Master's Thesis

Effects of Logo Element Congruence on Brand Traits and Evaluations

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Abstract

Objective: This research was conducted to examine the effect symbolic congruence among elements in a logo has on brand evaluation and strength of brand traits. Logo elements like colors, shapes and typefaces have symbolic meanings that can be conveyed to consumers. Few studies have examined how logos composed of multiple elements are perceived. It was hypothesized logos comprised of elements conveying the same meaning (i.e. congruent logos) would positively influence consumers' perceived brand liking and the strength of perceived brand traits. This relationship was expected because congruence leads to greater processing fluency, leading to a clearer interpretation of the logo's meaning and more positive evaluations of the brand.

Method: Two studies were performed to test the hypothesis. The first study tested the symbolic meaning of individual logo elements to establish their meaning and the traits they signal. Symmetry, color and wordmarks were investigated by manipulating stimuli in an experimental design. In the following study, a 2 × 2 between-subjects experimental design was used to test the effect of symbolically congruent elements — shape and color — on consumers' perceptions and evaluations. The logo elements were paired to have either a congruent or incongruent symbolic meaning. Logos were presented with a fictional company name and profile for evaluation.

Results: Results from the first study contradicted established research suggesting asymmetric logo shapes are perceived as more exciting and symmetric logos are perceived as more competent. The second study showed logo color and symmetry, two logo elements with conceptually related brand traits, exert influence on general impressions of companies. Color plays an important role in asymmetric logos, where there is a more positive attitude towards companies with blue logos than red logos. In symmetric logos, color exerts less influence, with no significant difference between red and blue. No significant results were found to support congruent logos leading to increased liking or stronger perceived brand traits.

Conclusions: The research demonstrates the difficulty in generalizing how individual logo elements affect consumer perception. Interpretation of logo elements when viewed in abstract, non-specific cases can vary from their interpretation when presented within the context of a company.

Keywords: Logo, Corporate Visual Identity, Congruence, Processing Fluency, Consumer Perceptions

Table of contents

I. Introduction

Logos are one of the main components of an organization's corporate visual identity (CVI). Organizations use logos and other CVI elements as a way to visually represent their values, brand architecture and other intangible features in order to relate to consumers and build identification among employees (Van den Bosch, Elving, & De Jong, 2006). Organizations spend time, money and effort on creating logos, modifying existing ones when needed, and ensuring their logos are used in an appropriate, consistent way.

Despite logos' importance in companies' communication, there is a fairly small amount of research which can help guide organizations in creating or modifying existing logos. Research has studied the effect of various symbolic associations of individual logo elements. Elements include colors, corporate names, shapes and typefaces. Researchers have attempted to determine how specific logo elements like colors and shapes affect individuals' interpretations of the brands or companies behind the logos. Results from this work has demonstrated logo elements can influence individuals' liking for a brand and interpretation of a brand's traits or values.

For instance, shapes have been shown to activate mental concepts of hardness and softness (Jiang, Gorn, & Chattopadhyay, 2015), teamwork and unity (Marsden & Thomas, 2013) and influence perceived excitement (Fajardo, Zhang, & Tsiros, 2016; Cian et al., 2014). Color has been shown to affect a brand's perceived personality traits, like sophistication, ruggedness or excitement (Labrecque & Milne, 2011). Typeface can increase our perception of attachment and emotion (Schroll, Schnurr, & Grewal, 2018) as well as level of engagement or pleasure (Henderson, Giese, & Cote, 2004).

Henderson & Cote (1998) have produced guidelines on what type of logo shape organizations can consider based on the needs of the organization. For example, companies which desire to be highly recognizable by consumers and have a positive association are advised to choose a logo which contains concrete objects, a symmetric, balanced logo with moderate elaborateness. Separate guidelines have been developed to guide companies choosing a typeface (Henderson et al., 2004). These findings and guidelines are independent and do not consider how each aspect, such as color, shape or typeface interacts as part of one logo, meaning the guidelines' overall applicability is limited.

Organizations face a challenge in determining which combination of logo elements to choose, from the broad array of shapes, spectrum of colors, and level of complexity, to produce the best possible logo. This research links together a range of studies on logo design to answer the question: "What is the effect symbolic congruence among elements in a logo has on brand evaluation and strength of brand traits?" The goal is to examine how the elements of a logo can work together in the clearest, most understandable way for potential consumers.

It is hypothesized that congruence among logo elements will positively influence consumers' perceived brand liking and the strength of perceived brand traits. This relationship is expected because congruence leads to greater processing fluency, leading to more positive evaluations and a clearer interpretation of the logo's meaning.

Before investigating how symbolic congruence among logo elements works, a more basic question first needs to be answered: "What is the effect of logo elements on consumer perception?" Findings from past research on logo shape (a)symmetry and color, as well as framed and incomplete wordmark logos are used as starting point to investigate logo element congruence. Color and shape (a)symmetry have been

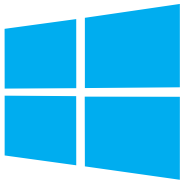
associated with how consumers perceive excitement and competence, while framed and incomplete wordmarks have been associated with innovativeness and trustworthiness.

This paper first establishes a theoretical framework summarizing current findings in logo design research and explains why congruence could potentially influence perception of brand traits and liking. Two studies are then described to test the hypothesis. The first study verifies past findings on shape (a)symmetry, color, incomplete and framed typefaces. The second study investigates how consumers perceive logos consisting of congruent elements. Analysis of the practical and theoretical implications follows.

II. Theoretical Framework

Studying how logo elements are perceived and interpreted requires an explanation of the underlying theories. This section outlines previous research in the field detailing how individual logo elements are perceived, and how logos with multiple elements are expected to be perceived.

Figure 1
Examples associations by logo type

Figurative associations			
	Microsoft Windows	Garmin	WhatsApp
Learned arbitrary associations			
	Spotify	Sony	Google Chrome

Logos are displayed for illustrative purposes and are trademarks of their respective organizations.

Associated symbolic meaning in logo design

Logos and their elements have associated symbolic meanings. Individuals can relate these elements automatically to other concepts and emotions. From these associations, individuals can make inferences about the brand's personality or traits. Doyle & Bottomley (2006) outline two general types of logo element associations: learned arbitrary associations and figurative associations. While Doyle & Bottomley (2006) apply these types specifically to typeface logos, they are also applicable to logos generally.

Figurative associations represent an item or feature found in the real world (Doyle & Bottomley, 2006, p. 114). For instance, the Microsoft Windows logo, depicting a windowpane, the logo for Garmin, depicting a compass pointing north, and the WhatsApp logo, depicting a phone and speech bubble, fit into this type (see figure 1 for depictions of these logos). Consumers relate these logos to other tangible objects.

Learned arbitrary associations are conditioned responses to elements (Doyle & Bottomley, 2006). These logos feature more abstract, less concrete features. The logos for Spotify, Sony and Google Chrome fit into this category (see figure 1 for depictions of these logos). These logos' features activate more implicit associations, indirectly related to their shapes, typeface features and colors.

A logo can trigger figurative and learned arbitrary associations simultaneously. For instance, the Garmin logo depicts a physical feature (the compass), which may cause viewers to relate to the company's background in navigation equipment, while the logo color (blue and black) and capitalized sans-serif typeface may cause viewers to make associations about the company's traits, like competence, strength or modernity. These individual logo features work together to affect the way consumers perceive the company. Past research has typically focused on examining one element, alone, to find associated arbitrary associations.

Colors, shapes & wordmarks

The effect of how logo elements operate when paired together, presented in a single logo, has not yet been extensively studied. Findings from previous research will be used as the basis for further study into congruent logo elements. Wordmark frames and (in)complete wordmark logos have shown to have potentially conflicting or compatible associations, along with color and shape symmetry.

Perceived excitement can be affected by both logo color and symmetry. Asymmetric logos increase a brand's perceived excitement (Bajaj & Bond, 2017; Luffarelli, Stamatogiannakis, & Yang, 2019; Bettels & Wiedmann, 2019). Asymmetric shapes are more difficult to process because they contain more visual information than symmetric shapes (Reber, Schwarz, & Winkielman, 2004). Symmetric shapes feature two halves with the same visual information. The increased difficulty processing asymmetric shapes leads to increased arousal, perceived as excitement.

Symmetric logo shapes, while less exciting, are expected to be perceived as more competent than asymmetric shapes. Symmetric shapes cause less arousal since the information is easier for individuals to process. The ease of processing symmetric shapes produces a positive feeling in the perceiver (Reber, et al., 2004) and these evaluations can carry over onto the brand. Luffarelli et al. (2019) found asymmetric logos are negatively associated with competence, thus, symmetric shapes would be expected to be more competent. To confirm symmetry has an effect on excitement and competence, the following hypotheses will be checked in study 1:

H1a: An asymmetric (symmetric) logo will be perceived as more (less) exciting.

H1b: A symmetric (asymmetric) logo will be perceived as more (less) competent.

Labrecque & Milne's (2011) research demonstrates color can affect perceptions of brand personality. Specific colors are shown to be positively linked to specific traits. Red is found to be perceived as an exciting color hue, while blue is found to be perceived as a competent color hue. While Labrecque & Milne (2011) do not investigate the mechanism responsible for their findings, a review of literature by Walters, Apter, & Svebak (1982) suggests the potential for a physiological and/or an associative cause. Red hues cause greater physiological arousal due to their longer wavelength and are also more likely to be associated with excitement. Blue hues cause less arousal due to their shorter wavelength and are more likely to be associated with relaxation and calm. The traits of red and blue to be verified in study 1 are:

H2a: Red (blue) will be perceived as more (less) exciting.

H2b: Blue (red) will be perceived as more (less) competent.

Framed wordmarks and incomplete wordmark logos are two elements which can affect trust in brands. Hagtvedt's (2011) research suggests incomplete wordmark logos, a typeface logo with parts missing, are rated as less trustworthy but more innovative compared to normal typeface logos which have no missing parts. Incomplete wordmark logos have greater perceptual ambiguity than normal typeface logos. This ambiguity simultaneously has positive and negative connotations. Individuals judge an incomplete logo to have less clarity. Since perceiving the logo is more difficult, the difficulty is interpreted as a negative experience attributed to the logo. The missing logo parts also have the capability to "spark interest," and the "visual interestingness encourages the perception of creativity" (Hagtvedt, 2011, p. 87). The results from Hagtvedt (2011) will be verified in study 1:

H3a: An incomplete (normal) wordmark logo will be perceived as less (more) trustworthy.

H3b: An incomplete (normal) wordmark logo will be perceived as more (less) innovative.

Fajardo et al. (2016) find framed wordmark logos increase feelings of protection and purchase intent when consumers perceive a high level of risk. Frames increase feelings of confinement and decrease purchase intent when consumers perceive a low level of risk. Individuals interpret the meaning of the frame based on their mindset. While Fajardo et al. (2016) did not directly measure trustworthiness or innovativeness, the symbolic protection of the frame may also have the perception of being more trustworthy than a normal, unframed wordmark. The symbolic confinement may also be perceived as being less innovative, since the physical structure provided by the frame may prompt less visual interest or ambiguity about the wordmark. These hypotheses will be checked in study 1:

H4a: A framed (normal) wordmark logo will be perceived as more (less) trustworthy.

H4b: A framed (normal) wordmark logo will be perceived as less (more) innovative.

Congruence & processing fluency

With a set of individual elements assembled to test, the next step is understanding how these elements will be perceived by consumers when presented together. If a congruent logo is presented to consumers, it is expected that consumers will like the logo more due to the increased processing fluency. Processing fluency is made up of both conceptual fluency and perceptual fluency. Lee & Labroo (2004) define conceptual fluency as the "ease with which the target comes to consumers' minds and pertains to the processing of meanings" (p. 151). Perceptual fluency is the "ease with which a person perceives and identifies the physical characteristics of a stimulus" (p. 152). In a logo, perceptual fluency would account for understanding the physical characteristics (like color, shape or size), while conceptual fluency would encompass logo meaning and associated traits. The greater ease of processing fluency leads to positive affect and more positive evaluations of the stimuli, overall (Reber, et al., 2004).

Processing fluency is a subjective experience. Some may prefer a more effortful processing experience. If a stimulus is too easy or simple to process (has a very high processing fluency), this could be interpreted as being a boring or simple stimulus, while if it is too complex (too low processing fluency) it could lead to an unclear interpretation (Miceli, Scopelliti, Raimondo, & Donato, 2014).

The effect of congruence on perception depends on individuals' tolerance for ambiguity. Van Rompay, Pruyn, & Tieke (2009) observed congruent stimuli increase processing fluency. In their study, advertisements for a water bottle brand were manipulated to have a shape and slogan reflecting either a natural or artificial symbolic meaning. In participants who scored highly on a "need for structure" scale, bottle shapes which matched their slogans were perceived more positively. These individuals had a low

tolerance for ambiguity — the incongruent shape and slogan were ambiguous, leading to a less positive evaluation. Congruence had no effect on liking for participants who had a low need for structure.

Congruence among design features & company identity

When considering how logos are perceived, it is important to consider not only the congruent design elements within the logo, but also congruence between the logo design overall and how it fits the underlying purpose or nature of the company. In both instances, higher processing fluency can lead to more positive evaluations.

Examining congruence among design features, Van Rompay & Pruyn (2011) manipulated product packaging shape to have congruent or incongruent symbolic associations with the typeface on the package label. A water bottle shape and the typeface on the label either conveyed congruent or incongruent associated traits (luxuriousness or casualness in one study, masculinity or femininity in another study). When the bottle shape and typeface traits matched (for instance, a luxurious bottle shape and luxurious typeface), brand credibility and product attractiveness increased. Congruent designs also lead to a higher expectation of price. In this case, the effects are a result of the matching visual stimuli communicating the same concepts.

Considering congruence between a design and its positioning or purpose, Bottomley & Doyle (2006) found when color and product function are congruent, the positioning of a brand seems more appropriate. Functional products (eg. power tools) are more appropriate when presented in functional colors, while sensory-social products (eg. chocolate) are most appropriate when presented in sensory-social colors. Doyle & Bottomley (2006) found similar effects for typeface and product function congruence. Typefaces which match a product's function lead to more positive judgements on appropriateness of the typeface.

Other studies show similar effects. The logo design must match the positioning of the company to be perceived more positively. Cian et al. (2014) found dynamic logos — those which convey movement — lead consumers to increase engagement (time spent looking at the logo) and this, in turn, leads to more positive attitudes towards the company. Attitudes were more strongly positive when the dynamic logo was paired with a company described as dynamic. The match between a dynamic logo and the concept of dynamism highlighted by the company description lead to higher fluency. Luffarelli et al. (2019) demonstrated asymmetric logos are perceived as more exciting apart from any background information on a company. Participants rated a fictious company more favorably when an asymmetric logo was paired with an exciting company persona than when paired with a symmetric logo. When an asymmetric logo was paired with a sincere or sophisticated brand personality, there was no difference in favorability compared to when paired with a symmetric logo. The fit between the exciting shape and the exciting persona is required for the positive evaluation of the company.

Jiang et al. (2015) found incongruence between an advertisement headline and logo shape tends to cause consumers to focus on the headline, not the logo shape, to interpret the meaning of the advertisement. The verbal headline positions the product, and any "unrelated visual (logo) cues are likely to be less important, and potentially disruptive" (Jiang et al., 2015, p. 721). The mismatch between the design element and product positioning is responsible for the disruption. The result also demonstrates the perception of a logo is influenced by the other CVI elements around it. Consumers may focus less on the logo, including any congruent elements within the logo, if it is placed in a context where other CVI elements signal a different brand trait or position the brand in manner contrary to the logo.

The decreased processing fluency caused by incongruence is not necessarily negative. Depending on the type of product, a moderate incongruence can produce more positive affect than congruence. Lyons &

Wien (2018), have found incongruence can positively affect product evaluations. Participants evaluated a utilitarian-framed product with an incongruent logo color to be more "premium" than one with a congruent logo color. Yet, when the product was framed as a hedonic product, congruence between logo color and product purpose increased premium evaluations. Products framed as hedonic must have at least a sufficient utilitarian benefit to be viewed as premium. When there is incongruence, there is "utilitarian uncertainty that weakens the premium evaluations... congruence will satisfy the utilitarian need and increase premium evaluations for these types of products" (p. 109). For utilitarian products, there is potential to increase excitement through the use of incongruence.

Combining Congruent Logo Elements

There is yet to be much attention paid to the micro-level effect of perceptual congruence between the elements of a logo. It is unclear whether the beneficial aspects of congruence also occur at a micro-level, solely within the logo. The present study intends to investigate this gap.

Multiple logo elements signaling the same associated traits are expected to result in stronger trait evaluations, since there is stronger conceptual fluency. For example, a logo which combines a shape and a color both associated with high level of excitement will be perceived as more exciting than a logo which conveys mixed meanings. Formally stated:

> **H5**: A company with a congruent (incongruent) logo will be more (less) likely to be perceived as having strong traits as signaled by those individual congruent elements.

Using the selected logo elements used for H1 thru H4, the following sub-hypotheses can be developed (due to results from study 1, hypotheses 5c and 5d are not tested):

> **H5a**: A company with a blue (red) and symmetric (asymmetric) logo will be perceived as being more (less) competent.
>
> **H5b**: A company with a red (blue) and asymmetric (symmetric) logo will be perceived as being more (less) exciting.
>
> **H5c**: A company with a normal (incomplete) typeface wordmark with (without) a frame will be perceived as being more (less) trustworthy.
>
> **H5d**: A company with an incomplete (normal) typeface wordmark without (with) a frame will be perceived as being more (less) innovative.

Logo elements conveying the same meaning will lead to consumers having a more favorable evaluation of the brand, since there is increased processing fluency. Formally stated:

> **H6**: A company with a congruent (incongruent) logo will be more (less) likely to be perceived as having a clear identity when paired with a congruent company persona.
>
> **H7**: A company with a congruent (incongruent) logo will be perceived as having a more (less) suitable logo when paired with a congruent company persona.
>
> **H8**: A company with a congruent (incongruent) logo will be perceived as more (less) likable.

III. Study 1 – Logo trait verification

The objective of Study 1 was to verify the individual logo elements' meanings observed in previous research were valid. Using an experimental design, participants observed a variety of wordmark logos, colors and logo shapes. Participants provided their feedback on these logo elements' meanings.

Method

Participants

A survey was taken online by 76 participants. Most participants were below the age of 26, reside in the Netherlands, and have a high level of education. Most of the respondents lived in a Western-culture country. A demographic profile of the respondents is shown in Table 1. Participants were recruited through a combination of convenience sampling, online through survey sharing sites Survey Circle and Pool Poll, as well as in-person on the University of Twente campus.

Participant groups were proportionately distributed across experimental conditions except for shape symmetry, where there was disproportionate distribution in two age groups. Detailed distributions of the sample across experimental conditions are available in the appendix (see: Demographic distribution – study 1). The disproportionate age group distribution was not shown to have a statistically significant effect on the dependent variables (further detail is provided in the appendix in Demographic distribution – study 1).

Table 1
Demographic profile of the sample (study 1)

Variable	Characteristics	n	%
Age	18-21	24	32
	22-25	24	32
	26-29	17	22
	30-39	7	9
	40-49	2	3
	60-69	2	3
Gender	Female	44	58
	Male	29	38
	Gender non-conforming	1	1
	Other/Prefer not to say	2	3
Education level	Secondary school graduate	7	9
	Trade/technical/vocational training	1	1
	Some bachelor's degree-level education	18	24
	Bachelor's degree	20	26
	Some master's degree-level education	9	12
	Master's degree	18	24
	Some Doctorate-level education	2	3
	Doctorate degree	1	1
Country of residence	Canada	1	1
	Finland	1	1
	Germany	5	7
	Ireland	1	1
	Malaysia	1	1
	Netherlands	50	66
	Pakistan	1	1
	Russia	1	1
	Spain	1	1
	United Kingdom	4	5
	United States	10	13
Total sample size		76	100.0

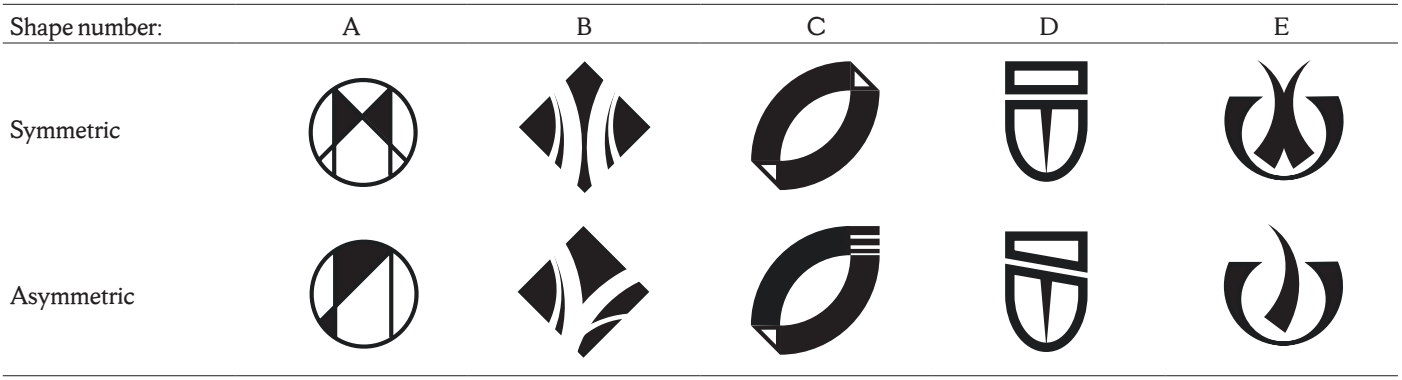
Because past research suggests color associations and meanings can differ based on one's culture and upbringing (Aslam, 2006), t-tests were conducted to compare Western and non-Western residents' responses across color conditions. There was no statistically significant difference between Western and non-Western respondents. Detailed tables and results of these tests are available in the appendix (see: Western vs. non-Western color traits).

Stimuli

Symmetry: To test the associated meanings of shape (a)symmetry, a set of 5 logos was designed (see Figure 2). Each of the five logos had two conditions — symmetric or asymmetric. The general layout of the shape remained consistent, but aspects of the logo were modified to create the appropriate condition.

Participants were randomly shown one logo from each of the 5 logo sets in random order. This ensured participants would not see a highly similar logo twice. The arrangement also allowed participants to see and rate a variety of symmetric and asymmetric logo shapes.

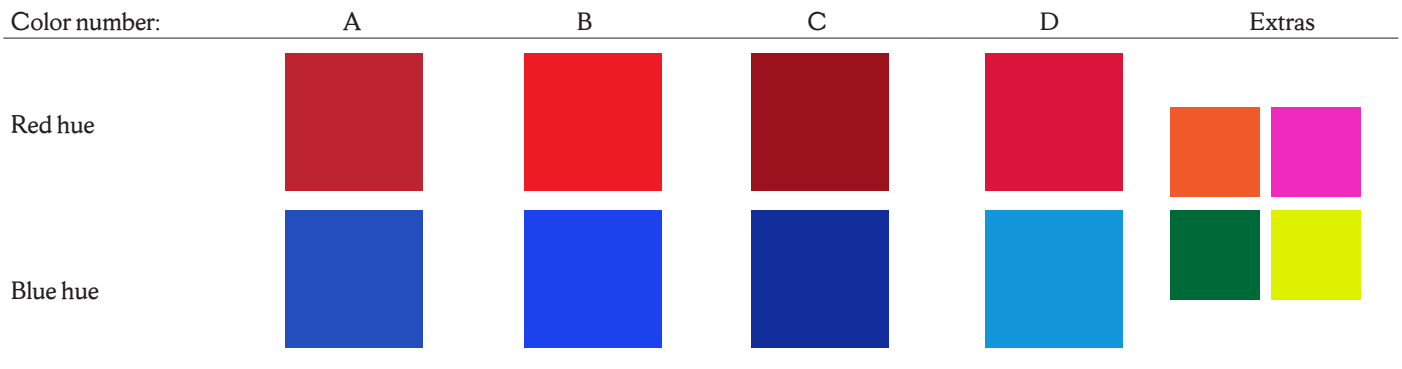
Figure 2
Shape stimuli (study 1)



Color: To test the associated meanings of color, a set of 4 colors was assembled (see Figure 3). These colors shared the same value and saturation, but the hue was manipulated to be either in the blue or red part of the spectrum.

Before taking the color portion of the survey, participants were asked if they were diagnosed with or believed they had colorblindness. Those who were excluded (n=4) automatically skipped the color section. Participants took the survey electronically using their own devices, for the ease of distribution and practicality. Because participants did not use calibrated monitors, color reproduction may have been affected; device screens vary in their ability to replicate color accurately. To ensure accurate color reproduction, participants were instructed to turn off any blue light filters, commonly known as "night mode."

Figure 3
Color stimuli (study 1)



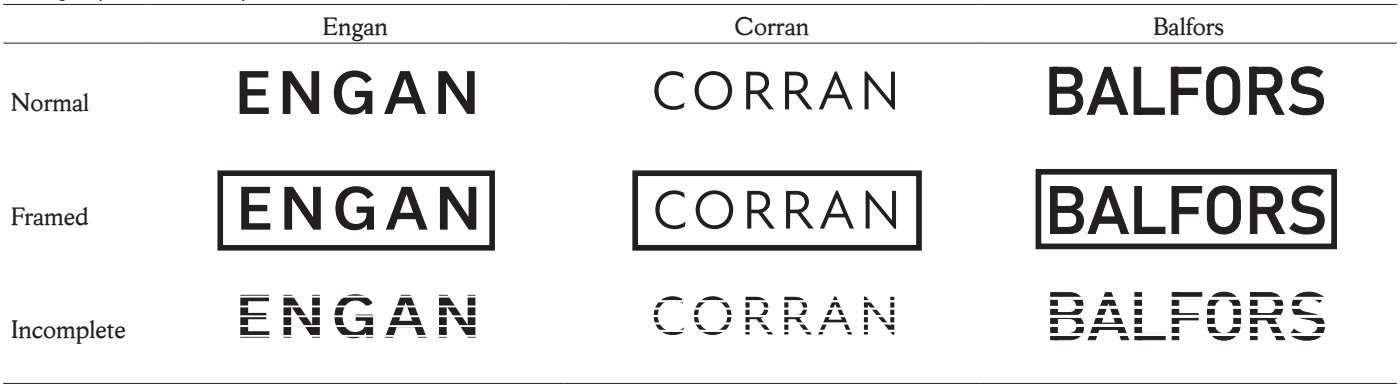
Participants were randomly shown 2 red colors and 2 blue colors from a pool containing a set of 4 red colors and 4 blue colors. Participants also saw 2 extra non-red, non-blue colors. Extra colors were inserted into the pool to avoid any potential repetitive effect of seeing two colors on similar areas of the color spectrum in a short period of time. Colors were shown in random order.

Company name: Before testing wordmark logos with (in)complete typeface and logo frames later in the survey, company names were checked to establish a baseline for traits. These company names were integrated into wordmark logos later in the survey.

Participants were shown the names: "Engan," "Corran," and "Balfors," in random order to evaluate. These names were chosen because they had no known existing familiar corporate names associated with them, and the order of letters was appropriate to be a pronounceable name.

Framed vs. Normal vs. Incomplete Wordmarks: Participants were shown wordmark logos from a set of three logos: a normal, incomplete or framed wordmark (see Figure 4). Participants were randomly assigned to see one wordmark logo from each of the three logo sets. This set was presented in random order.

Figure 4
Company stimuli (study 1)



Measures

Symmetry: On a 7-point semantic differential scale (1=Not at all applicable, 7=Highly applicable), participants were instructed to rate how applicable the following adjectives describe the brand, based on the logo, alone: exciting, active, competent, stable, traditional, familiar.

"Exciting" and "active" were combined to form an excitement index, while "competent" and "stable" were combined to form a competence index. There was high reliability in the excitement index (Cronbach's alpha = .803) and moderate reliability in the competence index (Cronbach's alpha = .632). Lower reliability in the competence index may have been a result of only including two items on the scale.

"Traditional" was also included to assist in the creation of company profiles in study 2. "Familiar" was included in the list of adjectives to examine whether the fictious logos reminded participants of another logo shape they had seen before. These adjectives were used throughout the color, company name and wordmark sections.

Participants were then instructed to rate how suitable the logo was to a given industry on a 7-point semantic differential scale (1=Not at all suitable, 7=Highly suitable). The industries were: education, insurance, manufacturing, restaurant, and transportation. These industries were selected as potentially compatible with the adjectives, as well as potentially compatible with the shapes, colors and wordmarks. These industries were used throughout the color, company name and wordmark sections.

Color: On a 7-point semantic differential scale (1=Not at all applicable, 7=Highly applicable), participants were instructed to rate how applicable the following adjectives describe the color: exciting, active, competent, stable, traditional.

"Exciting" and "active" were combined to form an excitement index, while "competent" and "stable" were combined to form a competence index. There was moderate reliability in the excitement index (Cronbach's alpha = .714) and high reliability in the competence index (Cronbach's alpha = .843).

Participants were then instructed to rate how suitable the color would be for a logo in a given industry on a 7-point semantic differential scale (1=Not at all suitable, 7=Highly suitable).

Company name: On a 7-point semantic differential scale (1=Not at all applicable, 7=Highly applicable), participants were instructed to rate how applicable the following adjectives describe the brand, based on the name, alone: trustworthy, innovative, reliable, creative, traditional, familiar.

Participants were then instructed to rate how suitable the name would be for a logo in a given industry on a 7-point semantic differential scale (1=Not at all suitable, 7=Highly suitable).

Framed vs. Normal vs. Incomplete Wordmarks: On a 7-point semantic differential scale (1=Not at all applicable, 7=Highly applicable), participants were instructed to rate how applicable the following adjectives describe the brand, based on the wordmark logo, alone: trustworthy, innovative, reliable, creative, traditional, familiar.

"Trustworthy" and "reliable" were combined to form a trustworthiness index, while "innovative" and "creative" were combined to form an innovativeness index. There was high reliability in the trustworthiness index (Cronbach's alpha = .879) and the innovativeness index (Cronbach's alpha = .850).

Participants were then instructed to rate how suitable the wordmark logo would be for a given industry on a 7-point semantic differential scale (1=Not at all suitable, 7=Highly suitable).

Results

Symmetry: In several individual shapes, there was evidence to show asymmetric shapes are perceived as more exciting than symmetric shapes, and symmetric shapes are perceived as more competent than asymmetric shapes. Results from individual shapes are shown in Table 2. As a whole, however, there was no evidence found to verify asymmetric shapes are perceived as more exciting, nor was there evidence found showing symmetric shapes are perceived as more competent than asymmetric shapes.

Table 2
Shape results (study 1)

Variant:	Shape A (Asymmetric)	Shape A (Symmetric)	Shape B (Asymmetric)	Shape B (Symmetric)	Shape C (Asymmetric)	Shape C (Symmetric)	Shape D (Asymmetric)	Shape D (Symmetric)	Shape E (Asymmetric)	Shape E (Symmetric)	Asymmetric (Overall)	Symmetric (Overall)
n	35	41	37	39	35	41	35	41	37	39	179	201
Excitement index												
Mean(μ)	3.64	4.12	4.80	4.67	4.26**	3.71**	3.93	3.43	4.53	4.76	4.24	4.12
SD	1.39	1.41	1.05	1.34	1.40	1.38	1.50	1.43	1.44	1.02	1.41	1.41
Competence index												
Mean(μ)	4.29	4.27	4.69*	4.18*	4.57	4.39	4.31***	4.74***	4.27	4.10	4.43	4.34
SD	1.16	1.11	1.10	1.07	1.08	1.08	1.11	.95	1.25	1.02	1.14	1.06

*Statistically significant difference in competence observed (t-test, independent samples, equal variance, one-sided: df =74, t=−2.049, p=.022)
**Statistically significant difference in excitement observed (t-test, independent samples, equal variance, one-sided: df =74, t=1.718, p=.045)
*** Statistically significant difference in competence observed (t-test, independent samples, equal variance, one-sided: df =74, t=1.823, p=.036)

There was no statistically significant difference between symmetric and asymmetric shapes in terms of overall excitement (t-test, independent samples, equal variance, one-sided: df =378, t=.799, p=.213). There was also no statistically significant difference between symmetric and asymmetric shapes in terms of overall competence (t-test, independent samples, equal variance, one-sided: df =378, t=.767, p=.222). For shape C, the asymmetric variant was perceived as more exciting than the symmetric variant (t-test, independent samples, equal variance, one-sided: df =74, t=1.718, p=.045). For shape B, the asymmetric variant was perceived as more competent than the symmetric variant (t-test, independent samples, equal variance, one-sided: df =74, t=1.734, p=.044). This is the opposite of what was expected. For shape D, the symmetric variant was perceived as more competent than the asymmetric variant (t-test, independent samples, equal variance, one-sided: df =74, t=1.856, p=.034).

Color: Red colors were perceived as more exciting than blue colors (t-test, independent samples, equal variance, one-sided: df =286, t=3.342, p<.001). Blue colors were perceived as more competent than red colors (t-test, independent samples, one-sided: df=286, t=5.342, p<.001). Results from individual colors are shown in Table 3.

Table 3
Color results (study 1)

Variant:	Color A (Blue)	Color A (Red)	Color B (Blue)	Color B (Red)	Color C (Blue)	Color C (Red)	Color D (Blue)	Color D (Red)	Blue (Overall)	Red (Overall)
HSB Value	H=224 S=81.77 B=74.3	H=354.85 S=81.77 B=74.3	H=229 S=88.14 B=92.55	H=357.69 S=88.14 B=92.55	H=228 S=88.39 B=60.78	H=355.62 S=88.39 B=60.78	H=201 S=90.87 B=85.88	H=348.24 S=90.87 B=85.88		
n	40	38	32	34	40	43	32	29	144	144
Excitement index										
Mean(μ)	3.79	4.20	4.25	5.34	3.81	4.15	4.64	4.93	4.09*	4.60*
SD	1.18	1.29	1.36	.97	1.15	1.40	1.33	1.21	1.28	1.33
Competence index										
Mean(μ)	5.65	5.04	4.78	3.59	5.51	5.01	5.13	4.38	5.30**	4.56**
SD	.89	1.06	1.34	1.23	.97	1.05	1.15	1.35	1.12	1.29

*Statistically significant difference in excitement observed (t-test, independent samples, equal variance, one-sided: df =286, t=3.342, p<.001)
**Statistically significant difference in competence observed (t-test, independent samples, equal variance, one-sided: df =286, t=5.342, p<.001)

Table 4
Wordmark results (study 1)

Variant:	Normal	Incomplete	Framed	Normal	Incomplete	Framed	Normal	Incomplete	Framed	Normal (Overall)	Incomplete (Overall)	Framed (Overall)
n	23	31	22	29	25	22	19	20	37	71	76	81
Trustworthiness index												
Mean(μ)	4.52	3.69	4.45	4.41	3.92	4.23	4.95	4.20	4.88	4.59*	3.90*	4.59
SD	.94	1.37	1.37	1.20	1.49	1.28	1.60	1.12	1.11	1.25	1.35	1.25
Innovativeness index												
Mean(μ)	3.35	3.89	3.77	3.62	4.44	3.77	3.47	3.47	3.31	3.49**	3.96**	3.56
SD	1.48	1.48	1.29	1.60	1.65	1.53	1.53	1.55	1.49	1.53	1.58	1.45

*Statistically significant difference in trustworthiness observed overall between normal & incomplete (t-test, independent samples, equal variance, one-sided: df =145, t=3.213, p<.001). **Statistically significant difference in innovativeness observed overall between normal & incomplete (t-test, independent samples, equal variance, one-sided: df =145, t=1.823, p=.035)

Framed vs. Normal vs. Incomplete Wordmarks: Normal wordmarks were perceived to be more trustworthy than incomplete wordmarks (t-test, independent samples, equal variance, one-sided: df =145, t=3.213, p<.001). Incomplete wordmarks were perceived to be more innovative than normal wordmarks (t-test, independent samples, equal variance, one-sided: df =145, t=1.823, p=.035). There was no statistically significant difference between complete and framed wordmarks in terms of trustworthiness or innovativeness. Results from individual wordmarks are shown in Table 4.

Conclusion

Some of the past research investigating logo design was unable to be verified. For shape symmetry and framed typefaces, results were generally contrary to what was expected, while color and incomplete typefaces were perceived as expected. Table 5 summarizes the hypotheses tested in study 1 and the outcome for each.

Table 5
Tested hypotheses & results (study 1)

Number	Description	Result
H1a	An asymmetric (symmetric) logo will be perceived as more (less) exciting.	Partially supported
H1b	A symmetric (asymmetric) logo will be perceived as more (less) competent.	Partially supported
H2a	Red (blue) will be perceived as more (less) exciting.	Supported
H2b	Blue (red) will be perceived as more (less) competent.	Supported
H3a	An incomplete (normal) wordmark logo will be perceived as less (more) trustworthy.	Supported
H3b	An incomplete (normal) wordmark logo will be perceived as more (less) innovative.	Supported
H4a	A framed (normal) wordmark logo will be perceived as more (less) trustworthy.	Not supported
H4b	A framed (normal) wordmark logo will be perceived as less (more) innovative.	Not supported

Symmetry: Results from study 1 partially support the hypothesis that asymmetric shapes are perceived as more exciting. Only Shape C was found to have the asymmetric variant be perceived as more exciting than the symmetric variant. Overall, the results contradict some of the previous research on symmetry's effect on excitement.

Increased arousal is attributed by Bajaj & Bond (2017) and Bettels & Wiedmann (2019) as the factor behind increased excitement. Since asymmetric logos are not as fluently processed as symmetric logos, the increased arousal leads perceivers to feel more excitement (Bajaj & Bond, 2017; Bettels & Wiedmann, 2019). It is possible the asymmetric logos in study 1 were not significantly more arousing to participants, leading to no differences in excitement.

An important difference between previous studies and study 1 is the choice of stimuli. This study is one of the few to use nearly identical shapes to study the effect of symmetry. Bettels & Wiedmann (2019) use only one nearly identical shape in pre-testing to establish a significant difference in excitement between asymmetric and symmetric shapes. Bajaj & Bond (2017) use a variety of different asymmetric shapes to

test their hypothesis. There was no comparison of differences among individual shapes since the shapes were unrelated perceptually. Bajaj & Bond (2017) also use more conceptually concrete imagery. The viewer may have been more easily able to relate the shapes to existing objects and concepts. Cian et al. (2014) use nearly identical shapes in their study on dynamic imagery and found increases in excitement in dynamic (asymmetric) logos. Arousal was due to perceived movement, not asymmetry. Stimuli were more conceptually concrete than what was used in study 1 (for example, depicting a Newton's cradle or see-saw). In study 1, stimuli were purposefully chosen to be less concrete in order to ensure differences in excitement were purely attributable to the shape, itself.

The results also contradict the expectation that symmetric logos will be perceived as more competent. Symmetric shapes were expected to have higher processing fluency, since there is less information for the viewer to process. Instead, there was no statistically significant difference found, overall. Only Shape D was shown to have the symmetric variant perceived as more competent than asymmetric variant. Shape B demonstrates asymmetric logos can be perceived as more competent than symmetric logos.

In study 2, shape C will be used to manipulate excitement, while shape D will be used to manipulate competence.

Color: The results support existing research finding blue is perceived to be more competent but less exciting than red, while red is perceived to be more exciting but less competent than blue.

In study 2, the most exciting red hue (shade B) will be used to manipulate excitement, while the most competent blue hue (shade A) will be used to manipulate competence.

Framed vs. Normal vs. Incomplete Wordmarks: The results support existing research finding incomplete wordmark logos are perceived to be more innovative but less trustworthy than normal wordmarks.

There was no support found for framed wordmarks being perceived to be more trustworthy but less innovative than normal wordmarks. In research by Fajardo et al. (2016), the frame's association with protection depends on a person's mental state. If an individual perceives the level of risk with a product or service is high, the logo frame is viewed as being protective. Without any risk manipulation, as was the case with study 1, the frame is unlikely to be viewed as more protective. Trustworthiness, potentially related to protection, was also not shown to be increased with the frame. There was no evidence that the frame is seen as less innovative, suggesting that there is no decreased visual interest in framed logos. Since risk was not manipulated nor considered by participants, the constraining connotation observed by Farjardo et al. (2016) may not have influenced perceived innovativeness.

Since there was no significant difference between framed and normal wordmarks, wordmarks will not be investigated in study 2.

IV. Study 2 – Congruent logo perception

In study 2, the effect of congruent logo elements was tested on the perception of brand traits and brand liking. Shape and color pairs from study 1 which showed statistically significant differences in competence or excitement were used to create the stimuli for the second study. Using a 2 (symmetry) × 2 (color) between-subjects experimental design, participants were presented with a company profile and logo to view, read and provide feedback.

Method

Participants

A survey was taken online by 221 participants, of which 181 responses were valid. Most participants were female and below the age of 30. Nearly all the respondents came from a Western cultural background. A demographic profile of the respondents is shown in Table 5. Participants were recruited through a combination of convenience sampling, online through survey sharing sites Survey Circle and Pool Poll, as well as in-person on the University of Twente campus.

The sample was refined by excluding participants using blue light (night mode) filters, participants with color blindness, or if the survey was completed in a time equal to or faster than 115 seconds (1.9 minutes) or equal to or slower than 900 seconds (15 minutes).

Participant groups were proportionately distributed across experimental conditions. Detailed distributions of the sample across experimental conditions are available in the appendix (see: Demographic distribution – study 2).

Table 6
Demographic profile of the sample (study 2)

Variable	Characteristics	n	%
Age	18-21	48	27
	22-25	47	26
	26-29	29	16
	30-39	11	6
	40-49	11	6
	50-59	12	7
	60-69	16	9
	70-79	7	4
Gender	Female	109	60
	Male	67	37
	Gender non-conforming	2	1
	Prefer not to answer	3	2
Education level	Some secondary school education	3	2
	Secondary school graduate	19	10
	Trade/technical/vocational training	4	2
	Some bachelor's degree-level education	21	12
	Bachelor's degree	60	33
	Some master's degree-level education	17	9
	Master's degree	33	18
	Some Doctorate-level education	12	7
	Doctorate degree	12	7
Country of residence	Albania	1	1
	Australia	3	2
	Canada	4	2
	Finland	1	1
	France	3	2
	Germany	14	8
	India	1	1
	Ireland	2	1
	Italy	1	1
	Netherlands	61	34
	Poland	1	1
	Portugal	1	1
	Qatar	1	1
	Russia	1	1
	Spain	1	1
	Sweden	1	1
	Switzerland	2	1
	United Kingdom	47	26
	United States	35	19
Total sample size		181	100

Compared to the sample population in study 1, gender and education were similarly distributed. Study 2 had proportionally more respondents from the United Kingdom and fewer from the Netherlands. Study 2 also had proportionally more respondents from the 50-59 year old age bracket. A detailed comparison of the samples across each of the demographic variables, including test results comparing the samples, is available in the appendix (see: Demographic comparison – Study 1 vs. study 2).

Stimuli

The shape pairs from study 1 with statistically significant differences in competence or excitement were used to create the stimuli for the second study. Since shape C demonstrated a higher level of excitement in its asymmetric form versus its symmetric form, and shape D demonstrated a higher level of competence in its symmetric form versus its asymmetric form, these shapes were used in study 2. To determine which

shade of color to pair with these shapes, the most and least exciting and the most and least competent colors were identified. Red shade B was both most exciting and least competent, while blue shade A was most competent and least exciting. This resulted in four logo variations for each shape.

A company profile was also created for each shape, since observing a logo without any context or knowledge of the company it represents is rare and less realistic. The profiles were created by first selecting the industries participants selected as most appropriate for each shape. The highest scoring industry with the least difference between the symmetric and asymmetric shapes was selected. A name was chosen for the company by selecting the most appropriate company name for an industry as rated by participants. The profiles were written to be relatable to consumers by offering relatable, familiar services. The same profile was used in all the stimuli presented, meaning the logo is the only factor which varied across experimental conditions. The profiles are shown in Figure 5.

Figure 5
Stimuli (study 2)

Shape C

	Blue	Red
Symmetric		
Asymmetric		

Balfors is a new travel website & app made for travelers who want to experience new places with the wisdom of local knowledge. Planning a trip to a new destination is as easy as setting your travel dates, budget and preferred kinds of activities. Balfors then helps you build an ideal plan in an interactive schedule builder, suggesting activities and sights to see based on your preferences. Planning is made even easier with one-click access to transit tickets and the option to shift your schedule if weather is unsuitable for outdoor activities.

Shape D

	Blue	Red
Symmetric		
Asymmetric		

Balfors Insurance offers individualized, specialized insurance plans to individuals. Our plans span both highly popular categories — like home, health and auto insurance — but also specialized areas such as identity theft protection or policies insuring valuable collectibles. Our team is experienced in finding the right plan for your needs, while also offering a competitive price. Should the unforeseen happen to you, we quickly process your claim and a dedicated member of our team will help guide you and answer any questions.

Procedure

Survey respondents were randomly assigned to a shape variant from either shape C or D and the accompanying company profile. Respondents were only exposed to either shape C or D. The same colors and company names were used for both shape C and D, thus participants could not be assigned to both shapes for multiple observations.

The survey was designed so as not to focus undue attention from the participants to the logo, particularly in the beginning of the survey. To do this, the survey was described as a survey about company profiles, and started with broad non-logo specific questions, gradually becoming more specific about the logo, itself. Questions designed to screen participants for color blindness and to determine whether a blue light filter (night mode) was turned on were also asked. These were presented after stimuli had been presented and responses had been given.

Measures

On a 7-point semantic differential scale (1=highly negative, 4=neutral, 7=highly positive), participants gave their opinion about their general feeling towards the company. They also gave their opinion about their interest in their services (1=Not at all interested, 7=Highly interested), the relevance of their services (1=Not at all relevant, 7=Highly relevant), and how clear the identity of the company seems (1=Not at all clear, 7=Highly clear).

On a 7-point semantic differential scale (1=Not at all applicable, 7=Highly applicable), participants were instructed to rate how applicable the following adjectives describe the brand: exciting, active, competent, skilled, familiar.

"Exciting" and "active" were combined to form an excitement index, while "competent" and "skilled" were combined to form a competence index. "Skilled" was included rather than "stable," the adjective used in study 1, in order to increase the reliability of the index. There was high reliability in the competence index (Cronbach's alpha = .806), but unacceptable reliability in the excitement index (Cronbach's alpha = .583). Only individual traits, not the indices, were used for analysis to avoid using an unreliable index.

Then, participants were asked about the logo, itself, on a 7-point semantic differential scale: its suitability (1=Not at all suitable, 7=Highly suitable), its likeability (1=Do not like at all, 7=Strongly like), and distinctiveness (1=Not at all distinctive, 7=Highly distinctive).

Factor Analysis

An exploratory factor analysis was performed on the survey items (excluding demographic information) to find conceptually related survey items. Two, three and four factors were extracted using principle components with 25 maximum iterations for convergence and Varimax rotation.

Table 7
Factor analysis components (study 2)

Construct	Scale	Factor Loading	Construct Reliability*
Overall feeling	Overall, what is your general feeling towards Balfors?	.865	1.00
Logo	Rate how clear the identity of Balfors seems to you.	.457	.745
	Rate how much you like the logo for Balfors.	.817	
	Rate how suitable you think the logo for Balfors is.	.876	
	Rate how distinctive you think the logo for Balfors is.	.723	
Interest level	Rate how interested you would be in the services Balfors offers.	.887	.783
	Rate how relevant Balfors' services would be to you.	.855	
	Exciting	.716	
Company traits	Competent	.830	.793
	Active	.813	
	Familiar	.533	
	Skilled	.836	

*Construct reliability calculated using Cronbach's alpha

For logical grouping, four factors were extracted for further analysis. The four factors consisted of participants' general feeling (one item), logo characteristics (four items), interest level (three items), and company characteristics (four items). The survey items included in the factors are listed in Table 7.

Logo characteristics are related to perceptions of the logo as well as how well it fits with the identity of the company. Interest level relates to the degree to which the company seems relevant and interesting to the participant. "Exciting" was grouped as an item within the interest level factor. While "exciting" was originally intended as a measure of a company characteristic, it could also describe the level of arousal or excitement the participants feel after reading the description and viewing the logo. The company traits factor is comprised of adjectives used to describe the company.

Results

Results from the individual shapes are shown in Table 8. Further results for each shape grouped by trait signaling, color, and symmetry are shown in the appendix.

Table 8
Results (study 2)

	Shape C				*Shape D*			
Variant:	Blue, Symmetric	Red, Symmetric	Blue, Asymmetric	Red, Asymmetric	Blue, Symmetric	Red, Symmetric	Blue, Asymmetric	Red, Asymmetric
Congruence:	Congruent	Incongruent	Incongruent	Congruent	Congruent	Incongruent	Incongruent	Congruent
n	25	22	21	27	24	22	20	20
General feeling								
Mean(μ)	4.60	4.86	5.52	3.44	5.08	4.59	4.95	3.70
SD	.82	.71	1.40	1.45	1.06	.91	1.00	1.13
Interest level								
Mean(μ)	4.76	5.00	5.05	5.11	4.04	4.14	3.90	3.55
SD	1.20	1.27	1.07	1.45	1.71	1.32	1.74	1.28
Relevance								
Mean(μ)	4.32	4.59	4.67	4.67	3.38	3.91	3.90	3.00
SD	1.46	1.30	1.32	1.57	1.66	1.72	1.80	1.62
Identity clarity								
Mean(μ)	4.60	4.27	4.67	4.74	4.96	4.50	4.65	5.00
SD	1.22	1.61	1.56	1.65	1.52	1.79	1.27	1.21
Exciting								
Mean(μ)	4.36	4.55	5.05	4.89	3.58	2.64	3.25	2.85
SD	1.47	1.53	1.40	1.63	1.79	1.09	1.33	1.23
Competent								
Mean(μ)	4.28	4.09	4.57	4.93	5.42	4.95	5.15	5.10
SD	1.06	1.44	1.36	1.38	1.38	1.29	.88	1.17
Logo liking								
Mean(μ)	2.56	2.82	2.95	3.33	3.96	2.86	4.20	3.85
SD	1.29	1.44	1.47	1.71	1.43	1.46	1.64	1.60
Logo suitability								
Mean(μ)	2.32	2.73	2.81	2.96	3.67	3.23	4.30	3.45
SD	1.25	1.08	1.25	1.65	1.55	1.80	1.56	1.54
Logo distinctiveness								
Mean(μ)	2.68	3.41	3.33	3.78	3.67	3.50	4.00	3.95
SD	1.44	1.47	1.74	1.74	1.81	1.60	1.69	1.50

Shape C

For shape C, a 2 (symmetry) × 2 (color) ANOVA revealed a significant effect of color as well as a significant interaction between color and symmetry on general feeling towards the company (color: $F(1,91) = 14.637$, $p<.001$, partial $\eta_p^2=.139$; interaction: $F(1,91) = 24.372$, $p<.001$, partial $\eta_p^2=.211$; adjusted $R^2=.291$) (see Figure 6). There was no significant effect of symmetry on general feeling. In an asymmetric condition, color appears to have a significant influence on general feeling, with blue colors leading to more positive evaluations than red colors. In a symmetric condition, color appears to have less influence, with similar mean scores for both red and blue.

While in study 1, there was no significant difference in perceived competence between the symmetric and asymmetric variants of shape C, competence was still measured in this study. There was a significant effect of symmetry on competence, but no significant effect of color nor a significant interaction (symmetry: $F(1,91) = 4.300$, $p=.041$, partial $\eta_p^2=.045$). The asymmetric variants are perceived to be more competent than the symmetric variants. Color and/or the company profile are the two factors could have been responsible for this outcome.

There was no significant effect of color nor symmetry on the company's perceived excitement, how likable the logo was, the logo's suitability, nor the logo's distinctiveness.

Figure 6
2 (symmetry) × 2 (color) ANOVA (shape C) on General Feeling

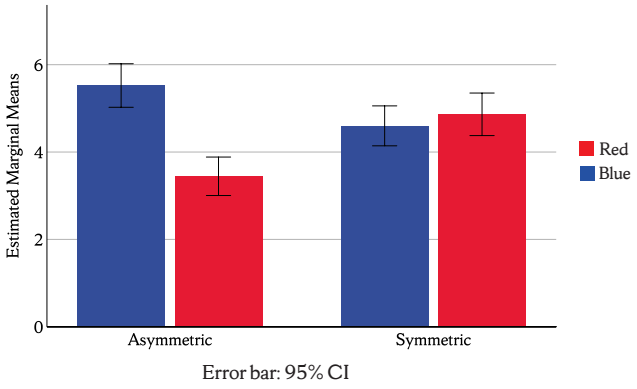
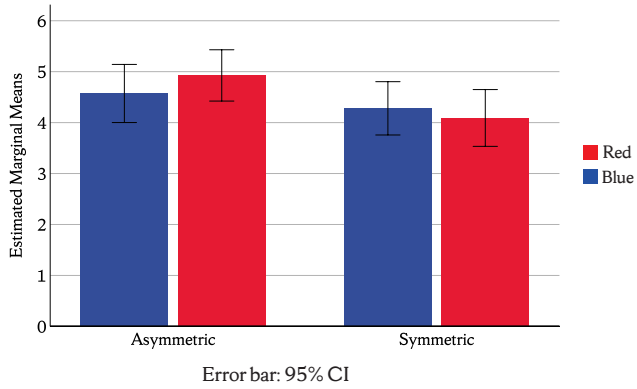


Figure 7
2 (symmetry) × 2 (color) ANOVA (shape C) on Competence



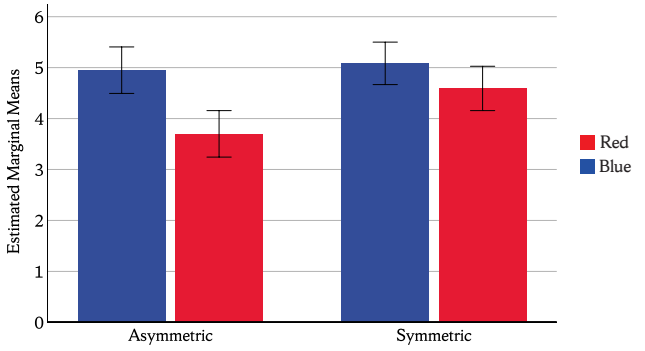
Shape D

For shape D, a 2 (symmetry) × 2 (color) ANOVA revealed a significant effect of color and symmetry on general feeling, but no significant interaction (color: $F(1,82) = 16.225$, $p<.001$, partial $\eta_p^2=.158$; symmetry: $F(1,82) = 5.327$, $p=.024$, partial $\eta_p^2=.061$; adjusted $R^2=.191$) (see Figure 8). In this case, there is more positive general feeling for the red symmetric variant compared to the red asymmetric variant. As was the case for shape C, in an asymmetric condition, blue colors are associated with more positive evaluations than red colors.

There was a significant effect of color on logo liking, but no significant effect of symmetry nor a significant interaction (color: $F(1,82) = 4.781$, $p=.032$, partial $\eta_p^2=.055$; adjusted $R^2=.072$) (see Figure 9). Blue logo variants were preferred over red logo variants. There were no significant effects of symmetry nor color on the company's perceived competence, the logo's suitability, nor the logo's distinctiveness.

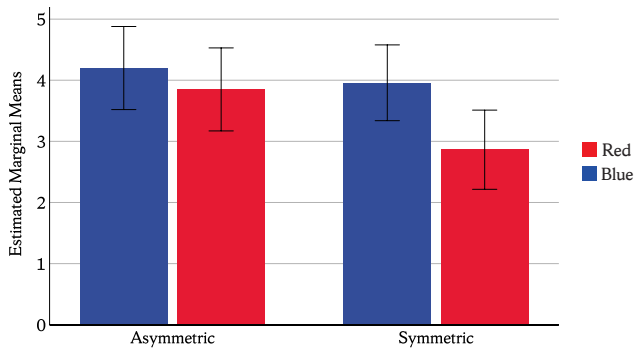
While in study 1, there was no significant difference in perceived excitement between the symmetric and asymmetric variations of shape D, excitement was still measured in this study. There was a significant effect of color on excitement, but no significant effect of symmetry nor a significant interaction (color: $F(1,82) = 4.931$, $p=.029$, partial $\eta_p^2=.057$) (see Figure 10). The blue variants were rated as more exciting overall. This is the opposite of what was expected, since red is a more exciting color.

Figure 8
2 (symmetry) × 2 (color) ANOVA (shape D) on General Feeling



Error bar: 95% CI

Figure 9
2 (symmetry) × 2 (color) ANOVA (shape D) on Logo Liking

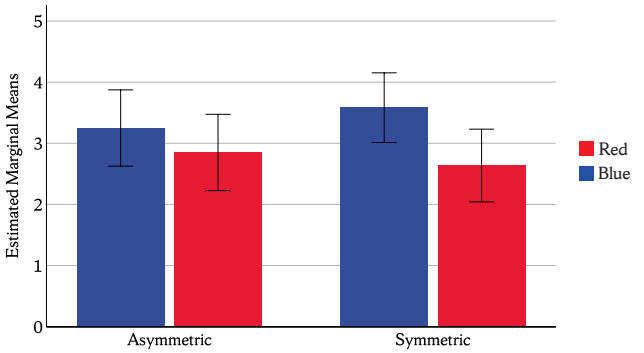


Error bar: 95% CI

Color and/or the company profile are the two factors could have been responsible for this outcome.

Across all four variations of the logos for both shape C and D, there was no statistically significant difference in respondents' attitudes towards the clarity of the company identity nor the logo suitability. The interest level and relevance of the company's services to the respondent — factors which were expected to influence general feeling towards the company — were also generally even.

Figure 10
2 (symmetry) × 2 (color) ANOVA (shape D) on Excitement



Error bar: 95% CI

Conclusion

Symmetry and color are both able to influence general attitudes towards a company. In both shapes, the asymmetric variants show pronounced differences in general feeling across red and blue, with blue leading to more positive evaluations. In the symmetric variants, there is less of a difference in general feeling across red and blue.

While for shape C, the incongruent logos have higher general feeling scores, for shape D, both congruent and incongruent logos have higher scores. Logos with congruent elements, alone, do not appear to influence liking of the logo, the company, or strengthen perceived brand traits. Attitude towards the company and liking for the logo appear to be unrelated.

Color affects liking in shape C and excitement in shape D, while symmetry affects competence in shape C. The reason for why these effects only occurs in certain shapes is not apparent in the data.

Table 9 summarizes the hypotheses tested in study 2 and the outcome for each.

Table 9
Tested hypotheses & results (study 2)

Number	Description	Result
H5	A company with a congruent (incongruent) logo will be more (less) likely to be perceived as having strong traits as signaled by those individual congruent elements.	Not supported
H5a	A company with a blue (red) and symmetric (asymmetric) logo will be perceived as being more (less) competent.	Not supported
H5b	A company with a red (blue) and asymmetric (symmetric) logo will be perceived as being more (less) exciting.	Not supported
H5c	A company with a normal (incomplete) typeface wordmark with (without) a frame will be perceived as being more (less) trustworthy.	Not tested
H5d	A company with an incomplete (normal) typeface wordmark without (with) a frame will be perceived as being more (less) innovative.	Not tested
H6	A company with a congruent (incongruent) logo will be more (less) likely to be perceived as having a clear identity when paired with a congruent company persona.	Not supported
H7	A company with a congruent (incongruent) logo will be perceived as having a more (less) suitable logo when paired with a congruent company persona.	Not supported
H8	A company with a congruent (incongruent) logo will be perceived as more (less) likable.	Not supported

V. General Discussion

Main findings

Symmetry and color, elements which have a conceptual overlap in their associated traits, have the power to influence general feeling towards a company. With asymmetric logos, blue leads to more positive general feelings towards the company than red. In symmetric logos, color plays a less important role on general feeling, with no significant difference in mean scores between red and blue.

The reason behind why a pronounced difference in blue and red asymmetric logos exists is not apparent in the data. Asymmetric red variants may have had less positive general feeling because they were perceived as too arousing or exciting, but this is not reflected in the excitement scores. It is also possible that the asymmetric red variants were somehow harder to process, decreasing processing fluency, but the identity clarity scores are not significantly lower for these variants. The asymmetric red variants had the highest identity clarity scores, though not at a statistically significant level. More research is required to understand why asymmetry has an impact on general feeling depending on logo color.

It is unclear why there are differences in the way symmetry and color affect perception in the two shapes; logo liking, excitement and competence are shown to be affected by symmetry and color, but not consistently across both shapes.

There was no support for the hypothesis that congruent logo elements are associated with an increased liking of a company, a stronger perception of the brand traits being signaled by congruent elements, nor for an increased liking of a company logo. Congruent logos were expected to lead to greater processing fluency, and in turn, a clearer company identity.

Theoretical implications

The outcome of this research has implications for the study of logo design as well as congruence. The research shows that symmetry and color can have an interactive relationship. The research also highlights the limits an individual logo element can have on consumer perception. Individual logo elements' meanings are nuanced and context-dependent. While elements like symmetry or color can be interpreted as exciting or competent in an abstract setting, interpretations can change when combined.

Logo element traits

The findings of the research add to the existing understanding of logo element traits by challenging some earlier findings. Individually, symmetric logos are not always necessarily perceived to be more competent. Asymmetric logos are not always necessarily perceived to be more exciting.

Study 1 demonstrates logo elements can be perceived as exciting or competent in isolation. When paired together, perceived trait strength can change in unexpected ways, as seen in study 2. Even when there is no difference between excitement or competence in isolation, when symmetry and color are paired together, there can be significant differences observed. The research establishes that symmetry and color have the ability to affect trait perception, but there is no evidence in the data which explains why symmetry is responsible for affecting competence in one case and why color is responsible for excitement in another. The expectation that congruent shapes would lead to stronger brand traits also was not supported.

Assimilation & Congruence

The effect of assimilation may account for why there was no evidence to support the hypotheses. Logos are just one part of consumers' holistic impression of a company. According to Van Riel & Van den Ban (2001), individuals interpret logo meaning through the lens of their experiences, interactions and other information they have about the company being represented. This can also work in reverse: the logo can affect the way individuals interpret their experiences, interactions and information. The company profile may have affected interpretation how brand traits were interpreted.

The positive feelings resulting from higher processing fluency only occur when all aspects about the company are congruent. In study 2, participants may have relied more on the information found in the company description than the logo to make judgements about the corporate identity or the strength of the brand traits. This was the case in the experiment Jiang et al. (2015) performed on logo shapes. Participants tended to focus on the text and other information positioning the advertised product, ignoring any positioning or information from the logo shape. Research by Luffarelli et al. (2019) shows similar effects: participants only viewed a company more positively when an asymmetric shape was paired with an exciting company profile.

While the logo elements were empirically demonstrated to be congruent on a micro-level (within the logo), on a macro-level (between the logo and the company profile), the stimuli may have been still been perceived as incongruent. It is conceivable the company name, description and logo when viewed as a whole were a poor match. The process by which stimuli for study 2 were created — crafting a company description and name from the industry deemed most appropriate for each shape — may have resulted in a corporate profile that did not meet expectations. Respondents from study 1 had attitudes about which shapes were suitable for a given industry. Once that shape was put in the context of a specific company within that industry in study 2, respondents may no longer have found the logo to be a good fit. In the case of shape C, this seems plausible: the mean suitability ranged from 2.32 to 2.96, which would indicate the logo had poor suitability. In the case of shape D, the mean suitability ranged from 3.26 to 4.30, indicating moderate suitability.

The company profile in study 2 was written in a neutral tone, stating the services each company offers. No direct references were made to excitement or competence. The ambiguous tone of the profile may have caused participants to view companies with incongruent logo variants more positively, since these logos convey ambiguous traits, though this was not always the case.

In study 1, logos were designed to be abstract so it would be difficult to trigger any mental associations with specific objects. This also afforded flexibility in creating a company profile. However, participants may have been expecting more concrete imagery in survey 2. For instance, the company profile for shape C was written to be a travel planning service, but this logo may have been expected to look like something tangibly travel-related, rather than the abstract shape that was presented.

Congruence between logo shapes was expected to lead to stronger brand traits, and in turn, be perceived as having a clearer company identity and more likable. Instead, the strength of brand traits does not appear to explain the difference in liking for the logo variants. Stronger brand traits did not lead to more positive evaluations.

Practical implications

More research is needed before making a practical recommendation. The mechanism behind the divergence in general feeling seen in the blue and red asymmetric logos needs to be better understood before making a recommendation on the ideal combination of shape and color to evoke a desired reaction. The divergence seen in asymmetric logos could only occur in a specific type of industry or set of circumstances and not be a generalizable phenomenon.

The logo, alone, appears to have some influence over the general feeling towards a company. The results underscore the importance of ensuring customers' experiences and interactions match the intended traits of the company. These factors have an effect on how the logo is interpreted.

Limitations

Ensuring high validity and reliability was considered throughout the research process. However, there were several limitations to the methods employed. A factor which may have affected the internal and external reliability was the color-calibration of monitors. For convenience and mass distribution, participants used their own devices to take the surveys. Not all devices reproduce color with the same degree of accuracy. While using color-calibrated monitors would have made recruiting participants more difficult, it would have eliminated most of the reliability concerns associated with color.

Another factor which may affect internal and external validity is the number of questions used to measure each concept. To keep the survey brief, thereby encouraging the number of responses, some concepts were only measured using one or two questions or traits (for example, general feeling was measured as just one question in survey 2, trustworthiness was measured with just two adjectives as an index in survey 1). Adding more questions could lengthen the time required to take the survey but increase certainty that the concepts are measured appropriately.

Sample selection may have affected external validity. As noted earlier, the sample for both surveys was heavily dominated by participants who reside in a Western culture. Color associations and meanings differ based on one's culture and upbringing (Aslam, 2006). There was no evidence in the results to suggest color traits were interpreted differently. Aslam (2006) also notes differences within Western cultures in color perception, noting differences among Anglo-Saxon, Nordic and Germanic populations. For the survey results to be more generalizable, a more culturally diverse respondent pool would be beneficial.

It is also possible the effect of a logo on consumer perception may be overexaggerated, as in other instances when logos are studied absent the context of a real company. Without experiences and a full impression of a company, the limited information presented to participants plays a bigger role in judgements. In reality, logos do not exist in isolation. However, studying specific logo elements requires eliminating the influence of these external factors. When a company is unfamiliar to consumers, the influence of the logo on perception can be stronger.

Further research

The present research begins to examine how congruent elements in a logo operate. The findings raise new questions about how symmetry and color combine to affect perception. Further research could be done to explore whether this effect can be replicated in other circumstances and what causes the divergence in general feeling across red and blue variants in asymmetric shapes.

There is still a lack of understanding about how elements individually affect consumer perception. Before attempting to experiment with congruent elements, individual elements' meanings need to be established. Some of the conclusions from previous research were unable to be replicated in the present study. Particularly for future research focusing on shapes, it seems especially important to control for differences in shape features by keeping the shape controlled in every element except for the one being manipulated. Had this been done, it may have yielded different results, changing the prevailing ideas about shape meaning.

The influence of color can also be explored further. While Bottomley & Doyle (2006) provide a general framework for singular colors, real world logos often incorporate multiple colors. Warm colors, cool colors or color gradients could be researched. No specific traits or associations have been derived from these elements.

While the present research examined shape symmetry, colors, logo frames and incomplete typefaces, because of their potential to have shared or opposing trait associations, a range of other possible combinations can be considered. To further understand the role of congruence, logo shape symmetry could be paired with typeface characteristics, or typeface characteristics may be paired color.

Pinpointing the influential factors affecting logo perception could also be investigated in the future. Quantifying the effect of assimilation in an experimental setting could be accomplished by including an intermediary study in between the initial one-element logo trait verification phase and the presentation of a two-element logo with company profile. The intermediate study could test solely the two-element logo without the company profile. This could eliminate any potential influence of the company profile on perception.

Incorporating the logo into a physical product or product advertisement is an alternative to using a company profile. Rather than explicitly stating what the company offers, using a more implicit method could affect the way consumers perceive the logo and brand traits. However, other design features of the advertisement or product could influence reactions.

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Appendix

Table 10
Results (study 2), by symmetry

	Shape C		*Shape D*	
				
Variant:	Symmetric	Asymmetric	Symmetric	Asymmetric
n	47	48	46	40
General feeling				
Mean(μ)	4.72	4.35	4.85	4.32
SD	.77	1.76	1.01	1.23
Interest level				
Mean(μ)	4.87	5.08	4.09	3.73
SD	1.23	1.29	1.52	1.52
Relevance				
Mean(μ)	4.45	4.71	4.74	4.82
SD	1.41	1.60	1.65	1.24
Identity clarity				
Mean(μ)	4.45	4.71	4.74	4.82
SD	1.41	1.60	1.65	1.24
Exciting				
Mean(μ)	4.45	4.96	3.13	3.05
SD	1.49	1.52	1.56	1.28
Competent				
Mean(μ)	4.19	4.77	5.20	5.13
SD	1.24	1.37	1.34	1.02
Logo liking				
Mean(μ)	2.68	3.17	3.43	4.02
SD	1.35	1.60	1.53	1.61
Logo suitability				
Mean(μ)	2.51	2.90	3.46	3.87
SD	1.18	1.48	1.67	1.59
Logo distinctiveness				
Mean(μ)	3.02	3.58	3.59	3.98
SD	1.48	1.74	1.69	1.58

Table 11
Results (study 2), by color

	Shape C		*Shape D*	
Variant:	Blue	Red	Blue	Red
n	46	49	44	42
General feeling				
Mean(μ)	5.02	4.08	5.02	4.17
SD	1.20	1.37	1.02	1.10
Interest level				
Mean(μ)	4.89	5.06	3.98	3.86
SD	1.14	1.36	1.70	1.32
Relevance				
Mean(μ)	4.48	4.63	3.61	3.48
SD	1.39	1.44	1.73	1.71
Identity clarity				
Mean(μ)	4.63	4.53	4.82	4.74
SD	1.37	1.63	1.40	1.55
Exciting				
Mean(μ)	4.67	4.73	3.43	2.74
SD	1.46	1.58	1.59	1.15
Competent				
Mean(μ)	4.41	4.55	5.30	5.02
SD	1.20	1.46	1.17	1.22
Logo liking				
Mean(μ)	2.74	3.10	4.07	3.33
SD	1.37	1.60	1.52	1.59
Logo suitability				
Mean(μ)	2.54	2.86	3.95	3.33
SD	1.26	1.41	1.57	1.66
Logo distinctiveness				
Mean(μ)	2.98	3.61	3.82	3.71
SD	1.60	1.62	1.74	1.55

Table 12
Results (study 2), by trait signaling

Shape C				*Shape D*		
Variant:	 Blue, Symmetric	 Blue, Asymmetric & Red, Symmetric	 Red, Asymmetric	 Red, Asymmetric	 Blue, Asymmetric & Red, Symmetric	 Blue, Symmetric
Trait	Low Excitement	Mixed Excitement	High Excitement	Low Competence	Mixed Competence	High Competence
n	25	43	27	20	42	24
General feeling						
Mean(μ)	4.60	5.19	3.44	3.70	4.76	5.08
SD	.82	1.14	1.45	1.13	.96	1.06
Interest level						
Mean(μ)	4.76	5.02	5.11	3.55	4.02	4.04
SD	1.20	1.16	1.45	1.28	1.52	1.71
Relevance						
Mean(μ)	4.32	4.63	4.67	3.00	3.90	3.38
SD	1.46	1.29	1.57	1.62	1.74	1.66
Identity clarity						
Mean(μ)	4.60	4.47	4.74	5.00	4.57	4.96
SD	1.22	1.58	1.65	1.21	1.55	1.52
Exciting						
Mean(μ)	4.36	4.79	4.89	2.85	2.93	3.58
SD	1.47	1.47	1.63	1.23	1.24	1.79
Competent						
Mean(μ)	4.28	4.33	4.93	5.10	5.05	5.42
SD	1.06	1.41	1.38	1.17	1.10	1.38
Logo liking						
Mean(μ)	2.56	2.88	3.33	3.85	3.50	3.96
SD	1.29	1.43	1.71	1.60	1.67	1.43
Logo suitability						
Mean(μ)	2.32	2.77	2.96	3.45	3.74	3.67
SD	1.25	1.15	1.65	1.54	1.75	1.55
Logo distinctiveness						
Mean(μ)	2.68	3.37	3.78	3.95	3.74	3.67
SD	1.44	1.59	1.74	1.50	1.64	1.81

Introduction section

You are being invited to participate in a research study about individuals' responses to company logos. Through a survey, we will present you with several different logos to get your feedback. This study is being done by Harmen Rockler, a master's candidate from the Faculty of Behavioural, Management and Social Sciences at the University of Twente.

The purpose of this research study is to gather your impressions about logos, and will take you approximately 15 minutes to complete. The data collected will be used for master's research regarding logo design. The data will be published online as part of this research. Your participation in this study is entirely voluntary and you can withdraw at any time.

We believe there are no known risks associated with this research study; however, as with any online related activity the risk of a data breach is always possible. To the best of our ability your individual answers in this study will remain confidential. The data collected in the survey is not personally identifiable. We will minimize any risks by storing data in encrypted, password protected files. This data will not be used or shared for any purposes beyond this master's research project.

Study contact details for further information: Harmen Rockler (h.o.rockler@student.utwente.nl)

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Secretary of the Ethics Committee of the Faculty of Behavioural, Management and Social Sciences at the University of Twente by ethicscommittee-bms@utwente.nl

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I consent voluntarily to be a participant in this study and understand that I can withdraw from the study at any time, without having to give a reason.

→ Yes / No

I understand that information I provide will be used for a research project and that my answers will be reported as part of a larger, overall group of survey participants.

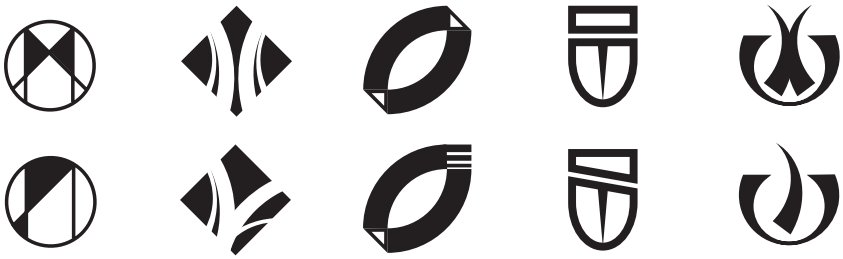
→ Yes / No

Note: *The below block of questions was presented 5 times, each time with a randomly assigned symmetric or asymmetric shape from one of the 5 groups. Shapes were shown in random order. Shapes were shown at a minimum height/width of 200 pixels.*

Shape section

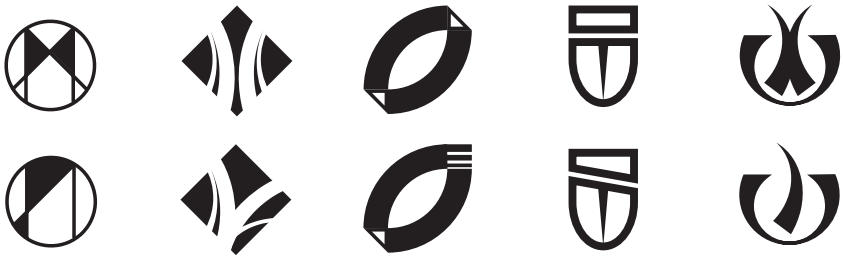
In this section, you will be presented with several logos and will be asked to give your responses about the brand, based on the logo alone.

Respond to the logo presented below, assuming that the logo represents a real brand.



Based on the logo alone, how well would you expect each of the following characteristics to describe the brand?

	1 - Not at all applicable	2	3	4	5	6	7 - Highly Applicable
Exciting	○	○	○	○	○	○	○
Competent	○	○	○	○	○	○	○
Active	○	○	○	○	○	○	○
Stable	○	○	○	○	○	○	○
Traditional	○	○	○	○	○	○	○
Familiar	○	○	○	○	○	○	○



How well would you expect the logo to suit a company within the categories, below?

	1 - Not at all suitable	2	3	4	5	6	7 - Highly suitable
Education	○	○	○	○	○	○	○
Insurance	○	○	○	○	○	○	○
Manufacturing	○	○	○	○	○	○	○
Restaurant	○	○	○	○	○	○	○
Transportation	○	○	○	○	○	○	○

Note: *The below block of questions was presented 6 times, each time with a randomly assigned color. Two of four possible red colors were shown, two of four possible blue colors were shown. Two extra (non-red or blue) colors were shown. Colors were shown in random order. Color swatches were shown at a height & width of 300 pixels.*

Color section

In the next section, you will be asked to look at several colors and give your responses to them.

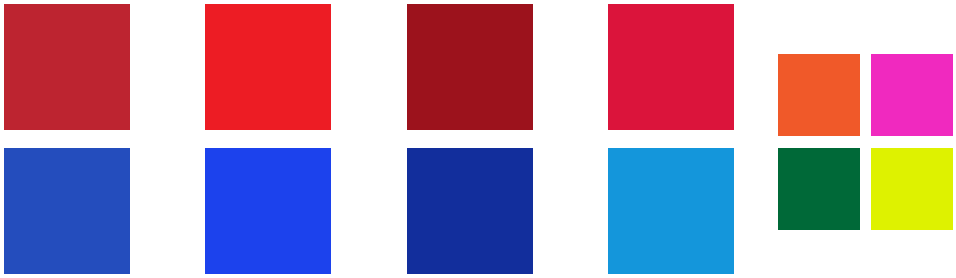
If you are using "night mode" (or another blue light filter) on your device, please disable it for this section of the survey.

Have you been diagnosed with color blindness?

→ No / Yes

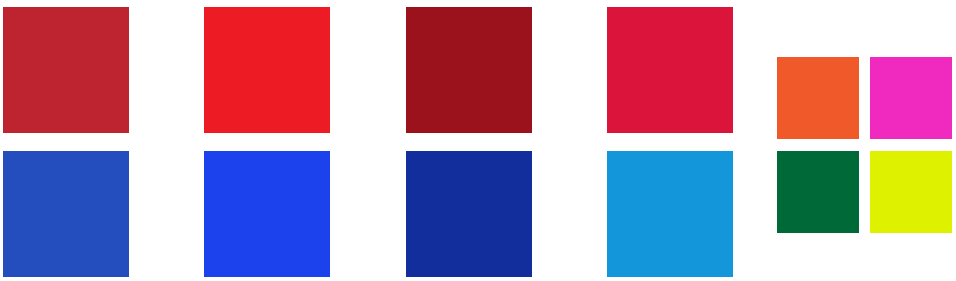
Note: *If participants chose yes, the remaining questions in the section were not presented.*

Respond to the color presented below.



How well do each of the following characteristics describe this color?

	1 - Not at all applicable	2	3	4	5	6	7 - Highly Applicable
Exciting	○	○	○	○	○	○	○
Competent	○	○	○	○	○	○	○
Active	○	○	○	○	○	○	○
Stable	○	○	○	○	○	○	○
Traditional	○	○	○	○	○	○	○
Familiar	○	○	○	○	○	○	○



How well would you expect the color to suit a company within the categories, below?

	1 - Not at all suitable	2	3	4	5	6	7 - Highly suitable
Education	○	○	○	○	○	○	○
Insurance	○	○	○	○	○	○	○
Manufacturing	○	○	○	○	○	○	○
Restaurant	○	○	○	○	○	○	○
Transportation	○	○	○	○	○	○	○

Note: *The below block of questions was presented 3 times, each time with a randomly assigned company name.*

Company name section

In the next section, you will be presented with a variety of company names and will be asked to give your responses to them.

Respond to the company name presented below, assuming that the company name represents a real brand:

Engan / Balfors / Corran

Based on the name alone, how well would you expect each of the following characteristics to describe the brand?

	1 - Not at all applicable	2	3	4	5	6	7 - Highly Applicable
Trustworthy	○	○	○	○	○	○	○
Innovative	○	○	○	○	○	○	○
Reliable	○	○	○	○	○	○	○
Creative	○	○	○	○	○	○	○
Traditional	○	○	○	○	○	○	○
Familiar	○	○	○	○	○	○	○

How well would you expect the name **Engan / Balfors / Corran** to suit a company within the categories, below?

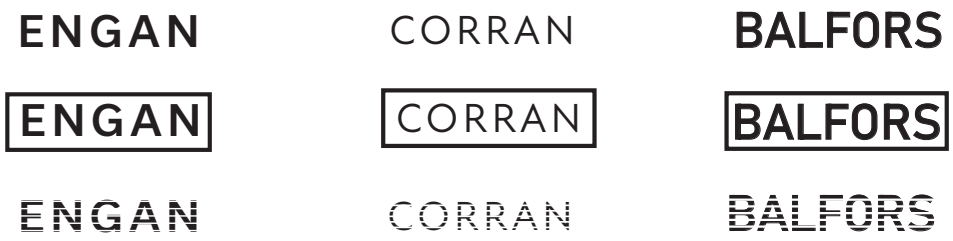
	1 - Not at all suitable	2	3	4	5	6	7 - Highly suitable
Education	○	○	○	○	○	○	○
Insurance	○	○	○	○	○	○	○
Manufacturing	○	○	○	○	○	○	○
Restaurant	○	○	○	○	○	○	○
Transportation	○	○	○	○	○	○	○

Note: *The below block of questions was presented 3 times, each time with a randomly assigned wordmark from one of the 3 groups. Wordmarks were shown in random order. Wordmarks were shown at a width of 300 pixels.*

Wordmark section

In the next section, you will be presented with a variety of logos comprised of names and will be asked to give your response to them.

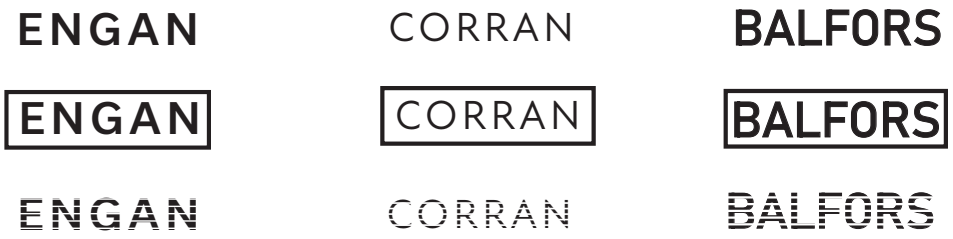
Respond to the logo presented below, assuming that the logo represents a real brand.



Based on the logo alone, how well would you expect each of the following characteristics to describe the brand?

	1 - Not at all applicable	2	3	4	5	6	7 - Highly Applicable
Trustworthy	○	○	○	○	○	○	○
Innovative	○	○	○	○	○	○	○
Reliable	○	○	○	○	○	○	○
Creative	○	○	○	○	○	○	○
Traditional	○	○	○	○	○	○	○
Familiar	○	○	○	○	○	○	○

How well would you expect the logo to suit a company within the categories, below?



	1 - Not at all suitable	2	3	4	5	6	7 - Highly suitable
Education	○	○	○	○	○	○	○
Insurance	○	○	○	○	○	○	○
Manufacturing	○	○	○	○	○	○	○
Restaurant	○	○	○	○	○	○	○
Transportation	○	○	○	○	○	○	○

Demographic section
The following questions are used for demographic purposes.

Which country do you live in?

[List of countries presented as dropdown]

What is your age?

[Presented as dropdown ranging from 18 to 105+]

What is your gender?

Female
Male
Gender non-conforming
Prefer not to answer

What is your educational level? Select the highest level you have achieved.

Some secondary school education
Secondary school graduate
Trade/technical/vocational training
Some bachelor's degree-level education
Bachelor's degree
Some master's degree-level education
Master's degree
Some Doctorate-level education
Doctorate degree

If you would like receive a copy of the results of the research when it is made public, you may enter your email address, below. Otherwise, you may leave the box blank and continue.

[Blank box presented for email address]

Introduction section

You are being invited to participate in a research study about individuals' responses to company profiles. Through a survey, we will present you a company profile to get your feedback. This study is being done by Harmen Rockler, a master's candidate in communication science at the University of Twente.

This survey will take you approximately 4 - 7 minutes to complete. Your participation in this study is entirely voluntary and you can withdraw at any time.

We believe there are no known risks associated with this research study; however, as with any online related activity the risk of a data breach is always possible. To the best of our ability your individual answers in this study will remain confidential. The data collected in the survey is not personally identifiable. We will minimize any risks by storing data in encrypted, password protected files. This data will not be used or shared for any purposes beyond this master's research project.

Study contact details for further information: Harmen Rockler (h.o.rockler@student.utwente.nl)

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Secretary of the Ethics Committee of the Faculty of Behavioural, Management and Social Sciences at the University of Twente by ethicscommittee-bms@utwente.nl

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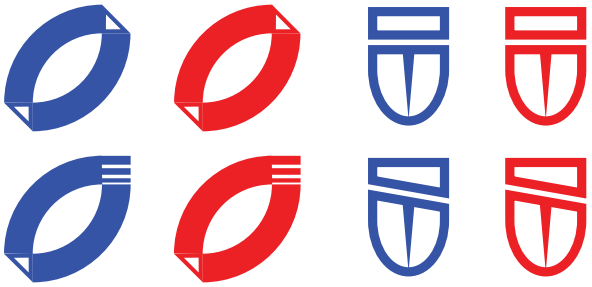
I consent voluntarily to be a participant in this study and understand that I can withdraw from the study at any time, without having to give a reason. I understand that information I provide will be used for a research project and that my answers will be reported as part of a larger, overall group of survey participants.

→ Yes / No

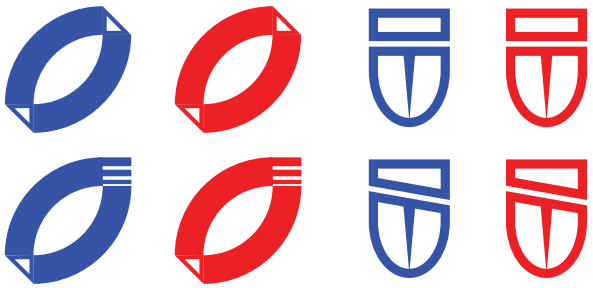
Note: *Participants were randomly assigned to view one of the 8 logos below, paired with the appropriate company profile. See Figure 5 for the written profile text. Logos were shown at height of 200 pixels.*

Main section

Please read the company profile provided below, then click the button below to proceed to the questions. For your convenience & reference, the description & logo will be shown above each question.



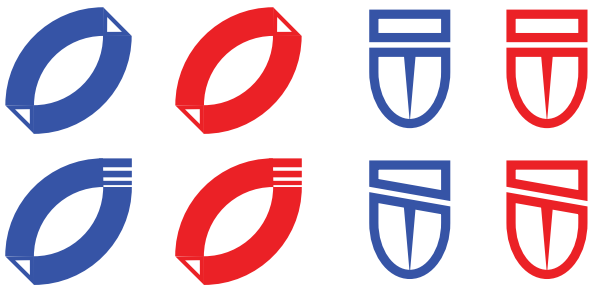
[Written profile presented here]



[Written profile presented here]

Overall, what is your general feeling towards [Balfors/Balfors Insurance]?

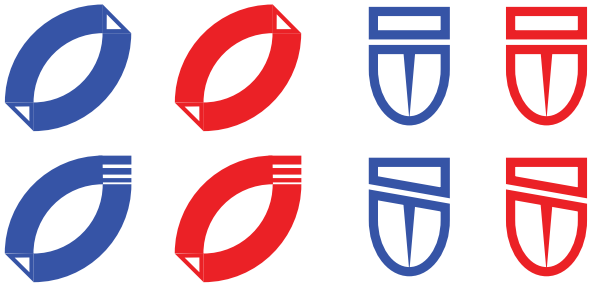
1 - Highly negative	2	3	4 - Neutral	5	6	7 - Highly positive
○	○	○	○	○	○	○



[Written profile presented here]

Rate how interested you would be in the services [Balfors/Balfors Insurance] offers.

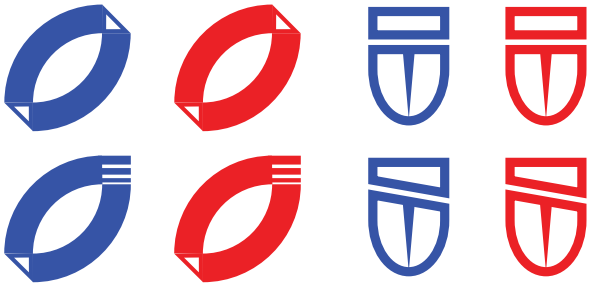
1 - Not at all interested	2	3	4	5	6	7 - Highly interested
○	○	○	○	○	○	○



[Written profile presented here]

Rate how relevant [Balfors'/Balfors Insurance's] services would be to you.

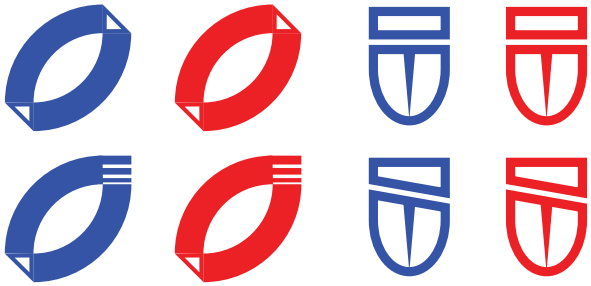
1 - Not at all relevant	2	3	4	5	6	7 - Highly relevant
○	○	○	○	○	○	○



[Written profile presented here]

Rate how clear the identity of [Balfors/Balfors Insurance] seems to you.

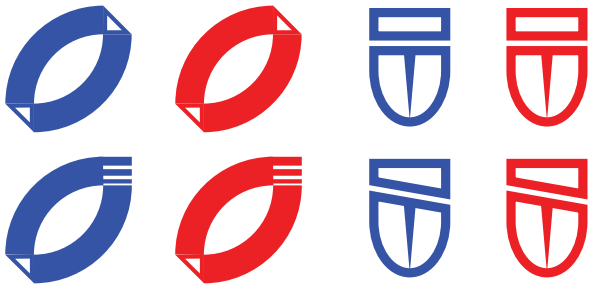
1 - Not at all clear	2	3	4	5	6	7 - Highly clear
○	○	○	○	○	○	○



[Written profile presented here]

Using the adjectives below, how would you describe [Balfors/Balfors Insurance]?

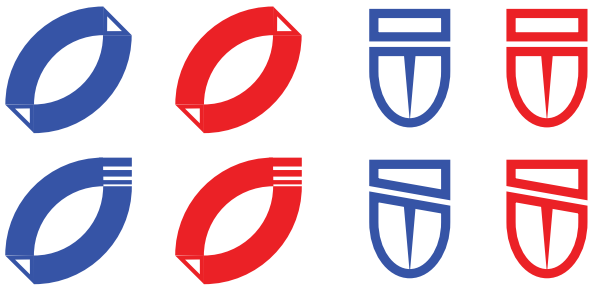
	1 - Not at all applicable	2	3	4	5	6	7 - Highly Applicable
Competent	○	○	○	○	○	○	○
Active	○	○	○	○	○	○	○
Familiar	○	○	○	○	○	○	○
Skilled	○	○	○	○	○	○	○
Exciting	○	○	○	○	○	○	○



[Written profile presented here]

Rate how much you like the logo for [Balfors/Balfors Insurance].

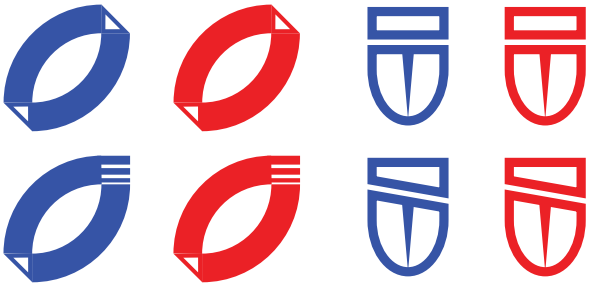
1 - Not at all clear	2	3	4	5	6	7 - Highly clear
○	○	○	○	○	○	○



[Written profile presented here]

Rate how suitable you think the logo for [Balfors/Balfors Insurance] is.

1 - Not at all clear	2	3	4	5	6	7 - Highly clear
○	○	○	○	○	○	○



[Written profile presented here]

Rate how distinctive you think the logo for [Balfors/Balfors Insurance] is.

1 - Not at all clear	2	3	4	5	6	7 - Highly clear
○	○	○	○	○	○	○

Demographic section
The following questions are used for demographic purposes.

Which country do you live in?

[List of countries presented as dropdown]

What is your nationality?

Dual nationality? Select "Dual Nationality" from the bottom of the dropdown list - this will enable you to select two countries.

[List of countries presented as dropdown]

What is your age?

[Presented as dropdown ranging from 18 to 105+]

What is your gender?

Female
Male
Gender non-conforming
Prefer not to answer

What is your educational level? Select the highest level you have achieved.

Some secondary school education
Secondary school graduate
Trade/technical/vocational training
Some bachelor's degree-level education
Bachelor's degree
Some master's degree-level education
Master's degree
Some Doctorate-level education
Doctorate degree

Have you been diagnosed with color blindness? **OR** Do you believe you have color blindness?

No / Yes

Do you have a blue light filter (commonly known as night mode) turned on?

Not sure or don't know what a blue light filter/night mode is? Select "no."

No / Yes

If you would like receive a copy of the results of the research when it is made public, you may enter your email address, below. Otherwise, you may leave the box blank and continue.

[Blank box presented for email address]

In this section, the demographic distribution of participants is shown across conditions in study 1. Each participant was assigned to multiple different shape, color and wordmark conditions.

For the purposes of simplifying the education level of participants, the variable was re-coded as either medium/low education and high education. The medium/low consists of: some secondary school education, secondary school graduate, trade/technical/vocational training, some Bachelor's-level education, and Bachelor's degree. The high consists of: some Master's degree-level education, Master's degree, some Doctorate-level education, and Doctorate degree.

Blue color shades

Distribution across the four shades of blue are detailed in this section.

Age

Shade groups did not have an effect on age, demonstrating a proportional distribution.
(One way ANOVA, $F(3,144)= .395$, $p=.757$).

		Value Label	N
Blue color shade	1	Shade 1	40
	2	Shade 2	32
	3	Shade 3	40
	4	Shade 4	32

Tests of Between-Subjects Effects

Dependent Variable: What is your age?					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	88.701[a]	3	29.567	.395	.757
Intercept	723662646.2	1	723662646.2	9667076.134	.000
ColorNumber	88.701	3	29.567	.395	.757
Error	10480.187	140	74.858		
Total	732723284.0	144			
Corrected Total	10568.889	143			

a. R Squared = .008 (Adjusted R Squared = -.013)

Gender

The distribution of gender identity across shades of blue is shown to be proportional.
(Chi square (homogeneity) = 4.807, df = 9, n=144, p=.906).

Crosstab

			Blue color shade				
			Shade 1	Shade 2	Shade 3	Shade 4	Total
What is your gender?	Female	Count	23a	21a	24a	20a	88
		Expected Count	24.4	19.6	24.4	19.6	88.0
		% within What is your gender?	26.1%	23.9%	27.3%	22.7%	100.0%
	Male	Count	15a	10a	14a	11a	50
		Expected Count	13.9	11.1	13.9	11.1	50.0
		% within What is your gender?	30.0%	20.0%	28.0%	22.0%	100.0%
	Gender non-conforming	Count	1a	0a	0a	1a	2
		Expected Count	.6	.4	.6	.4	2.0
		% within What is your gender?	50.0%	0.0%	0.0%	50.0%	100.0%
	Prefer not to answer	Count	1a	1a	2a	0a	4
		Expected Count	1.1	.9	1.1	.9	4.0
		% within What is your gender?	25.0%	25.0%	50.0%	0.0%	100.0%
Total		Count	40	32	40	32	144
		Expected Count	40.0	32.0	40.0	32.0	144.0
		% within What is your gender?	27.8%	22.2%	27.8%	22.2%	100.0%

Each subscript letter denotes a subset of Color group number categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.087[a]	9	.906
Likelihood Ratio	5.586	9	.780
Linear-by-Linear Association	.139	1	.709
N of Valid Cases	144		

a. 8 cells (50.0%) have expected count less than 5. The minimum expected count is .44.

Country of residence

The distribution of country of residence across shades of blue is shown to be proportional.
(Chi square (homogeneity) = 29.482, df =30, n=144, p=.492).

			Blue color shade				
			Shade 1	Shade 2	Shade 3	Shade 4	Total
Which country do you live in?	Canada	Count	1a	0a	1a	0a	2
		Expected Count	.6	.4	.6	.4	2.0
		% within Which country do you live in?	50.0%	0.0%	50.0%	0.0%	100.0%
	Finland	Count	1a	0a	0a	1a	2
		Expected Count	.6	.4	.6	.4	2.0
		% within Which country do you live in?	50.0%	0.0%	0.0%	50.0%	100.0%
	Germany	Count	5a	0b	0b	5a	10
		Expected Count	2.8	2.2	2.8	2.2	10.0
		% within Which country do you live in?	50.0%	0.0%	0.0%	50.0%	100.0%
	Ireland	Count	0a	1a	1a	0a	2
		Expected Count	.6	.4	.6	.4	2.0
		% within Which country do you live in?	0.0%	50.0%	50.0%	0.0%	100.0%
	Malaysia	Count	0a	1a	1a	0a	2
		Expected Count	.6	.4	.6	.4	2.0
		% within Which country do you live in?	0.0%	50.0%	50.0%	0.0%	100.0%
	Netherlands	Count	25a	21a	25a	21a	92
		Expected Count	25.6	20.4	25.6	20.4	92.0
		% within Which country do you live in?	27.2%	22.8%	27.2%	22.8%	100.0%
	Pakistan	Count	1a	0a	0a	1a	2
		Expected Count	.6	.4	.6	.4	2.0
		% within Which country do you live in?	50.0%	0.0%	0.0%	50.0%	100.0%
	Russia	Count	1a	0a	1a	0a	2
		Expected Count	.6	.4	.6	.4	2.0
		% within Which country do you live in?	50.0%	0.0%	50.0%	0.0%	100.0%
	Spain	Count	0a	1a	1a	0a	2
		Expected Count	.6	.4	.6	.4	2.0
		% within Which country do you live in?	0.0%	50.0%	50.0%	0.0%	100.0%
	United Kingdom	Count	3a	1a	2a	2a	8
		Expected Count	2.2	1.8	2.2	1.8	8.0
		% within Which country do you live in?	37.5%	12.5%	25.0%	25.0%	100.0%
	United States	Count	3a	7a	8a	2a	20
		Expected Count	5.6	4.4	5.6	4.4	20.0
		% within Which country do you live in?	15.0%	35.0%	40.0%	10.0%	100.0%
Total		Count	40	32	40	32	144
		Expected Count	40.0	32.0	40.0	32.0	144.0
		% within Which country do you live in?	27.8%	22.2%	27.8%	22.2%	100.0%

Each subscript letter denotes a subset of Color group number categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	29.482[a]	30	.492
Likelihood Ratio	38.733	30	.132
Linear-by-Linear Association	.020	1	.889
N of Valid Cases	144		

a. 38 cells (86.4%) have expected count less than 5. The minimum expected count is .44.

Education

The distribution of education level across shades of blue is shown to be proportional.
(Chi square (homogeneity) = .188, df=3, n=144, p=.980).

Crosstab

			Blue color shade				
			Shade 1	Shade 2	Shade 3	Shade 4	Total
Simplified education level	Medium/Low	Count	24a	19a	23a	20a	86
		Expected Count	23.9	19.1	23.9	19.1	86.0
		% within Simplified education level	27.9%	22.1%	26.7%	23.3%	100.0%
	High	Count	16a	13a	17a	12a	58
		Expected Count	16.1	12.9	16.1	12.9	58.0
		% within Simplified education level	27.6%	22.4%	29.3%	20.7%	100.0%
Total		Count	40	32	40	32	144
		Expected Count	40.0	32.0	40.0	32.0	144.0
		% within Simplified education level	27.8%	22.2%	27.8%	22.2%	100.0%

Each subscript letter denotes a subset of Color group number categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.188[a]	3	.980
Likelihood Ratio	.188	3	.979
Linear-by-Linear Association	.014	1	.906
N of Valid Cases	144		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 12.89.

Red color shades

Distribution across the four shades of red are detailed in this section.

Age

Shade groups did not have an effect on age, demonstrating a proportional distribution. (One way ANOVA, F(3,144)=.376, p=.771).

Between-Subjects Factors

		Value Label	N
Red color shade	1	Shade 1	38
	2	Shade 2	34
	3	Shade 3	43
	4	Shade 4	29

Tests of Between-Subjects Effects

Dependent Variable: What is your age?

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	84.392[a]	3	28.131	.376	.771
Intercept	717451667.4	1	717451667.4	9580167.044	.000
ColorShade	84.392	3	28.131	.376	.771
Error	10484.497	140	74.889		
Total	732723284.0	144			
Corrected Total	10568.889	143			

a. R Squared = .008 (Adjusted R Squared = -.013)

Gender

The distribution of gender identity across shades of red is shown to be proportional.
(Chi square (homogeneity) = 4.490, df = 9, n=144, p=.876).

Crosstab

			Red color shade				
			Shade 1	Shade 2	Shade 3	Shade 4	Total
What is your gender?	Female	Count	21a	23a	28a	16a	88
		Expected Count	23.2	20.8	26.3	17.7	88.0
		% within What is your gender?	23.9%	26.1%	31.8%	18.2%	100.0%
	Male	Count	16a	9a	13a	12a	50
		Expected Count	13.2	11.8	14.9	10.1	50.0
		% within What is your gender?	32.0%	18.0%	26.0%	24.0%	100.0%
	Gender non-conforming	Count	0a	1a	1a	0a	2
		Expected Count	.5	.5	.6	.4	2.0
		% within What is your gender?	0.0%	50.0%	50.0%	0.0%	100.0%
	Prefer not to answer	Count	1a	1a	1a	1a	4
		Expected Count	1.1	.9	1.2	.8	4.0
		% within What is your gender?	25.0%	25.0%	25.0%	25.0%	100.0%
Total		Count	38	34	43	29	144
		Expected Count	38.0	34.0	43.0	29.0	144.0
		% within What is your gender?	26.4%	23.6%	29.9%	20.1%	100.0%

Each subscript letter denotes a subset of Color group number categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.490[a]	9	.876
Likelihood Ratio	5.243	9	.813
Linear-by-Linear Association	.000	1	.989
N of Valid Cases	144		

a. 8 cells (50.0%) have expected count less than 5. The minimum expected count is .40.

Country of residence

The distribution of country of residence across shades of red is shown to be proportional. (Chi square (homogeneity) = 17.530, df =30, n=144, p=.966).

Crosstab

			Red color shade				
			Shade 1	Shade 2	Shade 3	Shade 4	Total
Which country do you live in?	Canada	Count	0a	1a	1a	0a	2
		Expected Count	.5	.5	.6	.4	2.0
		% within Which country do you live in?	0.0%	50.0%	50.0%	0.0%	100.0%
	Finland	Count	1a	0a	1a	0a	2
		Expected Count	.5	.5	.6	.4	2.0
		% within Which country do you live in?	50.0%	0.0%	50.0%	0.0%	100.0%
	Germany	Count	3a	2a	4a	1a	10
		Expected Count	2.6	2.4	3.0	2.0	10.0
		% within Which country do you live in?	30.0%	20.0%	40.0%	10.0%	100.0%
	Ireland	Count	0a	1a	1a	0a	2
		Expected Count	.5	.5	.6	.4	2.0
		% within Which country do you live in?	0.0%	50.0%	50.0%	0.0%	100.0%
	Malaysia	Count	0a	1a	0a	1a	2
		Expected Count	.5	.5	.6	.4	2.0
		% within Which country do you live in?	0.0%	50.0%	0.0%	50.0%	100.0%
	Netherlands	Count	26a	20a	25a	21a	92
		Expected Count	24.3	21.7	27.5	18.5	92.0
		% within Which country do you live in?	28.3%	21.7%	27.2%	22.8%	100.0%
	Pakistan	Count	1a	0a	0a	1a	2
		Expected Count	.5	.5	.6	.4	2.0
		% within Which country do you live in?	50.0%	0.0%	0.0%	50.0%	100.0%
	Russia	Count	0a	1a	1a	0a	2
		Expected Count	.5	.5	.6	.4	2.0
		% within Which country do you live in?	0.0%	50.0%	50.0%	0.0%	100.0%
	Spain	Count	0a	1a	1a	0a	2
		Expected Count	.5	.5	.6	.4	2.0
		% within Which country do you live in?	0.0%	50.0%	50.0%	0.0%	100.0%
	United Kingdom	Count	1a	3a	2a	2a	8
		Expected Count	2.1	1.9	2.4	1.6	8.0
		% within Which country do you live in?	12.5%	37.5%	25.0%	25.0%	100.0%
	United States	Count	6a	4a	7a	3a	20
		Expected Count	5.3	4.7	6.0	4.0	20.0
		% within Which country do you live in?	30.0%	20.0%	35.0%	15.0%	100.0%
Total		Count	38	34	43	29	144
		Expected Count	38.0	34.0	43.0	29.0	144.0
		% within Which country do you live in?	26.4%	23.6%	29.9%	20.1%	100.0%

Each subscript letter denotes a subset of Color group number categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	17.530[a]	30	.966
Likelihood Ratio	22.803	30	.823
Linear-by-Linear Association	.000	1	.999
N of Valid Cases	144		

a. 38 cells (86.4%) have expected count less than 5. The minimum expected count is .40.

Education

The distribution of education level across shades of red is shown to be proportional.
(Chi square (homogeneity) = .223, df=3, n=144, p=.974).

Crosstab

			Red color shade			
			Shade 1	Shade 2	Shade 3	Shade 4
Simplified education level	Medium/Low	Count	22a	21a	25a	18a
		Expected Count	22.7	20.3	25.7	17.3
		% within Simplified education level	25.6%	24.4%	29.1%	20.9%
	High	Count	16a	13a	18a	11a
		Expected Count	15.3	13.7	17.3	11.7
		% within Simplified education level	27.6%	22.4%	31.0%	19.0%
Total		Count	38	34	43	29
		Expected Count	38.0	34.0	43.0	29.0
		% within Simplified education level	26.4%	23.6%	29.9%	20.1%

Each subscript letter denotes a subset of Color group number categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.223[a]	3	.974
Likelihood Ratio	.223	3	.974
Linear-by-Linear Association	.046	1	.830
N of Valid Cases	144		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 11.68.

Shape symmetry

Age

Shape symmetry had an effect on age, demonstrating a disproportional distribution. (One way ANOVA, F(1,378)= 5.692, p=.018).

		Value Label	N
Symmetric or Asymmetric	1	Asymmetric	179
	2	Symmetric	201

Tests of Between-Subjects Effects

Dependent Variable: What is your age?					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	396.908[a]	1	396.908	5.692	.018
Intercept	1926608131	1	1926608131	27629453.89	.000
Symmetry	396.908	1	396.908	5.692	.018
Error	26358.026	378	69.730		
Total	1933215805	380			
Corrected Total	26754.934	379			

a. R Squared = .015 (Adjusted R Squared = .012)

Further refinement into age brackets demonstrates disproportionate distribution in the 22-25 and 26-29 year old age bracket. The 22-25 year old group was assigned more often to the asymmetric condition, while the 26-29 year old age group was assigned more often to the symmetric condition.

*Age bracket * Symmetric or Asymmetric Crosstabulation*

			Symmetric or Asymmetric		
			Asymmetric	Symmetric	Total
Age bracket	18-21	Count	64[a]	56[a]	120
		Expected Count	56.5	63.5	120.0
		% within Age bracket	53.3%	46.7%	100.0%
	22-25	Count	66[a]	54[b]	120
		Expected Count	56.5	63.5	120.0
		% within Age bracket	55.0%	45.0%	100.0%
	26-29	Count	27[a]	58[b]	85
		Expected Count	40.0	45.0	85.0
		% within Age bracket	31.8%	68.2%	100.0%
	30-39	Count	15[a]	20[a]	35
		Expected Count	16.5	18.5	35.0
		% within Age bracket	42.9%	57.1%	100.0%
	40-49	Count	5[a]	5[a]	10
		Expected Count	4.7	5.3	10.0
		% within Age bracket	50.0%	50.0%	100.0%
	60-69	Count	2[a]	8[a]	10
		Expected Count	4.7	5.3	10.0
		% within Age bracket	20.0%	80.0%	100.0%
Total		Count	179	201	380
		Expected Count	179.0	201.0	380.0
		% within Age bracket	47.1%	52.9%	100.0%

Each subscript letter denotes a subset of Symmetric or Asymmetric categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	16.134[a]	5	.006
Likelihood Ratio	16.604	5	.005
Linear-by-Linear Association	8.055	1	.005
N of Valid Cases	380		

a. 2 cells (16.7%) have expected count less than 5. The minimum expected count is 4.71.

To ensure the disproportionate age distribution did not affect scores for excitement and competence indices, a detailed distribution of the excitement and competence indices is included for each age bracket, along with ANOVA tests to confirm no significant effect of age on the indices.

Excitement index by symmetry and age bracket

		Symmetric or Asymmetric					
		Asymmetric			Symmetric		
		ExcitementIndex			ExcitementIndex		
		Count	Mean	Standard Deviation	Count	Mean	Standard Deviation
Age bracket	18-21	64	4.22	1.41	56	4.28	1.26
	22-25	66	4.17	1.43	54	4.45	1.36
	26-29	27	4.52	1.55	58	3.91	1.57
	30-39	15	4.17	1.11	20	3.33	1.29
	40-49	5	4.30	.91	5	3.80	1.52
	50-59	0	.	.	0	.	.
	60-69	2	4.00	2.83	8	4.63	1.13
	70-79	0	.	.	0	.	.
	80-89	0	.	.	0	.	.

Tests of Between-Subjects Effects

Dependent Variable: ExcitementIndex					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	29.218[a]	11	2.656	1.348	.196
Intercept	1960.012	1	1960.012	994.720	.000
Symmetry	.768	1	.768	.390	.533
AgeBracket	9.073	5	1.815	.921	.467
Symmetry * AgeBracket	16.002	5	3.200	1.624	.153
Error	725.113	368	1.970		
Total	7390.500	380			
Corrected Total	754.332	379			

a. R Squared = .039 (Adjusted R Squared = .010)

Competence index by symmetry and age bracket

		Symmetric or Asymmetric					
		Asymmetric			Symmetric		
		CompetenceIndex			CompetenceIndex		
		Count	Mean	Standard Deviation	Count	Mean	Standard Deviation
Age bracket	18-21	64	4.34	1.19	56	4.55	1.10
	22-25	66	4.44	1.24	54	4.55	1.08
	26-29	27	4.76	.95	58	4.18	.99
	30-39	15	4.23	.75	20	3.97	.94
	40-49	5	4.30	.84	5	4.80	.76
	50-59	0	.	.	0	.	.
	60-69	2	4.25	1.77	8	3.25	.60
	70-79	0	.	.	0	.	.
	80-89	0	.	.	0	.	.

Tests of Between-Subjects Effects

Dependent Variable: CompetenceIndex					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	24.482[a]	11	2.226	1.893	.039
Intercept	2109.908	1	2109.908	1794.469	.000
Symmetry	.811	1	.811	.690	.407
AgeBracket	7.345	5	1.469	1.249	.285
Symmetry * AgeBracket	10.572	5	2.114	1.798	.112
Error	432.689	368	1.176		
Total	7752.500	380			
Corrected Total	457.171	379			

a. R Squared = .054 (Adjusted R Squared = .025)

Gender

The distribution of gender identity across symmetry is shown to be proportional.
(Chi square (homogeneity) = 3.266, df = 3, n=380, p=.352).

Crosstab

			Symmetric or Asymmetric		
			Asymmetric	Symmetric	Total
What is your gender?	Female	Count	111a	109a	220
		Expected Count	103.6	116.4	220.0
		% within What is your gender?	50.5%	49.5%	100.0%
	Male	Count	60a	85a	145
		Expected Count	68.3	76.7	145.0
		% within What is your gender?	41.4%	58.6%	100.0%
	Gender non-conforming	Count	3a	2a	5
		Expected Count	2.4	2.6	5.0
		% within What is your gender?	60.0%	40.0%	100.0%
	Prefer not to answer	Count	5a	5a	10
		Expected Count	4.7	5.3	10.0
		% within What is your gender?	50.0%	50.0%	100.0%
Total		Count	179	201	380
		Expected Count	179.0	201.0	380.0
		% within What is your gender?	47.1%	52.9%	100.0%

Each subscript letter denotes a subset of Symmetric or Asymmetric categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.266[a]	3	.352
Likelihood Ratio	3.277	3	.351
Linear-by-Linear Association	.916	1	.338
N of Valid Cases	380		

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 2.36.

Country of residence

The distribution of country of residence across symmetry is shown to be proportional.
(Chi square (homogeneity) = 3.266, df = 10 , n=380, p=.240)

Crosstab

			Symmetric or Asymmetric		
			Asymmetric	Symmetric	Total
Which country do you live in?	Canada	Count	1a	4a	5
		Expected Count	2.4	2.6	5.0
		% within Which country do you live in?	20.0%	80.0%	100.0%
	Finland	Count	2a	3a	5
		Expected Count	2.4	2.6	5.0
		% within Which country do you live in?	40.0%	60.0%	100.0%
	Germany	Count	9a	16a	25
		Expected Count	11.8	13.2	25.0
		% within Which country do you live in?	36.0%	64.0%	100.0%
	Ireland	Count	3a	2a	5
		Expected Count	2.4	2.6	5.0
		% within Which country do you live in?	60.0%	40.0%	100.0%
	Malaysia	Count	5a	0b	5
		Expected Count	2.4	2.6	5.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	Netherlands	Count	123a	127a	250
		Expected Count	117.8	132.2	250.0
		% within Which country do you live in?	49.2%	50.8%	100.0%
	Pakistan	Count	3a	2a	5
		Expected Count	2.4	2.6	5.0
		% within Which country do you live in?	60.0%	40.0%	100.0%
	Russia	Count	1a	4a	5
		Expected Count	2.4	2.6	5.0
		% within Which country do you live in?	20.0%	80.0%	100.0%
	Spain	Count	3a	2a	5
		Expected Count	2.4	2.6	5.0
		% within Which country do you live in?	60.0%	40.0%	100.0%
	United Kingdom	Count	7a	13a	20
		Expected Count	9.4	10.6	20.0
		% within Which country do you live in?	35.0%	65.0%	100.0%
	United States	Count	22a	28a	50
		Expected Count	23.6	26.4	50.0
		% within Which country do you live in?	44.0%	56.0%	100.0%
Total		Count	179	201	380
		Expected Count	179.0	201.0	380.0
		% within Which country do you live in?	47.1%	52.9%	100.0%

Each subscript letter denotes a subset of Symmetric or Asymmetric categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.713a	10	.240
Likelihood Ratio	14.918	10	.135
Linear-by-Linear Association	.819	1	.366
N of Valid Cases	380		

a. 14 cells (63.6%) have expected count less than 5. The minimum expected count is 2.36.

Education

The distribution of education level across symmetry is shown to be proportional.
(Chi square (homogeneity) = .122, df = 1, n=380, p=.727)

Crosstab

			Symmetric or Asymmetric		
			Asymmetric	Symmetric	Total
Simplified education level	Medium/Low	Count	110a	120a	230
		Expected Count	108.3	121.7	230.0
		% within Simplified education level	47.8%	52.2%	100.0%
	High	Count	69a	81a	150
		Expected Count	70.7	79.3	150.0
		% within Simplified education level	46.0%	54.0%	100.0%
Total		Count	179	201	380
		Expected Count	179.0	201.0	380.0
		% within Simplified education level	47.1%	52.9%	100.0%

Each subscript letter denotes a subset of Symmetric or Asymmetric categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.122[a]	1	.727		
Continuity Correction[b]	.059	1	.808		
Likelihood Ratio	.122	1	.727		
Fisher's Exact Test				.753	.404
Linear-by-Linear Association	.121	1	.728		
N of Valid Cases	380				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 70.66.

b. Computed only for a 2x2 table

Wordmark type

Age

There is no affect of wordmark type on age, demonstrating a proportional distribution. (One way ANOVA, F(2,225)=2.026, p=.134).

Between-Subjects Factors

		Value Label	N
Framed, normal or incomplete	1.00	Normal	71
	2.00	Framed	81
	3.00	Incomplete	76

Tests of Between-Subjects Effects

Dependent Variable: What is your age?

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	283.974[a]	2	141.987	2.026	.134
Intercept	1156553921	1	1156553921	16502305.13	.000
WordmarkType	283.974	2	141.987	2.026	.134
Error	15768.987	225	70.084		
Total	1159929483	228			
Corrected Total	16052.961	227			

a. R Squared = .018 (Adjusted R Squared = .009)

Gender

The distribution of gender identity across wordmark type is shown to be proportional. (Chi square (homogeneity) = 5.257, df = 6, n=228, p=.511).

Crosstab

			Framed, normal or incomplete			
			Normal	Framed	Incomplete	Total
What is your gender?	Female	Count	38[a]	52[a]	42[a]	132
		Expected Count	41.1	46.9	44.0	132.0
		% within What is your gender?	28.8%	39.4%	31.8%	100.0%
	Male	Count	28[a]	27[a]	32[a]	87
		Expected Count	27.1	30.9	29.0	87.0
		% within What is your gender?	32.2%	31.0%	36.8%	100.0%
	Gender non-conforming	Count	1[a]	1[a]	1[a]	3
		Expected Count	.9	1.1	1.0	3.0
		% within What is your gender?	33.3%	33.3%	33.3%	100.0%
	Prefer not to answer	Count	4[a]	1[a]	1[a]	6
		Expected Count	1.9	2.1	2.0	6.0
		% within What is your gender?	66.7%	16.7%	16.7%	100.0%
Total		Count	71	81	76	228
		Expected Count	71.0	81.0	76.0	228.0
		% within What is your gender?	31.1%	35.5%	33.3%	100.0%

Each subscript letter denotes a subset of Framed, normal or incomplete categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.257[a]	6	.511
Likelihood Ratio	4.915	6	.555
Linear-by-Linear Association	.863	1	.353
N of Valid Cases	228		

a. 6 cells (50.0%) have expected count less than 5. The minimum expected count is .93.

Country of residence

The distribution of country of residence across symmetry is shown to be proportional.
(Chi square (homogeneity) = 18.698, df =20, n=228, p=.542)

Crosstab

			Framed, normal or incomplete			
			Normal	Framed	Incomplete	Total
Which country do you live in?	Canada	Count	0a	1a	2a	3
		Expected Count	.9	1.1	1.0	3.0
		% within Which country do you live in?	0.0%	33.3%	66.7%	100.0%
	Finland	Count	1a	0a	2a	3
		Expected Count	.9	1.1	1.0	3.0
		% within Which country do you live in?	33.3%	0.0%	66.7%	100.0%
	Germany	Count	6a	5a	4a	15
		Expected Count	4.7	5.3	5.0	15.0
		% within Which country do you live in?	40.0%	33.3%	26.7%	100.0%
	Ireland	Count	0a	2a	1a	3
		Expected Count	.9	1.1	1.0	3.0
		% within Which country do you live in?	0.0%	66.7%	33.3%	100.0%
	Malaysia	Count	0a	3a	0a	3
		Expected Count	.9	1.1	1.0	3.0
		% within Which country do you live in?	0.0%	100.0%	0.0%	100.0%
	Netherlands	Count	47a	53a	50a	150
		Expected Count	46.7	53.3	50.0	150.0
		% within Which country do you live in?	31.3%	35.3%	33.3%	100.0%
	Pakistan	Count	1a	0a	2a	3
		Expected Count	.9	1.1	1.0	3.0
		% within Which country do you live in?	33.3%	0.0%	66.7%	100.0%
	Russia	Count	2a	1a	0a	3
		Expected Count	.9	1.1	1.0	3.0
		% within Which country do you live in?	66.7%	33.3%	0.0%	100.0%
	Spain	Count	0a	2a	1a	3
		Expected Count	.9	1.1	1.0	3.0
		% within Which country do you live in?	0.0%	66.7%	33.3%	100.0%
	United Kingdom	Count	3a	4a	5a	12
		Expected Count	3.7	4.3	4.0	12.0
		% within Which country do you live in?	25.0%	33.3%	41.7%	100.0%
	United States	Count	11a	10a	9a	30
		Expected Count	9.3	10.7	10.0	30.0
		% within Which country do you live in?	36.7%	33.3%	30.0%	100.0%
Total		Count	71	81	76	228
		Expected Count	71.0	81.0	76.0	228.0
		% within Which country do you live in?	31.1%	35.5%	33.3%	100.0%

Each subscript letter denotes a subset of Framed, normal or incomplete categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	18.698[a]	20	.542
Likelihood Ratio	24.037	20	.241
Linear-by-Linear Association	.031	1	.861
N of Valid Cases	228		

a. 25 cells (75.8%) have expected count less than 5. The minimum expected count is .93.

Education

The distribution of education level across symmetry is shown to be proportional.
(Chi square (homogeneity) = 2.977, df = 2, n=228, p=.226)

Crosstab

			Framed, normal or incomplete			
			Normal	Framed	Incomplete	Total
Simplified education level	Medium/Low	Count	40a	46a	52a	138
		Expected Count	43.0	49.0	46.0	138.0
		% within Simplified education level	29.0%	33.3%	37.7%	100.0%
	High	Count	31a	35a	24a	90
		Expected Count	28.0	32.0	30.0	90.0
		% within Simplified education level	34.4%	38.9%	26.7%	100.0%
Total		Count	71	81	76	228
		Expected Count	71.0	81.0	76.0	228.0
		% within Simplified education level	31.1%	35.5%	33.3%	100.0%

Each subscript letter denotes a subset of Framed, normal or incomplete categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.977a	2	.226
Likelihood Ratio	3.024	2	.220
Linear-by-Linear Association	2.284	1	.131
N of Valid Cases	228		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 28.03.

Each participant was assigned to one shape (C or D) and one variant within that shape (asymmetric & blue, asymmetric & red, symmetric & blue, symmetric & red). In this section, the demographic distribution of participants is shown across conditions in study 2.

For the purposes of simplifying the education level of participants, the variable was re-coded as either medium/low education and high education. The medium/low consists of: some secondary school education, secondary school graduate, trade/technical/vocational training, some Bachelor's-level education, and Bachelor's degree. The high consists of: some Master's degree-level education, Master's degree, some Doctorate-level education, and Doctorate degree.

Shape C vs. D

Distribution across shape variants are detailed in this section.

Age

There is no affect of shape type on age, demonstrating a proportional distribution.
(One way ANOVA, $F(1,179)=.825$, $p=.365$).

		Value Label	N
Shape	3	Shape C	95
	4	Shape D	86

Tests of Between-Subjects Effects

Dependent Variable: What is your age?

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	215.440[a]	1	215.440	.825	.365
Intercept	924211700.1	1	924211700.1	3539325.654	.000
Shape	215.440	1	215.440	.825	.365
Error	46741.642	179	261.126		
Total	926593876.0	181			
Corrected Total	46957.083	180			

a. R Squared = .005 (Adjusted R Squared = -.001)

Gender

The distribution of gender identity across shapes is shown to be proportional.
(Chi square (homogeneity) = 5.538, df = 3, n=181, p=.136).

Crosstab

			Shape		
			Shape C	Shape D	Total
What is your gender?	Female	Count	51a	58a	109
		Expected Count	57.2	51.8	109.0
		% within What is your gender?	46.8%	53.2%	100.0%
	Male	Count	40a	27a	67
		Expected Count	35.2	31.8	67.0
		% within What is your gender?	59.7%	40.3%	100.0%
	Gender non-conforming	Count	1a	1a	2
		Expected Count	1.0	1.0	2.0
		% within What is your gender?	50.0%	50.0%	100.0%
	Prefer not to answer	Count	3a	0a	3
		Expected Count	1.6	1.4	3.0
		% within What is your gender?	100.0%	0.0%	100.0%
Total		Count	95	86	181
		Expected Count	95.0	86.0	181.0
		% within What is your gender?	52.5%	47.5%	100.0%

Each subscript letter denotes a subset of Shape categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.538a	3	.136
Likelihood Ratio	6.699	3	.082
Linear-by-Linear Association	4.859	1	.028
N of Valid Cases	181		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .95.

Education

The distribution of education level across shapes is shown to be proportional.
(Chi square (homogeneity) = .428, df =1, n=181, p=.513)

Crosstab

			Shape		
			Shape C	Shape D	Total
Simplified education level	Medium/Low	Count	54a	53a	107
		Expected Count	56.2	50.8	107.0
		% within Simplified education level	50.5%	49.5%	100.0%
	High	Count	41a	33a	74
		Expected Count	38.8	35.2	74.0
		% within Simplified education level	55.4%	44.6%	100.0%
Total		Count	95	86	181
		Expected Count	95.0	86.0	181.0
		% within Simplified education level	52.5%	47.5%	100.0%

Each subscript letter denotes a subset of Shape categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.428a	1	.513		
Continuity Correctionb	.253	1	.615		
Likelihood Ratio	.428	1	.513		
Fisher's Exact Test				.547	.308
Linear-by-Linear Association	.425	1	.514		
N of Valid Cases	181				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 35.16.

b. Computed only for a 2x2 table

Country of residence

The distribution of country of residence across shapes is shown to be proportional. (Chi square (homogeneity) = 17.593, df =18, n=181, p=.483)

Crosstab

			Shape		
			Shape C	Shape D	Total
Which country do you live in?	Albania	Count	0a	1a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	0.0%	100.0%	100.0%
	Australia	Count	2a	1a	3
		Expected Count	1.6	1.4	3.0
		% within Which country do you live in?	66.7%	33.3%	100.0%
	Canada	Count	1a	3a	4
		Expected Count	2.1	1.9	4.0
		% within Which country do you live in?	25.0%	75.0%	100.0%
	Finland	Count	1a	0a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	France	Count	3a	0a	3
		Expected Count	1.6	1.4	3.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	Germany	Count	6a	8a	14
		Expected Count	7.3	6.7	14.0
		% within Which country do you live in?	42.9%	57.1%	100.0%
	India	Count	1a	0a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	Ireland	Count	1a	1a	2
		Expected Count	1.0	1.0	2.0
		% within Which country do you live in?	50.0%	50.0%	100.0%
	Italy	Count	0a	1a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	0.0%	100.0%	100.0%
	Netherlands	Count	35a	26a	61
		Expected Count	32.0	29.0	61.0
		% within Which country do you live in?	57.4%	42.6%	100.0%
	Poland	Count	1a	0a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	Portugal	Count	1a	0a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	Qatar	Count	0a	1a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	0.0%	100.0%	100.0%
	Russia	Count	0a	1a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	0.0%	100.0%	100.0%
	Spain	Count	1a	0a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	Sweden	Count	0a	1a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	0.0%	100.0%	100.0%
	Switzerland	Count	2a	0a	2
		Expected Count	1.0	1.0	2.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	United Kingdom	Count	23a	24a	47
		Expected Count	24.7	22.3	47.0
		% within Which country do you live in?	48.9%	51.1%	100.0%
	United States	Count	17a	18a	35
		Expected Count	18.4	16.6	35.0
		% within Which country do you live in?	48.6%	51.4%	100.0%
Total		Count	95	86	181
		Expected Count	95.0	86.0	181.0
		% within Which country do you live in?	52.5%	47.5%	100.0%

Each subscript letter denotes a subset of Shape categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	17.593a	18	.483
Likelihood Ratio	23.402	18	.176
Linear-by-Linear Association	.608	1	.435
N of Valid Cases	181		

a. 30 cells (78.9%) have expected count less than 5. The minimum expected count is .48.

Color

Distribution across blue and red are detailed below.

Age

There is no affect of color hue on age, demonstrating a proportional distribution.
(One way ANOVA, F(1,179)=1.733, p=.190).

Between-Subjects Factors

		Value Label	N
Blue or red	1	Blue	90
	2	Red	91

Tests of Between-Subjects Effects

Dependent Variable: What is your age?

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	450.251[a]	1	450.251	1.733	.190
Intercept	926511500.1	1	926511500.1	3566047.202	.000
Color	450.251	1	450.251	1.733	.190
Error	46506.832	179	259.815		
Total	926593876.0	181			
Corrected Total	46957.083	180			

a. R Squared = .010 (Adjusted R Squared = .004)

Gender

The distribution of gender identity across color hue is shown to be p roportional.
(Chi square (homogeneity) = 3.239, df = 3, n=181, p=.356).

Crosstab

			Blue or red		
			Blue	Red	Total
What is your gender?	Female	Count	52[a]	57[a]	109
		Expected Count	54.2	54.8	109.0
		% within What is your gender?	47.7%	52.3%	100.0%
	Male	Count	34[a]	33[a]	67
		Expected Count	33.3	33.7	67.0
		% within What is your gender?	50.7%	49.3%	100.0%
	Gender non-conforming	Count	1[a]	1[a]	2
		Expected Count	1.0	1.0	2.0
		% within What is your gender?	50.0%	50.0%	100.0%
	Prefer not to answer	Count	3[a]	0[a]	3
		Expected Count	1.5	1.5	3.0
		% within What is your gender?	100.0%	0.0%	100.0%
Total		Count	90	91	181
		Expected Count	90.0	91.0	181.0
		% within What is your gender?	49.7%	50.3%	100.0%

Each subscript letter denotes a subset of Blue or red categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.239[a]	3	.356
Likelihood Ratio	4.398	3	.222
Linear-by-Linear Association	1.627	1	.202
N of Valid Cases	181		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .99.

Education

The distribution of education level across color hue is shown to be proportional.
(Chi square (homogeneity) = .295, df =1, n=181, p=.587)

Crosstab

			Blue or red		
			Blue	Red	Total
Simplified education level	Medium/Low	Count	55a	52a	107
		Expected Count	53.2	53.8	107.0
		% within Simplified education level	51.4%	48.6%	100.0%
	High	Count	35a	39a	74
		Expected Count	36.8	37.2	74.0
		% within Simplified education level	47.3%	52.7%	100.0%
Total		Count	90	91	181
		Expected Count	90.0	91.0	181.0
		% within Simplified education level	49.7%	50.3%	100.0%

Each subscript letter denotes a subset of Blue or red categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.295[a]	1	.587		
Continuity Correction[b]	.153	1	.695		
Likelihood Ratio	.295	1	.587		
Fisher's Exact Test				.651	.348
Linear-by-Linear Association	.293	1	.588		
N of Valid Cases	181				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 36.80.

b. Computed only for a 2x2 table

Country of residence

The distribution of country of residence across color hue is shown to be proportional.
(Chi square (homogeneity) = 16.982, df =18, n=181, p=.524)

Crosstab

			Blue or red		
			Blue	Red	Total
Which country do you live in?	Albania	Count	1a	0a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	Australia	Count	0a	3a	3
		Expected Count	1.5	1.5	3.0
		% within Which country do you live in?	0.0%	100.0%	100.0%
	Canada	Count	3a	1a	4
		Expected Count	2.0	2.0	4.0
		% within Which country do you live in?	75.0%	25.0%	100.0%
	Finland	Count	0a	1a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	0.0%	100.0%	100.0%
	France	Count	1a	2a	3
		Expected Count	1.5	1.5	3.0
		% within Which country do you live in?	33.3%	66.7%	100.0%
	Germany	Count	8a	6a	14
		Expected Count	7.0	7.0	14.0
		% within Which country do you live in?	57.1%	42.9%	100.0%
	India	Count	0a	1a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	0.0%	100.0%	100.0%
	Ireland	Count	1a	1a	2
		Expected Count	1.0	1.0	2.0
		% within Which country do you live in?	50.0%	50.0%	100.0%
	Italy	Count	0a	1a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	0.0%	100.0%	100.0%
	Netherlands	Count	32a	29a	61
		Expected Count	30.3	30.7	61.0
		% within Which country do you live in?	52.5%	47.5%	100.0%
	Poland	Count	0a	1a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	0.0%	100.0%	100.0%
	Portugal	Count	1a	0a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	Qatar	Count	1a	0a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	Russia	Count	0a	1a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	0.0%	100.0%	100.0%
	Spain	Count	0a	1a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	0.0%	100.0%	100.0%
	Sweden	Count	0a	1a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	0.0%	100.0%	100.0%
	Switzerland	Count	0a	2a	2
		Expected Count	1.0	1.0	2.0
		% within Which country do you live in?	0.0%	100.0%	100.0%
	United Kingdom	Count	25a	22a	47
		Expected Count	23.4	23.6	47.0
		% within Which country do you live in?	53.2%	46.8%	100.0%
	United States	Count	17a	18a	35
		Expected Count	17.4	17.6	35.0
		% within Which country do you live in?	48.6%	51.4%	100.0%
Total		Count	90	91	181
		Expected Count	90.0	91.0	181.0
		% within Which country do you live in?	49.7%	50.3%	100.0%

Each subscript letter denotes a subset of Blue or red categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	16.982a	18	.524
Likelihood Ratio	22.830	18	.197
Linear-by-Linear Association	.075	1	.784
N of Valid Cases	181		

a. 30 cells (78.9%) have expected count less than 5. The minimum expected count is .50.

Symmetry

Distribution across symmetry are detailed below.

Age

There is no affect of symmetry on age, demonstrating a proportional distribution.
(One way ANOVA, F(1,179)=2.203, p=.139).

Between-Subjects Factors

		Value Label	N
Asymmetric or symmetric	1	Asymmetric	88
	2	Symmetric	93

Tests of Between-Subjects Effects

Dependent Variable: What is your age?

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	570.958[a]	1	570.958	2.203	.139
Intercept	925799700.1	1	925799700.1	3572580.111	.000
Symmetry	570.958	1	570.958	2.203	.139
Error	46386.125	179	259.140		
Total	926593876.0	181			
Corrected Total	46957.083	180			

a. R Squared = .012 (Adjusted R Squared = .007)

Gender

The distribution of gender identity across symmetry is shown to be proportional.
(Chi square (homogeneity) = 5.083, df = 3, n=181, p=.166).

Crosstab

			Asymmetric or symmetric		
			Asymmetric	Symmetric	Total
What is your gender?	Female	Count	56[a]	53[a]	109
		Expected Count	53.0	56.0	109.0
		% within What is your gender?	51.4%	48.6%	100.0%
	Male	Count	32[a]	35[a]	67
		Expected Count	32.6	34.4	67.0
		% within What is your gender?	47.8%	52.2%	100.0%
	Gender non-conforming	Count	0[a]	2[a]	2
		Expected Count	1.0	1.0	2.0
		% within What is your gender?	0.0%	100.0%	100.0%
	Prefer not to answer	Count	0[a]	3[a]	3
		Expected Count	1.5	1.5	3.0
		% within What is your gender?	0.0%	100.0%	100.0%
Total		Count	88	93	181
		Expected Count	88.0	93.0	181.0
		% within What is your gender?	48.6%	51.4%	100.0%

Each subscript letter denotes a subset of Asymmetric or symmetric categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.083[a]	3	.166
Likelihood Ratio	7.010	3	.072
Linear-by-Linear Association	2.840	1	.092
N of Valid Cases	181		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .97.

Education

The distribution of education level across symmetry is shown to be proportional.
(Chi square (homogeneity) = 2.267, df =1, n=181, p=.132)

Crosstab

			Asymmetric or symmetric		
			Asymmetric	Symmetric	Total
Simplified education level	Medium/Low	Count	57[a]	50[a]	107
		Expected Count	52.0	55.0	107.0
		% within Simplified education level	53.3%	46.7%	100.0%
	High	Count	31[a]	43[a]	74
		Expected Count	36.0	38.0	74.0
		% within Simplified education level	41.9%	58.1%	100.0%
Total		Count	88	93	181
		Expected Count	88.0	93.0	181.0
		% within Simplified education level	48.6%	51.4%	100.0%

Each subscript letter denotes a subset of Asymmetric or symmetric categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.267[a]	1	.132		
Continuity Correction[b]	1.835	1	.176		
Likelihood Ratio	2.275	1	.132		
Fisher's Exact Test				.173	.088
Linear-by-Linear Association	2.255	1	.133		
N of Valid Cases	181				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 35.98.

b. Computed only for a 2x2 table

Country of residence

The distribution of country of residence across symmetry is shown to be proportional.
(Chi square (homogeneity) = 22.660, df =18, n=181, p=.204)

Crosstab

			Asymmetric or symmetric		
			Asymmetric	Symmetric	Total
Which country do you live in?	Albania	Count	1a	0a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	Australia	Count	2a	1a	3
		Expected Count	1.5	1.5	3.0
		% within Which country do you live in?	66.7%	33.3%	100.0%
	Canada	Count	2a	2a	4
		Expected Count	1.9	2.1	4.0
		% within Which country do you live in?	50.0%	50.0%	100.0%
	Finland	Count	0a	1a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	0.0%	100.0%	100.0%
	France	Count	0a	3a	3
		Expected Count	1.5	1.5	3.0
		% within Which country do you live in?	0.0%	100.0%	100.0%
	Germany	Count	9a	5a	14
		Expected Count	6.8	7.2	14.0
		% within Which country do you live in?	64.3%	35.7%	100.0%
	India	Count	1a	0a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	Ireland	Count	2a	0a	2
		Expected Count	1.0	1.0	2.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	Italy	Count	1a	0a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	Netherlands	Count	34a	27a	61
		Expected Count	29.7	31.3	61.0
		% within Which country do you live in?	55.7%	44.3%	100.0%
	Poland	Count	0a	1a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	0.0%	100.0%	100.0%
	Portugal	Count	1a	0a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	Qatar	Count	1a	0a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	Russia	Count	1a	0a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	Spain	Count	1a	0a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	100.0%	0.0%	100.0%
	Sweden	Count	0a	1a	1
		Expected Count	.5	.5	1.0
		% within Which country do you live in?	0.0%	100.0%	100.0%
	Switzerland	Count	1a	1a	2
		Expected Count	1.0	1.0	2.0
		% within Which country do you live in?	50.0%	50.0%	100.0%
	United Kingdom	Count	16a	31b	47
		Expected Count	22.9	24.1	47.0
		% within Which country do you live in?	34.0%	66.0%	100.0%
	United States	Count	15a	20a	35
		Expected Count	17.0	18.0	35.0
		% within Which country do you live in?	42.9%	57.1%	100.0%
Total		Count	88	93	181
		Expected Count	88.0	93.0	181.0
		% within Which country do you live in?	48.6%	51.4%	100.0%

Each subscript letter denotes a subset of Asymmetric or symmetric categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	22.660a	18	.204
Likelihood Ratio	28.549	18	.054
Linear-by-Linear Association	5.029	1	.025
N of Valid Cases	181		

a. 30 cells (78.9%) have expected count less than 5. The minimum expected count is .49.

The demographic profiles of Study 1 and study 2 are compared in this section.

For the purposes of simplifying the education level of participants, the variable was re-coded as either medium/low education and high education. The medium/low consists of: some secondary school education, secondary school graduate, trade/technical/vocational training, some Bachelor's-level education, and Bachelor's degree. The high consists of: some Master's degree-level education, Master's degree, some Doctorate-level education, and Doctorate degree.

Age

The distribution of age across study 1 and 2 is not shown to be similar. There are more respondents in the 50-59 age range in study 2 compared to study 1. (Chi square (homogeneity) = 15.234, df = 7, n = 257, p = .033).

Crosstab

			Study 1 or 2		
			Study 1	Study 2	Total
Age bracket	18-21	Count	24a	48a	72
		Expected Count	21.3	50.7	72.0
		% within Study 1 or 2	31.6%	26.5%	28.0%
	22-25	Count	24a	47a	71
		Expected Count	21.0	50.0	71.0
		% within Study 1 or 2	31.6%	26.0%	27.6%
	26-29	Count	17a	29a	46
		Expected Count	13.6	32.4	46.0
		% within Study 1 or 2	22.4%	16.0%	17.9%
	30-39	Count	7a	11a	18
		Expected Count	5.3	12.7	18.0
		% within Study 1 or 2	9.2%	6.1%	7.0%
	40-49	Count	2a	11a	13
		Expected Count	3.8	9.2	13.0
		% within Study 1 or 2	2.6%	6.1%	5.1%
	50-59	Count	0a	12b	12
		Expected Count	3.5	8.5	12.0
		% within Study 1 or 2	0.0%	6.6%	4.7%
	60-69	Count	2a	16a	18
		Expected Count	5.3	12.7	18.0
		% within Study 1 or 2	2.6%	8.8%	7.0%
	70-79	Count	0a	7a	7
		Expected Count	2.1	4.9	7.0
		% within Study 1 or 2	0.0%	3.9%	2.7%
Total		Count	76	181	257
		Expected Count	76.0	181.0	257.0
		% within Study 1 or 2	100.0%	100.0%	100.0%

Each subscript letter denotes a subset of Study 1 or 2 categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	15.234a	7	.033
Likelihood Ratio	21.220	7	.003
Linear-by-Linear Association	9.594	1	.002
N of Valid Cases	257		

a. 4 cells (25.0%) have expected count less than 5. The minimum expected count is 2.07.

Gender

The distribution of gender across study 1 and 2 is not shown to be different.
(Chi square (homogeneity) = .349, df = 3, n = 257, p = .951).

Crosstab

			Study 1 or 2		
			Study 1	Study 2	Total
What is your gender?	Female	Count	44a	109a	153
		Expected Count	45.2	107.8	153.0
		% within Study 1 or 2	57.9%	60.2%	59.5%
	Male	Count	29a	67a	96
		Expected Count	28.4	67.6	96.0
		% within Study 1 or 2	38.2%	37.0%	37.4%
	Gender non-conforming	Count	1a	2a	3
		Expected Count	.9	2.1	3.0
		% within Study 1 or 2	1.3%	1.1%	1.2%
	Prefer not to answer	Count	2a	3a	5
		Expected Count	1.5	3.5	5.0
		% within Study 1 or 2	2.6%	1.7%	1.9%
Total		Count	76	181	257
		Expected Count	76.0	181.0	257.0
		% within Study 1 or 2	100.0%	100.0%	100.0%

Each subscript letter denotes a subset of Study 1 or 2 categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.349[a]	3	.951
Likelihood Ratio	.334	3	.953
Linear-by-Linear Association	.276	1	.599
N of Valid Cases	257		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .89.

Education

The distribution of education level across study 1 and 2 is not shown to be different.
(Chi square (homogeneity) = .044, df =1, n=257, p=.834)

*Simplified education level * Study 1 or 2 Crosstabulation*

			Study 1 or 2		
			Study 1	Study 2	Total
Simplified education level	Medium/Low	Count	46a	107a	153
		Expected Count	45.2	107.8	153.0
		% within Study 1 or 2	60.5%	59.1%	59.5%
	High	Count	30a	74a	104
		Expected Count	30.8	73.2	104.0
		% within Study 1 or 2	39.5%	40.9%	40.5%
Total		Count	76	181	257
		Expected Count	76.0	181.0	257.0
		% within Study 1 or 2	100.0%	100.0%	100.0%

Each subscript letter denotes a subset of Study 1 or 2 categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.044[a]	1	.834		
Continuity Correction[b]	.005	1	.943		
Likelihood Ratio	.044	1	.833		
Fisher's Exact Test				.890	.473
Linear-by-Linear Association	.044	1	.834		
N of Valid Cases	257				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 30.75.

b. Computed only for a 2x2 table

Country of residence

The distribution of country of residence across study 1 and 2 is shown to be different. Compared to study 1, there are fewer participants in study 2 from the Netherlands and more from the United Kingdom.
(Chi square (homogeneity) = 38.089, df =20, n=257, p=.009)

Crosstab

			Study 1 or 2		
			Study 1	Study 2	Total
Which country do you live in?	Albania	Count	0a	1a	1
		Expected Count	.3	.7	1.0
		% within Study 1 or 2	0.0%	0.6%	0.4%
	Australia	Count	0a	3a	3
		Expected Count	.9	2.1	3.0
		% within Study 1 or 2	0.0%	1.7%	1.2%
	Canada	Count	1a	4a	5
		Expected Count	1.5	3.5	5.0
		% within Study 1 or 2	1.3%	2.2%	1.9%
	Finland	Count	1a	1a	2
		Expected Count	.6	1.4	2.0
		% within Study 1 or 2	1.3%	0.6%	0.8%
	France	Count	0a	3a	3
		Expected Count	.9	2.1	3.0
		% within Study 1 or 2	0.0%	1.7%	1.2%
	Germany	Count	5a	14a	19
		Expected Count	5.6	13.4	19.0
		% within Study 1 or 2	6.6%	7.7%	7.4%
	India	Count	0a	1a	1
		Expected Count	.3	.7	1.0
		% within Study 1 or 2	0.0%	0.6%	0.4%
	Ireland	Count	1a	2a	3
		Expected Count	.9	2.1	3.0
		% within Study 1 or 2	1.3%	1.1%	1.2%
	Italy	Count	0a	1a	1
		Expected Count	.3	.7	1.0
		% within Study 1 or 2	0.0%	0.6%	0.4%
	Malaysia	Count	1a	0a	1
		Expected Count	.3	.7	1.0
		% within Study 1 or 2	1.3%	0.0%	0.4%
	Netherlands	Count	50a	61b	111
		Expected Count	32.8	78.2	111.0
		% within Study 1 or 2	65.8%	33.7%	43.2%
	Pakistan	Count	1a	0a	1
		Expected Count	.3	.7	1.0
		% within Study 1 or 2	1.3%	0.0%	0.4%
	Poland	Count	0a	1a	1
		Expected Count	.3	.7	1.0
		% within Study 1 or 2	0.0%	0.6%	0.4%
	Portugal	Count	0a	1a	1
		Expected Count	.3	.7	1.0
		% within Study 1 or 2	0.0%	0.6%	0.4%
	Qatar	Count	0a	1a	1
		Expected Count	.3	.7	1.0
		% within Study 1 or 2	0.0%	0.6%	0.4%
	Russia	Count	1a	1a	2
		Expected Count	.6	1.4	2.0
		% within Study 1 or 2	1.3%	0.6%	0.8%
	Spain	Count	1a	1a	2
		Expected Count	.6	1.4	2.0
		% within Study 1 or 2	1.3%	0.6%	0.8%
	Sweden	Count	0a	1a	1
		Expected Count	.3	.7	1.0
		% within Study 1 or 2	0.0%	0.6%	0.4%
	Switzerland	Count	0a	2a	2
		Expected Count	.6	1.4	2.0
		% within Study 1 or 2	0.0%	1.1%	0.8%
	United Kingdom	Count	4a	47b	51
		Expected Count	15.1	35.9	51.0
		% within Study 1 or 2	5.3%	26.0%	19.8%
	United States	Count	10a	35a	45
		Expected Count	13.3	31.7	45.0
		% within Study 1 or 2	13.2%	19.3%	17.5%
Total		Count	76	181	257
		Expected Count	76.0	181.0	257.0
		% within Study 1 or 2	100.0%	100.0%	100.0%

Each subscript letter denotes a subset of Study 1 or 2 categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	38.089a	20	.009
Likelihood Ratio	44.554	20	.001
Linear-by-Linear Association	19.772	1	.000
N of Valid Cases	257		

a. 34 cells (81.0%) have expected count less than 5. The minimum expected count is .30.

Results of t-tests comparing Western and non-Western residents' responses across color conditions are reported in this section. There was no statistically significant difference between Western and non-Western respondents. Participants from Malaysia, Pakistan & Russia were included in the non-Western respondents category. Participants from all other countries in the sample were included in the Western category.

Blue — Excitement Index

Group Statistics

	Western or Non-Western	N	Mean	Std. Deviation	Std. Error Mean
Excitement Index (Blue)	Non-Western	6	4.7500	.98742	.40311
	Western	138	4.0580	1.28874	.10970

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Excitement Index (Blue)	Equal variances assumed	.441	.508	1.297	142	.197	.69203	.53352	-.36264	1.74670
	Equal variances not assumed			1.656	5.767	.151	.69203	.41777	-.34033	1.72439

Red — Excitement Index

Group Statistics

	Western or Non-Western	N	Mean	Std. Deviation	Std. Error Mean
Excitement Index (Red)	Non-Western	6	4.9167	1.20069	.49018
	Western	138	4.5870	1.33443	.11359

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Excitement Index (Red)	Equal variances assumed	.005	.946	.594	142	.553	.32971	.55463	-.76668	1.42610
	Equal variances not assumed			.655	5.551	.538	.32971	.50317	-.92606	1.58548

Blue — Competence Index

Group Statistics

	Western or Non-Western	N	Mean	Std. Deviation	Std. Error Mean
Competence Index (Blue)	Non-Western	6	5.1667	.93095	.38006
	Western	138	5.3080	1.13234	.09639

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Competence Index (Blue)	Equal variances assumed	.451	.503	-.301	142	.764	-.14130	.46952	-1.06945	.78684
	Equal variances not assumed			-.360	5.663	.732	-.14130	.39209	-1.11473	.83212

Red — Competence Index

Group Statistics

	Western or Non-Western	N	Mean	Std. Deviation	Std. Error Mean
Competence Index (Red)	Non-Western	6	4.8333	.98319	.40139
	Western	138	4.5435	1.30619	.11119

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Competence Index (Red)	Equal variances assumed	.536	.465	.536	142	.593	.28986	.54055	-.77870	1.35841
	Equal variances not assumed			.696	5.796	.513	.28986	.41650	-.73807	1.31778