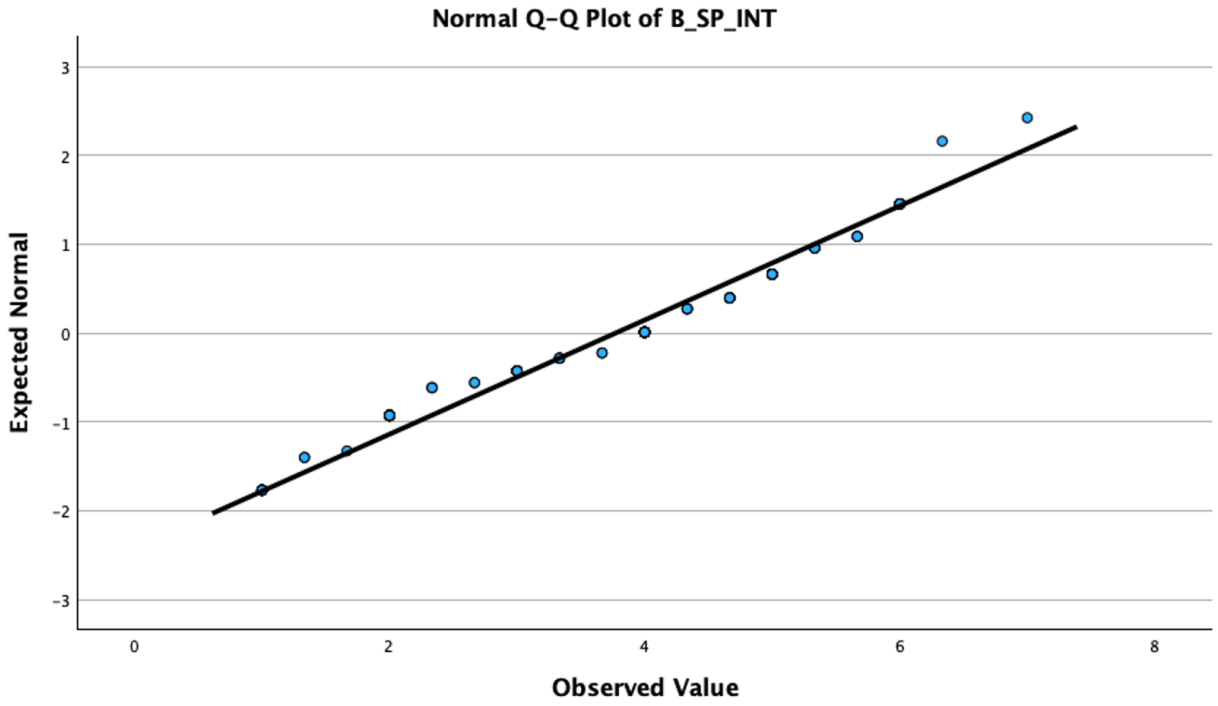

Figure 20: Normality: Q-Plot for composite variable: B_SP_INT

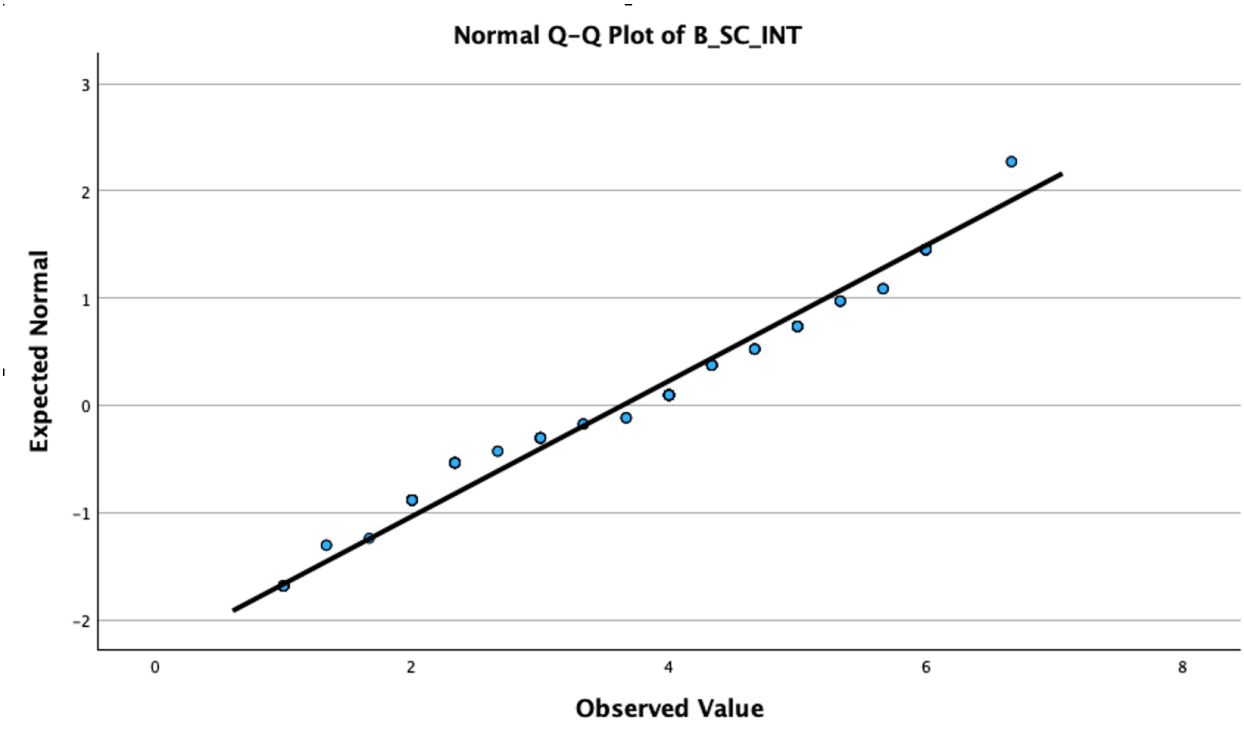

Figure 21: Normality: Q-Plot for composite variable: B_SC_INT

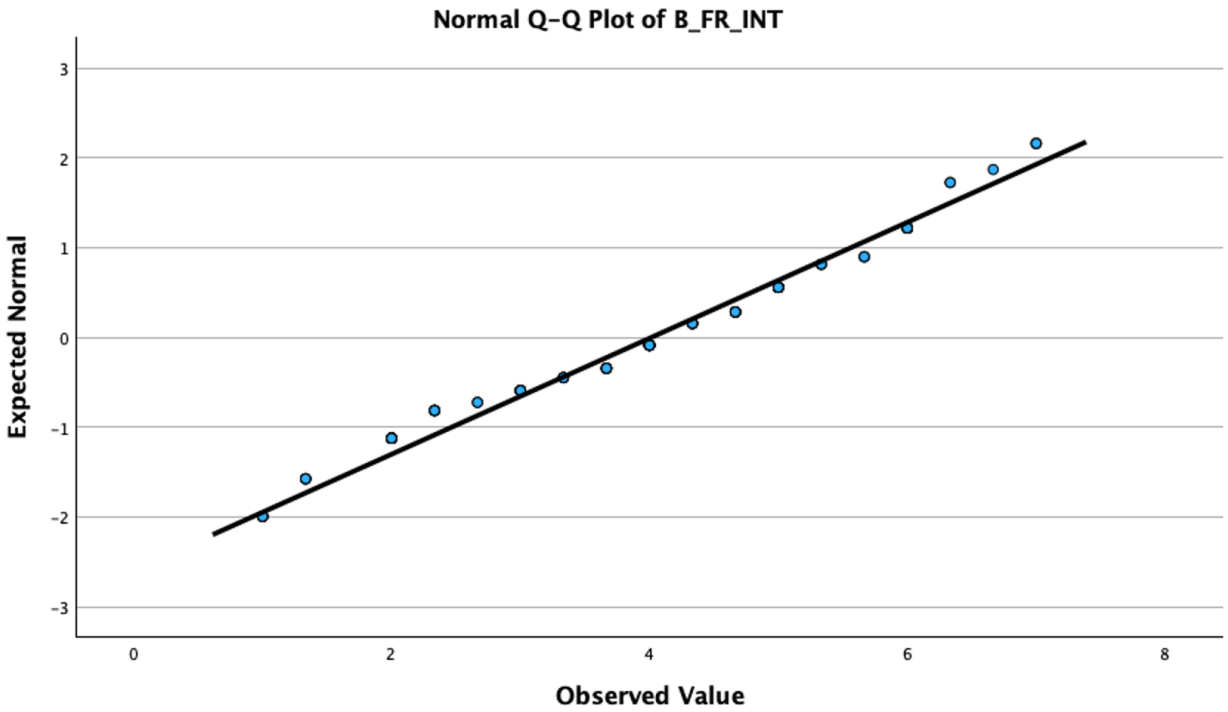

Figure 22: Normality: Q-Plot for composite variable: B_FR_INT

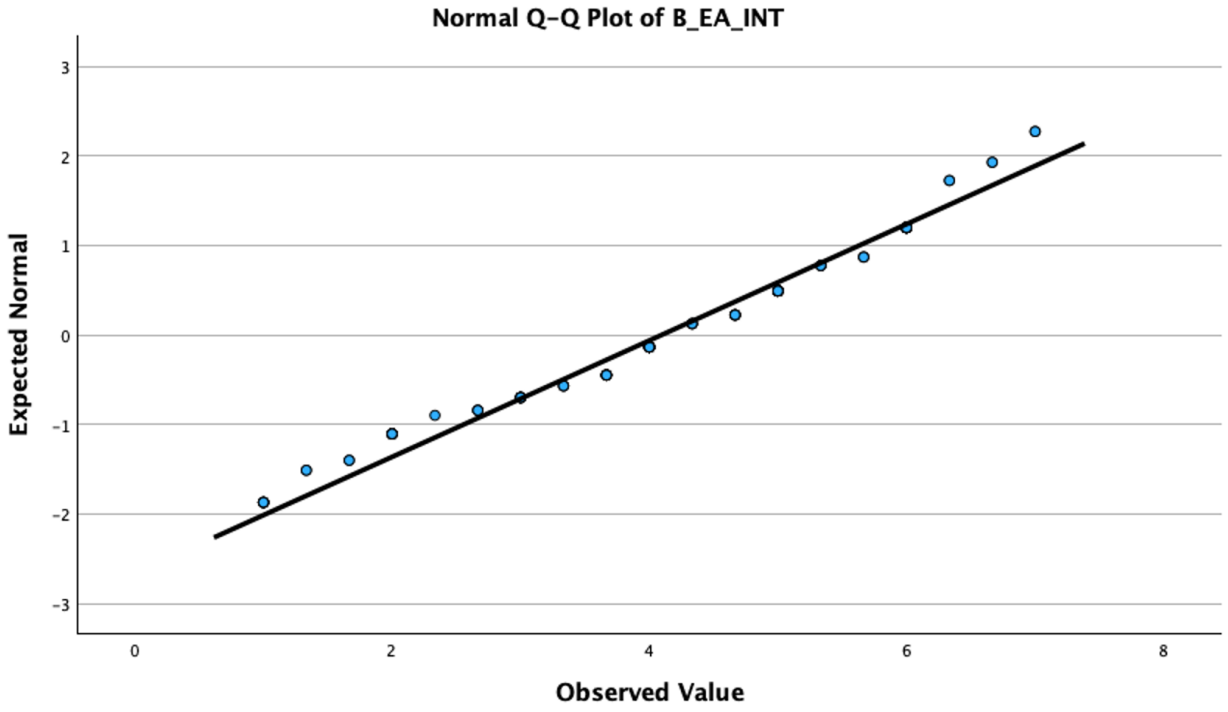

Figure 23: Normality: Q-Plot for composite variable: B_EA_INT

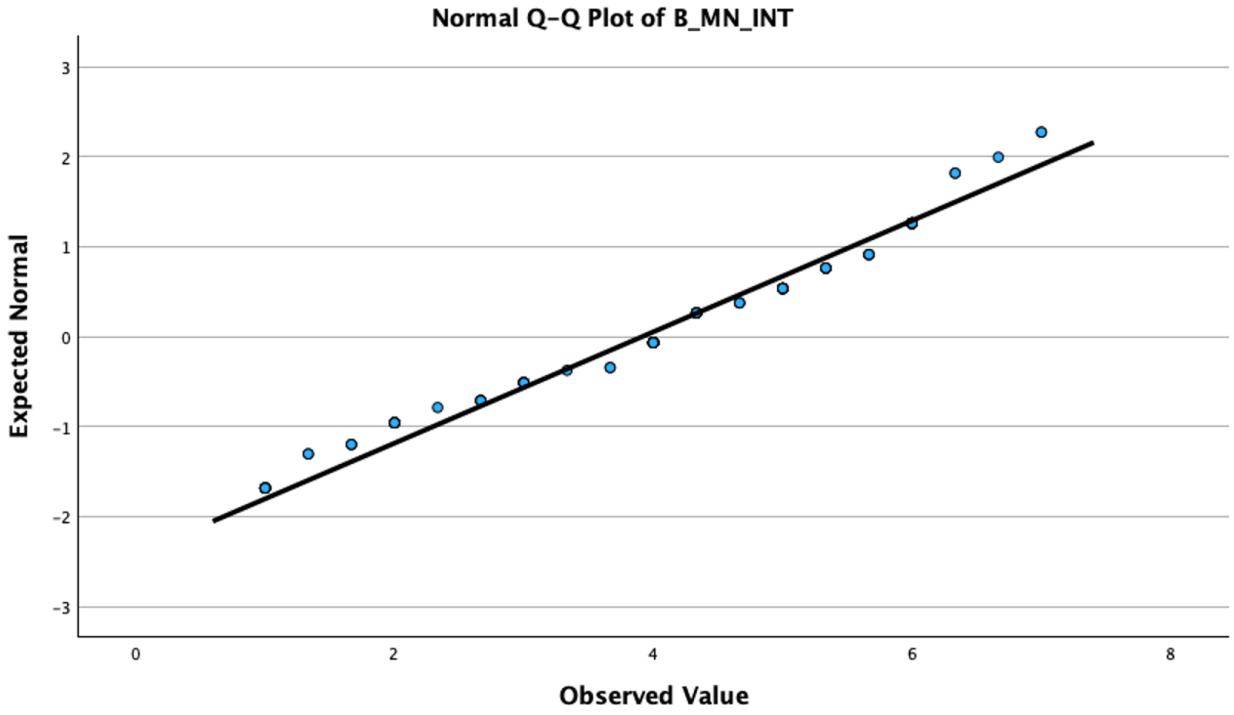

Figure 24: Normality: Q-Plot for composite variable: B_MN_INT

C.4.2 Sphericity: Mauchly's Test

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
NUDGES_A	.905	12.593	9	.182	.958	.992	.250

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept
Within Subjects Design: NUDGES_A

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 28: Mauchly's Test of Sphericity product A

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
NUDGES_B	.723	40.951	9	<.001	.867	.894	.250

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept
Within Subjects Design: NUDGES_B

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Table 29: Mauchly's Test of Sphericity product B

C.5 Repeated-Measures ANOVA

C.5.1 Product A

Descriptive Statistics

	Mean	Std. Deviation	N
A_SP_INT	4.4625	1.47803	129
A_SC_INT	3.6382	1.56792	129
A_FR_INT	4.6899	1.49140	129
A_EA_INT	4.1163	1.62535	129
A_MN_INT	4.2041	1.54015	129

Table 30: Descriptive Statistics Product A

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	
NUDGES_A	Sphericity Assumed	81.151	4	20.288	16.452	<.001	.114
	Greenhouse-Geisser	81.151	3.834	21.166	16.452	<.001	.114
	Huynh-Feldt	81.151	3.967	20.456	16.452	<.001	.114
	Lower-bound	81.151	1.000	81.151	16.452	<.001	.114
Error(NUDGES_A)	Sphericity Assumed	631.383	512	1.233			
	Greenhouse-Geisser	631.383	490.749	1.287			
	Huynh-Feldt	631.383	507.793	1.243			
	Lower-bound	631.383	128.000	4.933			

Table 31: Repeated-Measures ANOVA: Tests of Within-Subjects Product A

C.5.2 Product B

Descriptive Statistics

	Mean	Std. Deviation	N
B_SP_INT	3.7726	1.55679	129
B_SC_INT	3.6382	1.58390	129
B_FR_INT	4.0155	1.54889	129
B_EA_INT	4.0956	1.53839	129
B_MN_INT	3.9147	1.61712	129

Table 32: Descriptive Statistics Product B

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	
NUDGES_B	Sphericity Assumed	17.514	4	4.378	5.331	<.001	.040	
	Greenhouse-Geisser	17.514	3.469	5.049	5.331	<.001	.040	
	Huynh-Feldt	17.514	3.577	4.896	5.331	<.001	.040	
	Lower-bound	17.514	1.000	17.514	5.331	.023	.040	
Error(NUDGES_B)	Sphericity Assumed	420.486	512	.821				
	Greenhouse-Geisser	420.486	443.971	.947				
	Huynh-Feldt	420.486	457.846	.918				

	Lower-bound	420.486	128.000	3.285			

Table 33: Repeated-Measures ANOVA:Tests of Within-Subjects Product B

C.6 Post-hoc Comparisons

C.6.1 Estimated Marginal Means

Estimates

Measure: MEASURE_1

NUDGES_A	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	4.463	.130	4.205	4.720
2	3.638	.138	3.365	3.911
3	4.690	.131	4.430	4.950
4	4.116	.143	3.833	4.399
5	4.204	.136	3.936	4.472

Table 34: Estimated Marginal Means Product A

Estimates

Measure: MEASURE_1

NUDGES_B	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	3.773	.137	3.501	4.044

2	3.638	.139	3.362	3.914
3	4.016	.136	3.746	4.285
4	4.096	.135	3.828	4.364
5	3.915	.142	3.633	4.196

Table 35: Estimated Marginal Means Product B

C.6.2 Bonferroni Pairwise Comparisons

Pairwise Comparisons

Measure: MEASURE_1

(I) NUDGES_A	(J) NUDGES_A	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	.824*	.135	<.001	.438	1.211
	3	-.227	.130	.821	-.598	.143
	4	.346*	.120	.047	.002	.690
	5	.258	.123	.371	-.092	.609
2	1	-.824*	.135	<.001	-1.211	-.438
	3	-1.052*	.152	<.001	-1.487	-.617
	4	-.478*	.141	.010	-.882	-.074
	5	-.566*	.148	.002	-.988	-.144
3	1	.227	.130	.821	-.143	.598
	2	1.052*	.152	<.001	.617	1.487

	4	.574*	.144	.001	.163	.984
	5	.486*	.145	.010	.073	.899
4	1	-.346*	.120	.047	-.690	-.002
	2	.478*	.141	.010	.074	.882
	3	-.574*	.144	.001	-.984	-.163
	5	-.088	.141	1.000	-.491	.315
5	1	-.258	.123	.371	-.609	.092
	2	.566*	.148	.002	.144	.988
	3	-.486*	.145	.010	-.899	-.073
	4	.088	.141	1.000	-.315	.491
Based on estimated marginal means						
*. The mean difference is significant at the .05 level.						
b. Adjustment for multiple comparisons: Bonferroni.						

Table 36: Bonferroni Pairwise Comparisons Product A

Pairwise Comparisons						
Measure: MEASURE_1						
					95% Confidence Interval for Difference[b]	
(I) NUDGES_B	(J) NUDGES_B	Mean Difference (I-J)	Std. Error	Sig.[b]	Lower Bound	Upper Bound
1	2	.134	.090	1.000	-.124	.392

	3	-.243	.104	.211	-.540	.054
	4	-.323	.115	.057	-.651	.005
	5	-.142	.120	1.000	-.484	.200
2	1	-.134	.090	1.000	-.392	.124
	3	-.377*	.111	.009	-.696	-.059
	4	-.457*	.125	.004	-.815	-.100
	5	-.276	.117	.198	-.611	.058
3	1	.243	.104	.211	-.054	.540
	2	.377*	.111	.009	.059	.696
	4	-.080	.091	1.000	-.340	.180
	5	.101	.121	1.000	-.245	.447
4	1	.323	.115	.057	-.005	.651
	2	.457*	.125	.004	.100	.815
	3	.080	.091	1.000	-.180	.340
	5	.181	.126	1.000	-.180	.542
5	1	.142	.120	1.000	-.200	.484
	2	.276	.117	.198	-.058	.611
	3	-.101	.121	1.000	-.447	.245
	4	-.181	.126	1.000	-.542	.180
Based on estimated marginal means						
*. The mean difference is significant at the .05 level.						
b. Adjustment for multiple comparisons: Bonferroni.						

Table 37: Bonferroni Pairwise Comparisons Product B

C.7 Mixed-Design ANOVA: Moderation Analysis

C.7.1 Product A

Tests of Within-Subjects Effects							
Measure: MEASURE_1							
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	
NUDGES_A	Sphericity Assumed	34.256	4	8.564	7.101	<.001	.053
	Greenhouse-Geisser	34.256	3.831	8.942	7.101	<.001	.053
	Huynh-Feldt	34.256	4.000	8.564	7.101	<.001	.053
	Lower-bound	34.256	1.000	34.256	7.101	.009	.053
NUDGES_A * AGE	Sphericity Assumed	12.889	4	3.222	2.672	.031	.021
	Greenhouse-Geisser	12.889	3.831	3.364	2.672	.034	.021
	Huynh-Feldt	12.889	4.000	3.222	2.672	.031	.021
	Lower-bound	12.889	1.000	12.889	2.672	.105	.021
NUDGES_A * GENDER	Sphericity Assumed	8.668	4	2.167	1.797	.128	.014
	Greenhouse-Geisser	8.668	3.831	2.262	1.797	.131	.014
	Huynh-Feldt	8.668	4.000	2.167	1.797	.128	.014
	Lower-bound	8.668	1.000	8.668	1.797	.183	.014
Error(NUDGES_A)	Sphericity Assumed	607.821	504	1.206			
	Greenhouse-Geisser	607.821	482.721	1.259			
	Huynh-Feldt	607.821	504.000	1.206			
	Lower-bound	607.821	126.000	4.824			

Table 38: Mixed-Design ANOVA: Tests of Within-Subject Effects Product A

Tests of Between-Subjects Effects						
Measure: MEASURE_1						
Transformed Variable: Average						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	1435.424	1	1435.424	203.737	<.001	.618
AGE	.059	1	.059	.008	.927	.000
GENDER	1.662	1	1.662	.236	.628	.002
Error	887.730	126	7.045			

Table 39: Mixed-design ANOVA: Tests of Between-Subject Effects Product A

C.7.2 Product B

Tests of Within-Subjects Effects							
Measure: MEASURE_1							
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	
NUDGES_B	Sphericity Assumed	8.181	4	2.045	2.535	.039	.020
	Greenhouse-Geisser	8.181	3.459	2.365	2.535	.048	.020
	Huynh-Feldt	8.181	3.625	2.257	2.535	.045	.020
	Lower-bound	8.181	1.000	8.181	2.535	.114	.020
NUDGES_B * AGE	Sphericity Assumed	4.176	4	1.044	1.294	.271	.010
	Greenhouse-Geisser	4.176	3.459	1.207	1.294	.274	.010

	Huynh-Feldt	4.176	3.625	1.152	1.294	.273	.010
	Lower-bound	4.176	1.000	4.176	1.294	.257	.010
NUDGES_B * GENDER	Sphericity Assumed	7.244	4	1.811	2.245	.063	.018
	Greenhouse-Geisser	7.244	3.459	2.094	2.245	.073	.018
	Huynh-Feldt	7.244	3.625	1.998	2.245	.070	.018
	Lower-bound	7.244	1.000	7.244	2.245	.137	.018
Error(NUDGES_B)	Sphericity Assumed	406.586	504	.807			
	Greenhouse-Geisser	406.586	435.844	.933			
	Huynh-Feldt	406.586	456.761	.890			
	Lower-bound	406.586	126.000	3.227			

Table 40: Mixed-design ANOVA: Test of Within-Subject Effects Product B

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	1463.561	1	1463.561	161.720	<.001	.562
AGE	13.296	1	13.296	1.469	.228	.012
GENDER	.354	1	.354	.039	.844	.000
Error	1140.293	126	9.050			

Table 41: Mixed-Design ANOVA: Tests of Between-Subject Effects Product B

C.8 Repeated-Measures ANOVA: Age Groups

C.8.1 Product A

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
NUDGE	Sphericity Assumed	64.584	4	16.146	13.363	<.001	.096
	Greenhouse-Geisser	64.584	3.832	16.853	13.363	<.001	.096
	Huynh-Feldt	64.584	4.000	16.146	13.363	<.001	.096
	Lower-bound	64.584	1.000	64.584	13.363	<.001	.096
NUDGE * AGE_GROUP	Sphericity Assumed	22.420	8	2.803	2.319	.019	.036
	Greenhouse-Geisser	22.420	7.664	2.925	2.319	.021	.036
	Huynh-Feldt	22.420	8.000	2.803	2.319	.019	.036
	Lower-bound	22.420	2.000	11.210	2.319	.103	.036
Error(NUDGE)	Sphericity Assumed	608.962	504	1.208			
	Greenhouse-Geisser	608.962	482.861	1.261			
	Huynh-Feldt	608.962	504.000	1.208			
	Lower-bound	608.962	126.000	4.833			

Table 42: Tests of Within-Subjects Effects NUDGE and AGE_GROUP Product A

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df
NUDGE	Pillai's Trace	.270	11.367[b]	4.000	123.000
	Wilks' Lambda	.730	11.367[b]	4.000	123.000
	Hotelling's Trace	.370	11.367[b]	4.000	123.000
	Roy's Largest Root	.370	11.367[b]	4.000	123.000
NUDGE * AGE_GROUP	Pillai's Trace	.137	2.275	8.000	248.000
	Wilks' Lambda	.867	2.278[b]	8.000	246.000
	Hotelling's Trace	.150	2.281	8.000	244.000
	Roy's Largest Root	.114	3.522[c]	4.000	124.000

Multivariate Tests[a]

Effect		Sig.	Partial Eta Squared
NUDGE	Pillai's Trace	<.001	.270
	Wilks' Lambda	<.001	.270
	Hotelling's Trace	<.001	.270
	Roy's Largest Root	<.001	.270
NUDGE * AGE_GROUP	Pillai's Trace	.023	.068
	Wilks' Lambda	.023	.069
	Hotelling's Trace	.023	.070
	Roy's Largest Root	.009	.102

Table 43 and 44: Multivariate tests NUDGE and AGE_GROUP Product A

Estimates

Measure: MEASURE_1

Age Group (18-29 30-49 50+)	NUDGE	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
18-29	1	4.463	.213	4.041	4.884
	2	3.565	.224	3.122	4.007
	3	4.912	.213	4.490	5.334
	4	3.810	.230	3.355	4.264
	5	4.102	.221	3.664	4.540
30-49	1	4.444	.287	3.877	5.012
	2	4.049	.301	3.453	4.646
	3	4.543	.287	3.975	5.112
	4	3.938	.309	3.326	4.550
	5	4.259	.298	3.669	4.850
50+	1	4.472	.205	4.067	4.877
	2	3.497	.215	3.071	3.922
	3	4.560	.205	4.154	4.966
	4	4.491	.221	4.054	4.927
	5	4.270	.213	3.849	4.692

Table 45: Estimated Marginal Means Age Groups Product A

Pairwise Comparisons

Measure: MEASURE_1

NUDGE	(I) Age Group (18-29 30-49 50+)	(J) Age Group (18-29 30-49 50+)	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
1	18-29	30-49	.018	.357	1.000	-.848	.884
		50+	-.009	.295	1.000	-.725	.707
	30-49	18-29	-.018	.357	1.000	-.884	.848
		50+	-.027	.352	1.000	-.882	.827
	50+	18-29	.009	.295	1.000	-.707	.725
		30-49	.027	.352	1.000	-.827	.882
2	18-29	30-49	-.485	.375	.596	-1.395	.426
		50+	.068	.310	1.000	-.685	.821
	30-49	18-29	.485	.375	.596	-.426	1.395
		50+	.553	.370	.414	-.346	1.451
	50+	18-29	-.068	.310	1.000	-.821	.685
		30-49	-.553	.370	.414	-1.451	.346
3	18-29	30-49	.368	.358	.916	-.500	1.237
		50+	.352	.296	.710	-.366	1.070
	30-49	18-29	-.368	.358	.916	-1.237	.500
		50+	-.017	.353	1.000	-.873	.840
	50+	18-29	-.352	.296	.710	-1.070	.366
		30-49	.017	.353	1.000	-.840	.873
4	18-29	30-49	-.129	.385	1.000	-1.063	.806
		50+	-.681	.318	.103	-1.454	.092
	30-49	18-29	.129	.385	1.000	-.806	1.063
		50+	-.552	.380	.445	-1.474	.369
	50+	18-29	.681	.318	.103	-.092	1.454
		30-49	.552	.380	.445	-.369	1.474
5	18-29	30-49	-.157	.372	1.000	-1.059	.744
		50+	-.168	.307	1.000	-.914	.577
	30-49	18-29	.157	.372	1.000	-.744	1.059
		50+	-.011	.367	1.000	-.901	.878
	50+	18-29	.168	.307	1.000	-.577	.914
		30-49	.011	.367	1.000	-.878	.901

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

Table 46: Pairwise Comparisons product A

C.8.2 Product B

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
NUDGE	Sphericity Assumed	13.970	4	3.493	4.267	.002	.033
	Greenhouse-Geisser	13.970	3.458	4.040	4.267	.004	.033
	Huynh-Feldt	13.970	3.624	3.855	4.267	.003	.033
	Lower-bound	13.970	1.000	13.970	4.267	.041	.033
NUDGE * AGE_GROUP	Sphericity Assumed	7.981	8	.998	1.219	.286	.019
	Greenhouse-Geisser	7.981	6.916	1.154	1.219	.291	.019
	Huynh-Feldt	7.981	7.247	1.101	1.219	.289	.019
	Lower-bound	7.981	2.000	3.990	1.219	.299	.019
Error(NUDGE)	Sphericity Assumed	412.506	504	.818			
	Greenhouse-Geisser	412.506	435.685	.947			
	Huynh-Feldt	412.506	456.589	.903			
	Lower-bound	412.506	126.000	3.274			

Table 47: Tests of Within-Subjects Effetcs NUDGE and AGE_GROUP Product B

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df
NUDGE	Pillai's Trace	.087	2.937[b]	4.000	123.000
	Wilks' Lambda	.913	2.937[b]	4.000	123.000
	Hotelling's Trace	.095	2.937[b]	4.000	123.000
	Roy's Largest Root	.095	2.937[b]	4.000	123.000
NUDGE * AGE_GROUP	Pillai's Trace	.081	1.308	8.000	248.000
	Wilks' Lambda	.920	1.312[b]	8.000	246.000
	Hotelling's Trace	.086	1.316	8.000	244.000
	Roy's Largest Root	.075	2.324[c]	4.000	124.000

Multivariate Tests[a]

Effect		Sig.	Partial Eta Squared
NUDGE	Pillai's Trace	.023	.087
	Wilks' Lambda	.023	.087
	Hotelling's Trace	.023	.087
	Roy's Largest Root	.023	.087
NUDGE * AGE_GROUP	Pillai's Trace	.240	.040
	Wilks' Lambda	.238	.041
	Hotelling's Trace	.236	.041
	Roy's Largest Root	.060	.070

a. Design: Intercept + AGE_GROUP
Within Subjects Design: NUDGE

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

Table 48 and 49: Multivariate tests NUDGE and AGE_GROUP Product B

Estimates

Measure: MEASURE_1

Age Group (18-29 30-49 50+)	NUDGE	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
18-29	1	3.891	.223	3.450	4.332
	2	3.714	.227	3.265	4.163
	3	4.333	.220	3.898	4.768
	4	4.156	.221	3.719	4.594
	5	3.837	.233	3.376	4.297
30-49	1	3.926	.300	3.331	4.520
	2	3.852	.306	3.247	4.457
	3	3.951	.296	3.365	4.537
	4	4.185	.298	3.596	4.775
	5	3.975	.313	3.355	4.596
50+	1	3.585	.214	3.161	4.009
	2	3.459	.218	3.027	3.891
	3	3.755	.211	3.336	4.173
	4	3.994	.213	3.573	4.415
	5	3.956	.224	3.513	4.399

Table 50: Estimated Marginal Means Age Groups Product B

Pairwise Comparisons

Measure: MEASURE_1

NUDGE	(I) Age Group (18-29 30-49 50+)	(J) Age Group (18-29 30-49 50+)	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
1	18-29	30-49	-.035	.374	1.000	-.943	.873
		50+	.306	.309	.972	-.444	1.057
	30-49	18-29	.035	.374	1.000	-.873	.943
		50+	.341	.369	1.000	-.555	1.237
	50+	18-29	-.306	.309	.972	-1.057	.444
		30-49	-.341	.369	1.000	-1.237	.555
2	18-29	30-49	-.138	.381	1.000	-1.061	.786
		50+	.255	.315	1.000	-.509	1.019
	30-49	18-29	.138	.381	1.000	-.786	1.061
		50+	.393	.376	.893	-.519	1.304
	50+	18-29	-.255	.315	1.000	-1.019	.509
		30-49	-.393	.376	.893	-1.304	.519
3	18-29	30-49	.383	.369	.904	-.512	1.278
		50+	.579	.305	.180	-.161	1.319
	30-49	18-29	-.383	.369	.904	-1.278	.512
		50+	.196	.364	1.000	-.687	1.079
	50+	18-29	-.579	.305	.180	-1.319	.161
		30-49	-.196	.364	1.000	-1.079	.687
4	18-29	30-49	-.029	.371	1.000	-.929	.872
		50+	.163	.307	1.000	-.582	.907
	30-49	18-29	.029	.371	1.000	-.872	.929
		50+	.191	.366	1.000	-.697	1.080
	50+	18-29	-.163	.307	1.000	-.907	.582
		30-49	-.191	.366	1.000	-1.080	.697
5	18-29	30-49	-.139	.390	1.000	-1.086	.809
		50+	-.119	.323	1.000	-.902	.664
	30-49	18-29	.139	.390	1.000	-.809	1.086
		50+	.019	.385	1.000	-.915	.954
	50+	18-29	.119	.323	1.000	-.664	.902
		30-49	-.019	.385	1.000	-.954	.915

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

Table 51: Pairwise Comparisons product B