Browsing Through Products and People:

Online Review, Ratings, and Swiping

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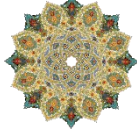
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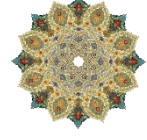
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که علم عشق در دفتر نباشد   بشوی اوراق اگر همدرس مایی

Dedicated to Curiosity...

Acknowledgement

When I decided to forgo my career in physical chemistry and start from scratch in cognitive science, I knew it would be a long, strenuous voyage. At the time, little I knew where the sea would take me. Nine years have passed and I am still sailing. But, now, I know that the journey is the destination if it pursues passion. It's a liberating belief that could not be realized without the presence and support of many. There are far too many to name but there are some people who I would like to especially thank.

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Abstract

In this thesis, I explored three topics, each addressing a different aspect online search for products and people. In chapter one, we investigated whether consumers' response to online product reviews depends, not only on static dimensions but also on more dynamic features such as narrative style. We showed that depending on the review's narrative style, consumers engage in an imaginary social interaction with the reviewer that significantly improves recommendation acceptance. The topic of interest in chapter two is product evaluation based on online product ratings. More specifically, we measured the relative effects of ratings expressed on larger versus smaller scales. The results suggest that when consumers aggregate ratings from different online product review websites, ratings expressed on larger scales have a stronger effect on product evaluation. In chapter three, we examined online dating and tested whether partner search via swift evaluation of profile photos, as is typical for apps such as Tinder, would promote a commodified view of other people. The findings provided evidence for a reduced perception of humanness in others, and lower fairness considerations after a date search task.

Resumen

En esta tesis, he explorado tres temas, cada uno abordando un aspecto diferente de la búsqueda en línea de productos y personas.. En el capítulo uno, investigamos si la respuesta de los consumidores a las opiniones de productos en línea depende, no solo de las dimensiones estáticas, sino también de las características más dinámicas como el estilo narrativo. Demostramos que, según el estilo narrativo de la opinión, los consumidores participan en una interacción social imaginaria con el escritor que mejora significativamente la aceptación de las recomendaciones. En el capítulo dos nos centramos en la evaluación de productos basada en calificaciones de productos en línea. Más específicamente, medimos los efectos relativos de las calificaciones expresadas en escalas más grandes versus más pequeñas. Los resultados sugieren que cuando los consumidores agregan calificaciones de diferentes sitios web , las calificaciones expresadas en escalas más grandes tienen un efecto más fuerte en la evaluación del producto. En el capítulo tres, examinamos las citas en línea y comprobamos si la búsqueda de pareja a través de una evaluación rápida de las fotos de perfil, como es típico en aplicaciones como Tinder, promueveuna visión comercial de los demás. Los hallazgos muestran un incremento en la deshumanización hacia los demás, así como menores consideraciones de equidad después de una tarea de búsqueda de citas.

Preface

This thesis allowed me to explore different areas of my broad range of interest. More importantly, it provided me with the opportunity of learning from four brilliant researchers each with distinct expertise and research style. As a testimony to this diverse learning experience, each chapter of this dissertation has a different personality not only in terms of the topic being covered but also the methodology, analysis and narrative style.

The first chapter was mentored by Dr. Maria Galli and Dr. Ana Valenzuela. The main proposal of this project is that when the review's narrative style makes consumers feel as in the company of the online reviewer (i.e., social presence), they engage in an imaginary social interaction with the reviewer. This chapter builds on the e-WOM literature by expanding our understanding of the effect of social presence in the acceptance of online recommendations, and of the mechanism underlying its persuasive effect. Across five studies we found that higher perceived social presence improves attitudes toward the reviewer because of the enhanced visualization of what could have been a face-to-face interaction. The result showed that perceptions of social presence provide significant persuasive power by increasing acceptance even when a non-favored item is recommended. These findings are particularly relevant to online retailers providing practical insights for brands, social media, and recommendation platforms to enrich their medium with consumer-generated social cues that can generate social presence.

In the second chapter, I received mentorship from Dr. Gael Le Mens. We investigated if and how different weights are distributed to ratings of different scales when they are aggregated to form a product attitude. Answering this question is important for two reasons. First, product review websites are only a few keystrokes away from each other, and the rating scales vary across them. This implies that consumers have to aggregate information from these sources to form opinions about products and services. Second, prior literature cannot provide a definite answer to this question and different lines of research have conflicting predictions. Our four studies provide support for what we call the scale effect: Ratings on larger scales are given more weight when combining ratings from different scales. The findings suggest that the scale effect is not due to the numerical magnitude of ratings. Nor fluency effect and neither scale granularity can explain the scale effect. Instead, this effect results from a deliberate intention to give more weight to ratings expressed on larger scales to increase evaluation accuracy. The scale effect has direct implications for recommendation systems and performance appraisals that aim to guide consumer's product attitudes and choices.

Chapter three was supervised by Dr. Gert Cornelissen. We examined if searching for a match by swift evaluation of profile photos as in online dating application, would promote a commodified view of other people. This project finds its inspiration in a recurrent criticism of online dating apps accusing them of creating an experience of "relationshopping" that compares online dating to being in a supermarket and shopping for a partner "off a supermarket shelf". We conducted four studies. The findings provided evidence for a reduced perception of humanness, and lower fairness considerations after a date search task. We further showed that a focus on rejecting undesirable dating targets as opposed to a focus on choosing desirable ones could lead to opposing effects. The significance of these findings can be realized taking into account that disregarding the human behind a profile can spill over into offline interactions and eventually become a norm.

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Chapter 1

THE PERSUASIVE POWER OF ONLINE SOCIAL PRESENCE

Joint with Maria Galli, and Ana Valenzuela

1.1.   Introduction

Online reviews are nowadays an inseparable and very influential part of the purchase process. About 93% of US consumers reported reading online reviews to determine whether a product/service was good or bad, and 68% of them said that positive reviews had driven them to engage with a specific business (BrightLocal, 2017). As a result, online influencers are shifting rapidly to the social domain, making reviews and recommendations a prime driver of choice (Wei & Banjo, 2019). Managing social talk, and specifically, online recommendations, has been found to be paramount for market success (Chevalier, Dover, and Mayzlin 2018; Mayzlin, Dover, and Chevalier 2014; Wang and Chaudhry 2018).

The body of research on e-WOM (electronic word of mouth) generation has focused on examining which characteristics of the reviewer (i.e., the source), consumer (i.e., the audience), and information conveyed (i.e., the content) contribute to the likelihood of consumers acting upon any given recommendation (Cheung and Thadani 2012; Floyd et al. 2014; Hong et al. 2017; King, Racherla, and Bush 2014). A review's perceived helpfulness has been found to increase with a reviewer's perceived reputation and expertise, as well as with his/her similarity to the audience in terms of linguistic style, experience, age, and social status (Banerjee, Bhattacharyya, and Bose 2017; Hernández-Ortega 2018; Racherla and Friske 2012). Review persuasiveness has been found to increase with linguistic depth, word count, attention to details, accuracy, readability, and ability to create involving experiences (Filieri 2015; Hernández-Ortega 2018; Huang et al. 2015; Van Laer et al. 2019; Liu and Park 2015). But many other ways to examine e-WOM remain unexplored (Berger 2014). Specifically, consumers' response to e-WOM may depend not only on static dimensions such as certain review or reviewer's characteristics, but also on more dynamic determinants, such as the degree to which a review prompts consumers to mentally simulate a potential interaction with the reviewer. This research investigates this. In particular, we investigate the psychological phenomenon of "social presence" as an important driver of e-WOM effectiveness (Baym 2015). Social presence has been defined as "the degree of salience of the other person in the interaction […]" (Short, Williams, and Christie 1976); more simply, as "the sense of being with another" (Biocca, Harms, and Burgoon 2003).

Although social presence is highest in face-to-face interactions, social cues (e.g., photos and socially rich texts), which are usually abundant in online reviews (Berger and Buechel 2012; Berger and Schwartz 2011; Wojnicki and Godes 2008), have been shown to often generate a sense of social presence. For instance, social presence can become salient in contexts in which reviewers disclose their name, location, or interests (Xie et al. 2011), show a picture of themselves (Karimi and Wang 2017), express their emotions or use

humour (Fang et al. 2016; Kim and Gupta 2012; Lee, Jeong, and Lee 2017; Li and Zhan 2011), or provide details of personal experiences with products (Mackiewicz 2010). These cues, through stimulating the reader's imagination, create a sense of being in the presence of the reviewer her/himself (Cyr et al. 2007; Hassanein and Head 2007; Naylor, Lamberton, and West 2012; Wei and Chen 2012). We propose that, when reading an online review, consumers may sense that they are in the company of the reviewer and spontaneously engage in an imaginary social interaction with them. As the "sense of being with" the reviewer becomes stronger and the imagined social interaction becomes more salient, the consumer's attitude toward such reviewer would become more favorable, thus, increasing the likelihood of recommendation acceptance.

This paper builds on the e-WOM literature by enhancing our understanding of the effect of social presence (and of the mechanism underlying it) in the acceptance of online reviews/recommendations. It also contributes to the understanding of social presence since, although the imaginary nature of social presence has been previously discussed (Algharabat and Shatnawi 2014; Biocca, Harms, and Burgoon 2003; Hassanein and Head 2007), we provide experimental evidence that imagination is basic in this process and that mental simulation of a potential interaction with the reviewer is the effect's key driver. We conduct five experiments to test our hypotheses that higher perceived social presence fosters mental simulation of the communication with the reviewer, which in turn, improves attitudes toward her/him, ultimately increasing review persuasiveness. Importantly, what lies at the heart of this phenomena is the enhanced visualization of what could have been a face-to-face interaction. This work provides actionable insights for brands, social media managers, and recommendation platforms.

1.1.1. *Mental Imagery and the Elicitation of Social Presence in Online Reviews*

Mental imagery has been defined as the ability to represent something in the mind even though that something is physically absent (Adaval 2018; Kosslyn, Thompson, and Ganis 2006). Relevant for the current research, people form mental images spontaneously in the course of comprehending information, making imagery-related processes relatively automatic (Wyer Jr, Hung, and Jiang 2008). Directly experiencing a product, an image, or a verbal description can prompt the generation of mental representations (MacInnis and Price 1987; Peck, Barger, and Webb 2013). Importantly, these mental representations influence judgment and decision-making in various ways (Bone and Ellen 1992; Dahl, Chattopadhyay, and Gorn* 1999; Jiang, Gerald J Gorn, et al. 2016; Petrova and Cialdini 2005; Unnava and Burnkrant 1991)

Also relevant for the current research, imaginary experiences are grounded in one's own bodily states (Elder and Krishna 2012), are generated from one's own perspective (Adaval 2018), and may be influenced by any cue or concept accessible or applicable at the time (Jiang, Gerald J Gorn, et al. 2016). Because online reviews and recommendations are often driven by self-presentation, rather than altruistic, motives (Berger and Buechel 2012; Berger and Schwartz 2011; Wojnicki and Godes 2008), they tend to include multiple social cues (e.g., human photos, audio, or video; socially rich texts), as these allow for self-disclosure (Fang et al. 2016; Kim and Gupta 2012; Lee, Jeong, and Lee 2017; Li and Zhan 2011). Crucially, these social cues often elicit *a sense of social presence* (Cyr et al. 2007; Gefen and Straub 2003; Hassanein and Head 2007; Kumar and Benbasat 2002; Reeves and Nass 1996; Riegelsberger, Sasse, and McCarthy 2003; Wang et al. 2007). Creating a sense of social presence, as we will argue below, and later demonstrate, facilitates persuasiveness, making the reader of an online review or recommendation more likely to accept it or act upon it. But what is social presence?

The concept of social presence has been variously defined (Vanden Abeele, Roe, and Pandelaere 2007). An early conceptualization defined it as "the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationship" (Short, Williams, and Christie 1976). Importantly, conveying social presence is not limited to face-to-face or even two-way communications, making the construct relevant to online reviews and recommendations. Merely including subtle social cues (Araujo 2018; Cyr et al. 2007; Kim, Suh, and Lee 2013) or changing the manner of speaking (Gunawardena and Zittle 1997) has been shown to generate a sense of social presence in both synchronous and asynchronous (e.g., message boards) communication, with humans as well as machines (e.g., chat-bots).

Critically, in technology-mediated interactions social presence signals "access to another intelligence" (Biocca 1997), and it is sometimes described as the degree to which the other is perceived to be a real person (Gunawardena and Zittle 1997), with "intention" (Biocca, Harms, and Burgoon 2003). While this establishes a baseline, such intentionality can range from mere focused attention (Rice 1993) to a more elaborate relationship dynamic leading some scholars to suggest that social presence represents the observers' modelling of such intentional states (Dennett 1989). Above all, social presence should not be confused with mere co-presence, which refers to the mere awareness (Goffman 1978) or feeling that others are co-situated within an interpersonal environment (Cho and Proctor 2001). Although co-presence may be one component of it, social presence represents a more complex and multi-faceted construct (Vanden Abeele, Roe, and Pandelaere 2007; Nowak and Biocca 2003).

1.1.2. *Social Presence leads to Imagined Interaction*

Consumers have been found to use mental simulation to make different decisions including whether to purchase a product or not (e.g., Anderson 1983; Elder and Krishna 2012; Schlosser 2003). In order to do that, a consumer might try to imagine him or herself actually consuming or interacting with the product. As imaginary experiences tend to be influenced by cues or concepts that are accessible or applicable at the time (Jiang et al., 2016), we propose that online reviews facilitate the imagination of actually interacting with the person providing recommendations to them.

Findings from two related lines of research are consistent with the idea that when reading an online review, a reader may spontaneously take the perspective of the reviewer, mentally simulating being with them. One stream of research suggests that people can spontaneously take the perspective suggested within verbal statements, even imagining themselves in the scene (Black, Turner, and Bower 1979; Jiang et al. 2014; Jiang and Wyer Jr 2009). For instance, in an early experiment consistent with this finding, participants were quicker to understand the statement "While Mary was reading a book in her room, John came in to talk to her" than the statement "While Mary was reading a book in her room, John went in to talk to her" (Black, Turner, and Bower 1979). The reason provided for the difference in comprehension speed was that when reading the first part of the sentence, participants spontaneously built an image of Mary from the perspective of someone who was *inside the room with her*, and this perspective was used to understand the second part of the sentence. When the latter half of the sentence elicited an image of John from the perspective of someone outside the room ("John *went in* to talk to her"), the shift in perspective created interference, slowing down comprehension (Adaval 2018).

In another line of research, subtle manipulations of a product in an advertisement (Elder and Krishna 2012) facilitated mental simulation of interacting with it (see also

Schlosser 2003). For instance, when a spoon in a print ad for cereal was visually depicted on the side of the ad that matched the participant's dominant hand, the degree to which consumers imagined using the product increased, as they could better visualize themselves interacting with it (Elder and Krishna 2012). By the same token, we propose that subtle manipulations to cues within an online review or recommendation may increase perceptions of social presence and facilitate the mental simulation of an interaction with the reviewer.

1.1.3. *Attitudes towards the Reviewer and Recommendation Acceptance*

Prior research has also shown that imagining communicating with someone may lead to building a more favorable attitude towards them, heightening perceptions of similarity between them and the self, leading to a stronger intention to meet them in person (Husnu and Crisp 2010; Turner, Crisp, and Lambert 2007). The "imagined contact" effect can be so powerful, in fact, that it is suggested as a tool for overcoming intergroup conflicts and improving intergroup attitudes (Dixon, Durrheim, and Tredoux 2005; Vezzali et al. 2013). In line with this, we hypothesize that the imaginary social interaction that is facilitated by reviews or recommendations containing cues leading to the formation of a sense of social presence may lead to the perception of the reviewer or recommender as more similar to their self, more trustworthy, and more reliable, generating a more positive attitude towards them.

In addition, the prior research reviewed earlier, which found that subtle manipulations of a product in an advertisement led to increased mental simulation of an interaction with it, also found that the increased mental simulation led to greater purchase intent (Elder and Krishna 2012; Schlosser 2003). We expect something analogous to happen when an individual reads an online review or recommendation containing cues conveying social presence. We expect that the simulated interaction with the reviewer will lead not only to a more positive attitude towards them, but also to an increase in the likelihood to accept their recommendation. We expect this pattern of results to be the case regardless of whether the recommended product is previously favored by the consumer or not. Thus, we propose:

H1: Online reviews that elicit a higher level of social presence are more persuasive in driving recommendation acceptance than reviews that elicit a lower level of social presence.

H2a: Online reviews that elicit a higher level of social presence facilitate imagined interaction with the reviewer to a greater degree than reviews that elicit a lower level of social presence (first mediator).

H2b: As imagined interaction with the reviewer is facilitated, the reader's attitude towards the reviewer improves (second mediator), leading to higher recommendation acceptance.

1.1.4. *Boundary Condition: When Imagined Interaction Fails to Enhance Recommendation Acceptance*

In determining a boundary condition to the effect, we attempt to establish when consumers may *not* be positively motivated to imagine interacting with others. For example, Darren W Dahl, Manchanda, and Argo (2001) found that, in the case of embarrassing products, consumers may prefer not to be seen buying or using them. In their research, the real or imagined presence of others during the purchase or consumption of products became a motivating factor in creating embarrassment for the consumer. Embarrassment is an aversive emotion that consumers typically strive to avoid (Blair and Roese 2013). Thus, we

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expect that when a review features an embarrassing product, cues that elicit a high level of social presence may *not* make the reader more likely to accept the recommendation. That is,

H3: Online reviews that elicit a higher level of social presence will lead to higher recommendation acceptance than reviews that elicit a lower level of social presence in the case of non-embarrassing product categories, but not in the case of embarrassing product categories.

Next, we describe five studies designed to test these hypotheses. The first study used data from the field, whereas the other four were randomized experiments. In all the experiments, social presence was induced via a subtle, yet effective and, crucially, managerially controllable cue, connected to the review's narrative style (Schindler and Bickart 2012).

1.1.5. Overview of Studies

Four studies test our hypotheses that higher perceived social presence improves attitudes toward the reviewer because of the enhanced visualization of what could have been a face-to-face interaction; and a fifth study tests the proposed boundary condition. Study 1 tested our initial hypothesis by investigating whether social presence triggered by online book reviews posted on Goodreads.com was associated with an increased number of likes by Goodreads.com readers. Study 1 provided initial, real-world evidence for our proposed relationship between social presence and positive attitude towards the review. Study 2 was conducted at a university lab. Students tried an online coffee-ordering application prototype. The app displayed a review for a special coffee flavor, written to induce either high or low social presence. The results showed that high (vs. low) social presence led to more positive attitudes towards the reviewer, which increased the likelihood of ordering the recommended coffee. Study 3, conducted online, tapped into the mental imagery process behind the proposed effects of social presence. Through manipulating mental resources, we hindered some participants' ability to generate imagery, pre-empting the hypothesized recreation of an imagined interaction with the reviewer, leading to no effect on the attitude towards the reviewer or on the likelihood of recommendation acceptance. Only when mental resources necessary for imagery generation were unconstrained did the hypothesized pattern of effects emerge. Experiment 4 shed additional light on the role of positive attitude towards the reviewers in the proposed mediation process by manipulating its informational value. If a consumer already likes or wants the item that is being recommended, having a positive attitude towards the reviewer should be inconsequential to their decision of whether to accept the reviewer's recommendation or not. Results showed that, although high (vs. low) social presence significantly enhanced attitudes towards the reviewer, when the recommended product was a previously favored (vs. non-favored) option, positive attitudes failed to predict willingness to accept the recommendation. Finally, experiment 5, also conducted at a university lab, examined the hypothesized boundary condition for the effects of social presence. If the reviewed product is an embarrassing (vs. non-embarrassing) one, a higher sense of social presence should *not* increase the likelihood of recommendation acceptance. The results were consistent with this final hypothesis.

It is worth highlighting that in these experiments, the observed effects are based on just one (experiments 2, 4 and 5) or at most three reviews (experiment 3), which underscores the impact of social presence in the real world: Market statistics show that

consumers read on average 10 online reviews to build trust, with 70% of them reading at least 4 reviews (BrightLocal, 2017).

1.1.6. *Measuring social presence*

One of the main challenges in this research was choosing the right measures for our variables of interest. Unlike other psychological constructs, there is not a well-established measurement of social presence (Biocca, Harms, and Burgoon 2003). Sense of social presence has typically been measured using self-reported scales focusing on the subjective quality of the communication, which is imperative to a sense of another person in mediated communication (Gefen and Straub 2003; Short, Williams, and Christie 1976). Further, to the best of our knowledge, there is only one scale developed to measure the interactive aspect of social presence (Lee and Nass 2003).

In study 1, sense of social presence was measured using three items selected from the scales above to capture both the quality of the communication and imagined interaction. In the subsequent studies, we measured sense of social presence and imagined interaction separately (all the scales are provided in Appendix A). Our primary measure of social presence, which we used in all experiments, is the Likert scale developed by Gefen and Straub (2003). Additionally, in experiments 3, 4, and 5 we included the semantic-differential social presence scale by Short, Williams, and Christie (1976). To simplify reporting in the text, the results with the latter scale are relegated to the appendix (they replicate the results with our primary measure of social presence in all cases).

1.2. Study 1: Field Study – The Persuasive Power of Online Social Presence

Study 1 was designed to provide an initial test, using real-world data, of our hypothesis that online social presence increases persuasiveness of the review (H1). If our hypothesis is true, reviews that elicit a high sense of social presence should facilitate a positive response from readers, such as liking the review or giving it a thumbs-up (following a similar procedure as Labrecque, Swani, and Stephen 2020). To test this, we collected data from Goodreads.com, a growing database of books. Goodreads.com users can rate and review books in addition to other features that the website provides. Relevant to our study, Goodreads.com users can also give their "like" to reviews written by other users.

1.1.1. Data

Our data comprised reviews of the five most read books in the last week of January of 2019, which had an average rating of above four on a 5-star scale, Table 1 - 1. These books were listed on the "Most Read Books This Week" page of Goodreads.com. In addition to the reviews, we also recorded their publication date and the number of received likes, hereafter "review likes".

Table 1 - 1: Descriptive Summary Of The Books Used In The Analysis

Book	Author	Genre	Average Rating	Number of Ratings
Becoming	Michelle Obama	Memoir	4.69	79,796
Where the Crawdads Sing	Delia Owens	Bildungsroman	4.54	68,260
Verity	Colleen Hoover	Thriller	4.51	19,795
Educated	Tara Westover	Biography	4.49	168,060
The Great Alone	Kristin Hannah	Historical Fiction	4.33	164,464

Past research has shown that peripheral cues such as the rating given by the reviewer influence a reader's attitude towards the review (Baek, Ahn, and Choi 2012; Huang et al. 2015; Wang, Wang, and Yao 2019). Thus to control for this extraneous influence, for each book we selected, randomly, 100 reviews from among those that had given a five-star rating. After sorting each book's reviews based on their word count, the top and bottom five were eliminated, resulting in a final collection of 450 reviews (90 per book) with word counts ranging from four to 992 words (M = 214.68, SD = 182.17).

Level of social presence elicited by reviews. To measure the level of social presence triggered by the reviews, each review was rated on a three-item Likert scale (1: Strongly disagree; 7: Strongly agree). These items were adopted from prior research and customized to match the context: "While reading the reviews, I could vividly imagine the reviewer" (Lee and Nass 2005); "I felt a sense of personalness in the reviews" (Gefen and Straub 2003; Qiu and Benbasat 2009); and "I had the feeling that I was interacting with another human being" (Hadi and Valenzuela 2020).

Raters were composed of 462 Prolific Academic users and 96 undergraduates from a large North-American university (193 women, M_{age} = 33.26, SD_{age} = 12.45). Each participant rated two reviews per book, 10 reviews in total, randomly drawn from the set of 450 reviews. Overall, 65% of the reviews were rated by exactly 13 participants, and the rest by 9 to 14 participants, Appendix A - Table 1.

Aside from social presence, we also included a series of control variables. Review word count was included to control for the effect of review length (Mudambi and Schuff 2010; Pan and Zhang 2011). To control for review extremity (Agnihotri and Bhattacharya 2016; Ludwig et al. 2013), we used LIWC software to determine the proportion of words with affective content (Pennebaker et al. 2015; Tausczik and Pennebaker 2010). Review age, calculated as the number of days between review posting and review collection date, was also added (Chen and Lurie 2013). Finally, because some books had more ratings than others, likely due to having been read by more people, we also included book titles as dummy variables. This allowed us to control for the influence of having been read by a larger audience on the number of likes received, Table 1 - 2.

Table 1 - 2: Descriptive Summary Of Variables In The Negative Binomial Regression Model

	Review Likes Count	Review Age	Review Extremity	Review Length	Social Presence
Mean	51.94	148.28	7.62	214.68	4.61
SD	153.53	129.04	4.04	182.17	.78

To test for multicollinearity we checked the inter-correlation matrix and variance inflation factor (VIF) between the variables. Multicollinearity did not seem to be a concerning factor, Appendix A - Table 2. The dependent measure, "review likes count", had a positively skewed distribution characterized by over dispersion (M = 51.94, SD = 153.53, Min = 5, Max = 2152, Skewness = 10.24, Kurtosis = 122.05); therefore, we used a negative binomial regression for the analysis (Gardner, Mulvey, and Shaw 1995; Van Laer et al. 2019; Salehan and Kim 2016; Zhou and Guo 2017). The model's goodness of fit was close to 1 (Deviance/df = 1.16), suggesting that using a negative binomial regression was appropriate.

1.2.1. Results

A social presence score was calculated for each review by averaging the three items (Cronbach's alpha was .70 or larger for 87.6% of the reviews; Appendix A - Table 3). Rather than regression coefficients, we report effect sizes of the independent variables using the incidence rate ratio (IRR), which is the percent change in the incident rate of the dependent variable (i.e., number of likes) due to the independent variables. In comparison to the reference book, Where the Crawdads Sing, reviews of Becoming ($\beta = .45$; $p = .005$; 95% CI [.14, .75]; IRR = 1.56) and Verity ($\beta = .40$; $p = .015$; 95% CI [.08, .71]; IRR = 1.49) received significantly more likes. Educated ($\beta = .31$; $p = .069$; 95% CI [-.02, .63]; IRR = 1.36), and The Great Alone ($\beta = -.04$; $p = .82$; 95% CI [-.40, .31]; IRR = .96) did not receive significantly more likes than the reference book. The effect of review age on the number of review likes was negligible and marginally significant ($\beta = .00$; $p = .09$; 95% CI [.00, .00]; IRR = 1.00), but, in line with previous research, review extremity ($\beta = .03$; $p < .05$; 95% CI [.01, .06]; IRR = 1.04) and review length ($\beta = .003$; $p = .000$; 95% CI [.00, .00]; IRR = 1.003) did. Importantly, as predicted, social presence significantly increased review likes ($\beta = .16$; $p = .016$; 95% CI [.03, .30]; IRR = 1.18), Table 1 - 3.

Table 1 - 3: Review Likes Count – Negative Binomial Regression

Parameter	Coefficient (β)	Wald Chi-Square	95% Wald Confidence Interval		IRR	95% Wald Confidence Interval (IRR)	
			Lower	Upper		Lower	Upper
(Intercept)	1.69***	25.20	1.03	2.35	5.43	2.81	10.52
Book= Becoming	.45**	8.02	.14	.75	1.56	1.15	2.13
Book=Educated	.31	3.31	-.02	.64	1.36	.98	1.89
Book=Verity	.40*	5.98	.08	.71	1.49	1.08	2.04
Book= The Great Alone	-.04	.05	-.40	.31	.96	.67	1.37
Review Length	.00	2.88	.00	.00	1.00	1.00	1.00
Review Extremity	.04*	5.96	.01	.06	1.04	1.01	1.07
Review Length	.00***	95.38	.00	.00	1.00	1.00	1.00
Social Presence	.17*	5.86	.03	.30	1.18	1.03	1.35
Likelihood Ratio Chi-Square=196.446; $p = .000$							
* Significant at the .05 level, ** Significant at the .01 level, *** Significant at the .001							

1.2.2. Discussion

Study 1 tested the relationship between social presence and attitude towards the review using data from the field. After controlling for other relevant variables, consistent with our hypothesis, social presence significantly predicted review likes, a proxy for positive attitude towards the review. In order to establish a causal relationship, in the following studies we took an experimental approach.

1.3. Study 2: Attitudes towards the Reviewer

Study 2 provided an initial experimental test of our model in the lab. Social presence (high vs. low) was manipulated between subjects, and its direct and indirect effects (through positive attitude towards the reviewer) on the likelihood of accepting the recommended product were tested.

For this study, we created an online coffee-ordering application prototype, named CooCa, where participants supposedly had to place an order for Starbucks VIA instant coffee. Participants were 223 undergraduates (97 women; 84.3% 18-24 years old) that took part in exchange for course credit. The app first showed participants the four flavors that

were available in the collection: Chocolate, Caramel, Vanilla, and Spice, and then provided "CooCa's recommended coffee of the day," a randomly selected review of one of the four flavors by an unknown coffee enthusiast.

Social presence was manipulated by varying the review's narrative style. Previous research has shown that personal pronouns increase the perception that the other agent is involved in the interaction (Labrecque, Swani, and Stephen 2020; Packard, Moore, and McFerran 2018). Reviews in the high vs. low social presence conditions were identical except for the narrative style: In the high social presence condition they were written in first-person narrative style, whereas in the low social presence condition they were written in objective narrative style (samples in Appendix A - Figure 1). After reading the review, participants completed measures of recommendation acceptance, social presence, positive attitude towards the reviewer, and coffee drinking habits.

1.3.1. Measures

Participants indicated the likelihood of ordering the recommended coffee on the following item: "How likely is it that you would order this coffee?" (1: Extremely unlikely; 7: Extremely likely). Social presence was measured using four items adopted from Gefen and Straub (2003); e.g., I felt a sense of human contact when reading the review, see Appendix A - Table 4. Attitudes towards the reviewer were measured using two items, "I felt favorably towards the reviewer," and "I felt positive about the reviewer" (1: Strongly disagree; 7: Strongly agree). Overall coffee-drinking habit, Starbucks visiting frequency, and online food ordering experience were measured by asking participants how often they drink coffee, visit Starbuck, and order food online (1: Never; 7: Very often).

A screening question was included, at the end, to eliminate participants who had had Starbucks VIA coffee previously. Firstly, participants had been told that Starbucks VIA coffee was espresso coffee, but in reality, it is instant coffee. An additional reason for excluding participants who had experienced Starbuck's VIA coffee before was that someone's preference for a product with which they are familiar tends to be stable (Coupey, Irwin, and Payne 1998; Kramer 2007), making it difficult to change it. Indeed, people with task-relevant knowledge and experience tend to discount advice (Bonaccio and Dalal 2006); aligned with this, recommendation agents have been shown to be less effective for consumers with product expertise (Murray and Häubl 2009; Xiao and Benbasat 2007).

1.3.2. Results

Fifty-four participants who had experienced Starbucks VIA instant coffee were excluded, leaving 168 participants for analysis. Composite scores were calculated for social presence ($\alpha = .87$) and attitude towards the reviewer ($r = .81$; $p = .000$). Social presence was successfully manipulated (M $_{high}$ = 4.78, SD $_{high}$ = 1.33; M $_{low}$ = 4.21, SD $_{low}$ = 1.21; t(166) = 2.91; p = .004; 95% CI [.18, .96]). Participants in the high social presence condition exhibited a higher likelihood of ordering the recommended coffee (M = 5.01, SD = 1.74) than participants in the low social presence condition (M = 4.46, SD = 1.91; t(166) = 1.95; p = .053; 95% CI [-.01, 1.10]). There was no interaction between social presence and the recommended coffee flavor (F(3, 160) = .99; p = .40), Appendix A - Table 6. Furthermore, and consistent with our hypothesis, social presence positively impacted attitudes towards the reviewer (M high = 5.25, SD high = 1.09; M low = 4.91, SD low = 1.12; t(166) = 2.00; p = .047; 95% CI [.00, .68]). As a robustness check we did an ANCOVA using coffee-drinking habit, Starbucks visiting frequency, and online food ordering experience as covariates. From the three covariates only online food ordering experience was a significant

predictor of the likelihood of ordering the recommended coffee and the main result did not differ (the result is summarized in Appendix A).

Next, we conducted a mediation analysis (Hayes, 2009), to test whether positive attitude towards the reviewer mediates the effect of social presence on the likelihood of ordering the coffee. Bootstrapping results (n = 5000) supported this mediation pattern (Indirect Effect = .29; SE = .15; 95% CI [.01, .60]), Appendix A - Table 7.

1.3.3. Discussion

Study 2's results provide experimental support for H1 and H2b. Increasing social presence by the subtle manipulation of changing the review's narrative style positively impacted the likelihood of ordering a coffee flavor recommended at random. This was shown to be mediated by a more positive attitude towards the reviewer. It is important to note that the observed effect size was between medium and small (Cohen's d = .3), which is quite impressive considering that taste is the most important factor in food choice (Glanz et al. 1998) and that there is an innate reluctance towards novel flavors (McFarlane and Pliner 1997).

Although study 2 provides experimental support for some key elements in our model, our proposed process requires capturing the "extent of imagined interaction" in order to be able to test H2a. Study 3 does that and tests the full two-step process. It also accounts for other dimensions of the positive attitude construct, namely similarity, trust, and perceived expertise (Bonaccio and Dalal 2006; Faraji-Rad, Samuelsen, and Warlop 2015; Feng and MacGeorge 2010; Wilson and Sherrell 1993), by using a more comprehensive scale.

1.4.   Study 3: Mediating Role of Ability to Imagine Interaction

In study 3, we had two goals. First, we replicated the results of experiment 2 in a different context (Travel reviews) and increased the conservativeness of the test by examining the likelihood of accepting a recommended item declared as non-favoured. Second, we tested the hypothesized imagery-based nature of the process underlying the effect of social presence on recommendation acceptance.

To test the imagery nature of the underlying process, we relied on the mental imagery literature. Forming mental images based on verbal information involves both visual processing and semantic processing (Baddeley 1992; Jiang and Wyer Jr 2009), thus requiring availability of both the visuospatial sketchpad and the phonological loop components of working memory (Baddeley 1992). If either of these two working memory components is constrained, the generation of mental images is impaired. If the elicitation of social presence involves mental imagery, constraining either of the two working memory components should prevent a social presence manipulation from influencing the extent of imagined interaction, the consequent improvement of the attitude towards the reviewers, and finally the likelihood of accepting their recommendation. That is, under constrained mental resources we should see no effects at all of the social presence manipulation across the proposed two-step process.

A potential competing outcome of restraining mental resources on consumer preferences should be noted. Prior research has shown that restraining a consumer's mental resources may disrupt their ability to access self-goal information, reducing the anticipated negative emotion from trading off something of personal importance (Drolet and Luce 2004). By this account, thus, restraining mental resources should *increase* the positive effect of the social presence manipulation on recommendation acceptance. However, if in

spite of this countering influence we were to observe a null effect of the social presence manipulation on recommendation acceptance in the restrained cognitive resources conditions, this would be strong evidence for our hypothesis that the elicitation of a sense of social presence hinges on an imagery process.

Three-hundred and thirteen Prolific Academic participants (176 female; 3 with unidentified gender; M $_{age}$ = 33.5, SD $_{age}$ = 12.3) were randomly assigned to one of the six conditions of a 3 (working memory capacity: unconstrained vs. verbal-load vs. visual-load) × 2 (social presence: high vs. low) between-subjects design. The verbal-load and visual-load manipulations made up for the second level of working memory factor, namely constrained working memory.

Participants first filled out a "travelling preference survey" in which they had to rank-order four travelling styles according to their preference: "foodie," "nature," "culture," and "nightlife-seeking." This was done so that later, when participants were shown reviews of a city described as a highly recommended destination, the reviews featured the travelling style that the participant had ranked in third place, ensuring that the recommendation featured an option declared as non-favored.

In the unconstrained working memory conditions, participants then received three online reviews (in either a high or low social presence format, depending on condition). To pre-empt a potential effect of familiarity, the recommended destinations were chosen from central and eastern European cities not listed in the "Top 100 City Destinations Ranking" (Bremner 2016): Belgrade (nightlife-seeking), Rijeka (nature), Tbilisi (foodie), and Torun (culture). For each travelling destination, two sets of reviews were developed: one written in first-person narrative format (High Social Presence; see Appendix A - Figure 2 for samples), and the other one written in objective narrative format (Low Social Presence; see Appendix A - Figure 3 for samples).

In the constrained working memory conditions, the working memory capacity manipulation was introduced right before showing participants the reviews. In the verbal-load conditions, participants were asked to memorize a 10-digit number just before reading the reviews, and recall it afterwards (Jia et al. 2017; Shiv and Huber 2000). In the visual-load conditions, participants had to memorize a 5×5 grid with an "X" in 10 of the cells just before reading the reviews, and reconstruct it afterwards (Jiang et al. 2015), Appendix A - Figure 4.

After reading the reviews, all participants indicated their likelihood of travelling to the recommended destination, and completed the scales measuring imagined contact with the reviewer, social presence, and positive attitude towards the reviewers. Participants also indicated their travelling attitude and traveling habit.

1.4.1. Pre-test

We ran a pre-test to pre-empt three potential concerns. First, travel reviews are very conducive to narrative transportation, as the reviewer tends to walk the reader trough his/her experience using storytelling (Van Laer et al. 2019). Narrative transportation can be persuasive by creating a positive attitude towards the story (Argo, Zhu, and Dahl 2007; Escalas 2004; Green and Brock 2000). If the different social presence conditions were to induce different levels of narrative transportation, we might see increased recommendation acceptance because of a reader transporting to the setting described in the review and enjoying the story more, and not necessarily because of an increased level of perceived social presence. To prevent differences in narrative transportation between conditions, we made sure that review content resembled an enumeration of features (Hamby, Daniloski,

and Brinberg 2015), to avoid it reading like a sequence of events (Graesser, Singer, and Trabasso 1994).

Second, using objective narrative style as we do in the low social presence condition could also affect perceptions of the reviewer's credibility and of the review's informational value. Deceivers have been found to use first person narrative less frequently in order to distance themselves from the receiver (Hauch et al. 2015; Newman et al. 2003). Also, reviews from sources with low credibility are perceived to be less informative and helpful, and are less likely to be taken into account in the final decision (Filieri 2015). To prevent possible credibility differences between the high and low social presence conditions in this experiment, an introductory text asked participants to think of the reviews as written by TripAdvisor "star" reviewers recognized by the TripAdvisor community. Finally, as the level of emotional valence elicited can also affect product preferences (e.g., Kim, Park, and Schwarz 2009), we also measured review pleasantness.

One-hundred and twenty Prolific Academic online participants (77 Women; M_{age} = 33.10; SD = 11.46) took part in this pre-test. They were randomly assigned to one of eight conditions: 2 (Social presence: High vs Low) x 4 (Travelling destination: Belgrade, Rijeka, Tbilisi, and Torun). After reading the reviews, participants completed the same social presence measure as in main study of this experiment. Narrative transportation was measured using a 3-item scale adopted from Green and Brock (2000). Perceived credibility was assessed with three items measuring credibility, informativeness, and helpfulness of the reviews (All items in Appendix A - Table 9). A final item measured review pleasantness (1: Unpleasant - 7: Pleasant).

Perceived social presence (α = .88), narrative transportation (α = .90), and credibility (α = .81) scores were computed by averaging over the respective scale items. Social presence was significantly higher in the high (M = 5.35; SD = 1.03) compared to the low social presence condition (M = 4.62; SD = 1.29; t(118) = 3.46; p = .000; 95% CI [.31, 1.16]), regardless of the recommended destination (F(3, 112) = .29; p = .83). Narrative transportation was not significantly affected by the social presence manipulation (M $_{high}$ = 4.90, SD $_{high}$ = 1.26; M $_{low}$ = 4.53, SD $_{low}$ = 1.39; t(118) = 1.53; p = .13; 95% CI [-.11, .85]). Reviewer credibility (M $_{high}$ = 5.51, SD $_{high}$ = .90; M $_{low}$ = 5.44, SD $_{low}$ = 1.09; t < 1), review pleasantness (M $_{high}$ = 5.77, SD $_{high}$ = 1.44; M $_{low}$ = 5.62, SD $_{low}$ = 1.19; t < 1), and reading time (M $_{high}$ = 46.05 sec; SD $_{high}$ = 40.74; M $_{low}$ = 41.60; SD $_{low}$ = 21.40; t < 1) were also unaffected by the manipulation. Based on these results, we concluded that the reviews created for study 3 were suitable for testing the hypothesized mediation.

1.4.2. Measures

Participants indicated their willingness to take the recommendation on two items: "Would you take this recommendation?" (1: Definitely Not; 7: Definitely Yes), and "How likely is it that you would choose [recommended city name] as your travel destination?" (1: Extremely Unlikely; 7: Extremely likely).

The extent of "imagined interaction" was measured with five items. The first four were adopted from a scale developed in the human-computer interaction literature to capture the social aspect of co-presence (Lee and Nass 2003), with a fifth added to reiterate the "interactive" aspect of the construct, Appendix A - Table 10. Social presence was measured using the same items as in study 2, together with the semantic-differential scale by Short, Williams, and Christie (1976); as mentioned earlier, all analyses using this scale are reported in Appendix A.

Finally, we added six new items to the ones used in study 2 to measure the general feeling of "liking" the person. The new items add dimensions identified in the literature as relevant to the construct of "attitude towards the reviewer:" Perceived similarity towards the reviewers (Faraji-Rad, Samuelsen, and Warlop 2015), trust, perceived expertise, and willingness to meet with the reviewers face-to-face (Bonaccio and Dalal 2006; Feng and MacGeorge 2010; Wilson and Sherrell 1993). For the items see Appendix A - Table 11.

Participants also indicated their traveling attitude and travelling habit by answering how important travelling was to them (1: Not at all important, 7: Extremely important) and how often they travelled (1: Very rarely, 7: Very frequently).

Results. Participants who failed to correctly recall at least 30% of the 10-digit number (N = 12) or of the positions of the "X's" on the grid (N = 7) were excluded (Gilbert and Hixon 1991; Wentzel, Tomczak, and Herrmann 2010). Composite scores were calculated for social presence (α = .82), imagined interaction (α = .78), attitude towards the reviewer (α = .88), and likelihood of recommendation acceptance (r = .83; p = .000). The results including these dropped partcipants is in Appendix A.

1.4.3. Results

In the unconstrained working memory conditions, the social presence manipulation was effective (M $_{low}$ = 4.52, SD $_{low}$ = 1.28; M $_{high}$ = 5.08, SD $_{high}$ = .89; t(104) = 2.64; p = .012; 95% CI [.13, .99]). However, consistent with our expectation, the social presence manipulation failed to produce differences in perceived social presence when there was a working memory constraint (verbal load condition: M $_{low}$ = 4.51, SD $_{low}$ = 1.19; M $_{high}$ = 4.64, SD $_{high}$ = 1.05; t < 1; visual load condition: M $_{low}$ = 4.68, SD $_{low}$ = 1.30; M $_{high}$ = 4.84, SD $_{high}$ = 1.09; t < 1). The type of working memory load did not affect perceived social presence at all (main effect: F(1, 184) = 1.18; p = .278; interaction: F(1, 184) = .01; p = .931). Thus, we collapsed the visual and verbal load conditions into a single 'constrained working memory' condition for the subsequent analyses.

A two-way ANOVA with recommendation acceptance likelihood as dependent variable and social presence (high/low) and working memory capacity (unconstrained/constrained) as independent variables showed a main effect of social presence (F(1, 290) = 3.90; p = .049). Working memory capacity did not affect recommendation acceptance by itself (F(1, 290) = 2.75; p = .10), but, consistent with expectations, it did interact significantly with working memory capacity (F(1, 290) = 4.54; p = .034). Planned contrasts showed that when working memory was unconstrained, high social presence increased recommendation acceptance likelihood (M $_{low}$ = 4.62, SD $_{low}$ = 1.42; M $_{high}$ = 5.25, SD $_{high}$ = 1.07; t(290) = 2.56; p = .011). However, when working memory was constrained, it did not (M $_{low}$ = 5.21, SD $_{low}$ = 1.32; M $_{high}$ = 5.18, SD $_{high}$ = 1.20; t(290) < 1). We also included travelling habit and travelling attitude as covariates in the analysis, travelling attitude significantly predicted recommendation acceptance likelihood (F(1, 288) = 7.03; p = .008), the rest of the findings remained unchanged, Appendix A.

We found the same pattern of results for the two mediators. An ANOVA with the first mediator, imagined interaction, as dependent variable and social presence and working memory capacity as independent variables yielded no significant main effects of either social presence (F(1, 290) = 2.51; p = .11) or working memory capacity (F(1, 290) = 2.01; p = .16). However, the two factors' joint influence was significant (F(1, 290) = 3.73; p = .055). Planned contrasts confirmed that only in the unconstrained working memory condition did the social presence manipulation affect the extent of imagined interaction (M

low = 4.24, SD low = 1.06; M high = 4.73, SD high = 1.00; t(290) = 2.20; *p* = .029). When working memory was constrained, the social presence manipulation had no effect (M low = 4.31, SD low = 1.25; M high = 4.27, SD high = 1.12; t(290) < 1).

In the case of the second mediator, there was a statistically marginal main effect of the social presence manipulation on attitude towards the reviewers (F(1, 290) = 2.97; *p* = .086), but no main effect of working memory capacity (F(1, 290) = .00; *p* = .97). Importantly, however, both factors' joint influence was significant (F(1, 290) = 3.74; *p* = .054). Consistent with expectations, planned contrasts showed an increase in the attitude towards the reviewers in the high social presence condition relative to the low social presence condition only when working memory was unconstrained (M low = 4.37, SD low = 1.04; M high = 4.80, SD high = .76; t(290) = 2.28; *p* = .023). When it was constrained, attitude towards the reviewers did not vary as a function of the social presence manipulation (M low = 4.60, SD low = 1.09; M high = 4.58, SD high = .90; t(290) < 1).

Finally, we conducted a moderation-serial mediation analysis using PROCESS v3.3 model 83 (Appendix A - Figure 5; Hayes, 2012, 2017) to test our hypotheses. Bootstrapping tests (5,000 resamples) indicated that the hypothesized indirect effect through the two serial mediators (extent of imagined interaction and attitude towards the reviewer) was significantly moderated by whether working memory capacity was constrained or not (Index of moderated mediation = -.25; SE = .13; 95% CI [-.52, .00]). That is, when working memory was unconstrained, the influence of social presence on recommendation acceptance likelihood was serially mediated by imagined interaction with the reviewer, followed by increased attitudes towards them (Indirect effect = .22; SE = .10; 95% CI [.04, .43]). This mediating pattern did not hold when working memory was constrained (Indirect effect = -.03; SE = .09; 95% CI [-.20, .14]), for the mediation analysis see Appendix A - Table 14.

1.4.4. *Discussion*

Study 3 tested the mental imagery nature of the process hypothesized to underlie the effect of social presence on willingness to accept an online recommendation. Consistent with our hypothesis that the elicitation of a sense of social presence by an online review involves imagery, we showed that when the ability to imagine was constrained (vs. unconstrained), the social presence manipulation failed to affect social presence perceptions, thus failing to affect the extent of imagined interaction, attitudes towards the reviewers, and recommendation acceptance likelihood. We further showed that the positive effect of social presence on recommendation acceptance is serially mediated by imagined interaction with the reviewer and positive attitude towards the reviewer.

In study 3, we increased the conservativeness of the test by recommending participants an option that they actually disliked. Study 2's results were replicated under these more astringent conditions. In sum, social presence seems to be quite persuasive as participants were more likely to accept a recommendation even for a disliked option.

1.5. Study 4: Manipulating the Informativeness of "Positive Attitude towards Reviewer"

Study 4 aimed to provide additional experimental evidence of the mediation process, specifically of the second mediator, attitude towards the reviewer. We achieved this by manipulating its relevance in the decision to accept the recommendation. Based on the finding that people tend to seek the advice of others when they are uncertain about a problem, not when they are certain (Gino, Brooks, and Schweitzer 2012; Gino and Moore 2007), study 4 varied participants' preferences for the recommended option: some participants were recommended an option that they (already knew that they) liked, and others were recommended an option that they disliked. We expected that attitudes towards the reviewer (or recommender in this case) would only influence recommendation acceptance when the advocated product was a non-favored one; when the advocated product was a favored one, we expected attitudes towards the recommender to be non-influential.

Because such a design may raise concerns about creating a ceiling effect for accepting the recommendation featuring the favored (vs. non-favored) option, in all conditions the advocates of the recommended product were members of an out-group. We know from previous research that there is a tendency to diverge from outgroup-advocated products (Berger and Heath 2007), so using outgroup advocates should aid in reducing the ceiling effect. Moreover, this design will help provide strong evidence for the persuasive power of social presence (i.e., if it is found to increase the chance of accepting a non-favored option even when recommended by outgroup advocates).

Two-hundred and two Prolific Academic participants (133 female; 3 with unidentified gender; $M_{age} = 33.65$, $SD_{age} = 11.66$) were randomly assigned to one of two between-subjects conditions (recommended book type: most favourite; least favourite). Social presence was measured, and included as a continuous factor in the analyses.

The study's objective was supposedly to test a beta version of an upcoming online book club app. Participants first logged into the online book-club mock-up app by choosing their avatar from a set of options. Then they completed several questions about personal and social attitudes. Among the various questions they were asked, two items measured their "literary preferences" for two book attributes: genre (romance; crime; fantasy) and author type (established author; emerging author). Unbeknownst to them, this information was used later for the most vs. least favourite product manipulation.

The personal and social attitudes survey's objective was purportedly to match participants with similar opinions and tastes, to form reading groups. Supposedly, there were three reading groups with 12 members each: the Raccoons, the Parrots, and the Koalas. Based on their answers to the survey, they fit the Raccoons reading group. To further promote in-group feelings, participants' avatar and the Raccoons' logo were displayed at the top of every screen throughout the remainder of the study.

Participants were next informed that their task was to select a book for their upcoming reading club meeting. At that point, a personalized book recommendation popped up, suggesting a book that either matched very well or that did not match at all their literary preferences. In both conditions, the recommendation was endorsed by members of an out-group, the parrots. For instance, if a participant had chosen "fantasy" and "emerging author" as his or her least (most) favourite genre and author type, in the least-favourite (most-favourite) recommended book type condition they would read:

"People in one of the other groups (the Parrots) favoured the book below, and would recommend it to you too. Please consider it as a recommendation." Following this, participants reported their willingness to accept the recommendation, and completed the imagined interaction, social presence, and attitude towards the recommender scales.

In this study, participants did not see a synopsis of the recommended book; they were just shown a picture of its cover with the genre and author type below it. Because the book cover design could influence their likelihood of accepting the recommendation, we measured how appealing they found it, as well as whether they had read the book previously. We also asked participants to state whether they had found the recommendation realistic, because receiving a recommendation that matches one's least-favorite characteristics might have seemed unrealistic to at least some, affecting their likelihood of accepting it. Finally, they reported their book reading habits, online book purchase experience, and basic demographic variables.

1.5.1. Pre-test

The outgroup manipulation was pre-tested to ensure its effectiveness. Two-hundred and six Prolific Academic participants (132 women, $M_{age} = 35.67$, $SD_{age} = 9.94$) completed the pre-test together with an unrelated study for another project. After completing the survey about their personal and social attitudes, participants were shown the logos and slogans of the three groups (Raccoons, Parrots, and Koalas) and were asked to imagine that based on their responses they had been classified in the Raccoons reading group (i.e., their in-group). Then, after completing the unrelated study, participants indicated their agreement with three statements measuring their attitudes towards in-group and out-group members: "I felt favorably about members of the 'Racoons' (Parrots) group;" "I think members of the 'Raccoons' (Parrots) group share similar preferences with me;" and "I think I have very much in common with other members of the 'Raccoons' (Parrots) group" (1: Strongly disagree; 7: Strongly agree). These three items were averaged to create an in-group ($\alpha = .88$) and out-group ($\alpha = .91$) attitude score. The grouping task was effective in creating in-group-outgroup distance: Participants favored in-group members ($M = 5.08$, $SD = 1.16$) significantly more than out-group members ($M = 4.06$, $SD = 1.32$; $t(205) = 9.15$, $p = .000$).

1.5.2. Measures

Willingness to accept the recommendation was measured by a two-item 9-point semantic differential scale anchored by "I'm not willing to pick this book at all" vs. "I'm very much willing to pick this book;" and "I'm not taking the recommendation at all" vs. "I'm absolutely taking the recommendation." We used a 9 point scale (instead of previously 7-point scale) to increase score variance due to the concern about ceiling effects in the favoured book recommendation condition.

Imagined interaction, social presence, and attitude towards the recommenders were measured with the same scales as in experiment 3. Book cover appeal was measured by having participants rank the six book covers used in this study (of which each participant had seen only one). Realism of the recommendation process (1: Very artificial, 7: Very realistic), book reading habit (1: Never; 7: Everyday), and online book purchase experience (1: Never, 7: Many times) were all measured with one item.

1.5.3. Results

Ten participants who had read the recommended were excluded. Composite scores for social presence (α = .88), imagined interaction (α = .80), attitude towards the recommenders (α = .90), and willingness to accept the recommendation (r = .88; p = .000) were obtained by averaging the respective scale items.

Unsurprisingly, the likelihood of accepting the recommendation was higher when it featured the most compared to the least favorite book option (M $_{most}$ = 6.79, SD $_{most}$ = 1.69; M $_{least}$ = 4.05, SD $_{least}$ = 2.16; t(170.33) = 9.71; p = .000; 95% CI [2.19, 3.29]). The same pattern was found for attitudes towards the recommenders (M $_{most}$ = 4.54, SD $_{most}$ = .88; M $_{least}$ = 3.87, SD $_{least}$ = 1.04; t(190) = 4.89; p = .000; 95% CI [.14, .77]), perceived social presence (M $_{most}$ = 4.43, SD $_{most}$ = 1.23; M $_{least}$ = 3.93, SD $_{least}$ = 1.37; t(190) = 2.63; p = .009; 95% CI [.12, .86]), and imagined interaction (M $_{most}$ = 4.26, SD $_{most}$ = 1.10; M $_{least}$ = 3.80, SD $_{least}$ = 1.11; t(190) = 2.84; p = .005; 95% CI [.14, .77]). We did not a-priori expect this pattern for the latter two variables. However, it may be explained when looking at the pattern of perceived realism of the recommendation process: Participants who were recommended their most favorite book type perceived the recommendation process as more realistic than the participants who were recommended their least favorite book type (M $_{most}$ = 4.42, SD $_{most}$ = 1.60; M $_{least}$ = 3.86, SD $_{least}$ = 1.62; t(190) = 2.36; p = .020; 95% CI [.09, 1.03]). Likely, the lower realism of the recommendation process in the least favorite condition attenuated perceived presence of the recommenders (and thus imagined interaction with them).

We had hypothesized that if attitude towards the recommenders has a mediating role in the relationship between social presence and recommendation acceptance likelihood, its effect would dissipate when attitude towards the recommender is not informative to the decision. To test this hypothesis, we conducted a moderation-serial mediation analysis using PROCESS v3.3 model 87 (Appendix A - Figure 7; Hayes, 2012; 2017) with social presence as independent variable, imagined interaction as the first mediator, attitude towards the recommenders as the second mediator, and recommended book (least favourite = 0, most favourite = 1) as the moderator of the relationship between attitude towards the recommenders and likelihood of accepting the recommendation. Attractiveness of the recommended book's cover was included as a covariate.

The analysis showed the hypothesized moderated mediation (Moderated Mediation Index = -.19; SE = .08; 95% CI [-.36, -.04]). That is, positive attitude towards the reviewers mediated the effect of imagined interaction on likelihood of recommendation acceptance only when the recommended book was of the least favorite type (Indirect Effect = .22; SE = .07; 95% CI [.10, .39]). When the recommended book was of the most favorite type, the mediation was no longer statistically significant (Indirect Effect = .04; SE = .07; 95% CI [-.09, .17]), Appendix A - Table 16. The result remained the same after including book reading habit, online book purchase experience and perceived realisticness as the covariates, Appendix A.

1.5.4. Discussion

Experiment 4 was designed to provide convergent experimental evidence of the hypothesized process, in particular, of the effect of the second mediator (attitude towards the reviewer/recommender) on our outcome variable. We based the design of this study on prior research findings showing that an individual's attitude towards a recommender matters in their decision to accept a recommendation only when they are uncertain about what to do (Gino, Brooks, and Schweitzer 2012; Gino and Moore 2007). By manipulating whether the recommended book matched vs. failed to match each participant's previously declared literary preferences, we made the attitude towards the recommender(s)

informative vs. uninformative to the decision of whether to accept the recommendation or not. Consistent with our expectation, the results showed that attitudes towards the reviewer/recommender only matters as part of the proposed sequential process when there is uncertainty about how well the recommendation represents participants' preferences.

1.6. Study 5: Embarrassing Products in the Presence of an Imagined Reviewer

Our theoretical model proposes that reviews that elicit a sense of social presence prompt imagination of interacting with the reviewer, and that this drives the higher likelihood of recommendation acceptance. Study 3 demonstrated that mental imagery is indeed involved, although it did not speak as to the content of the mental imagery. Study 5 gets at the content of the mental imagery process that we hypothesize underlies the effect of social presence.

The real or imagined presence of others during the purchase of so-called embarrassing products (e.g., condoms and adult diapers) has been shown to generate a significant level of embarrassment (Dahl, Manchanda, and Argo 2001). Embarrassment is an aversive emotion, and consumers employ different coping mechanisms to mitigate it. One documented mechanism is avoidance behavior; for example, avoiding purchasing the embarrassing product altogether (Blair and Roese 2013). Considering these prior findings, if it is true that high perceived social presence prompts imagination of interacting with the reviewer, an online recommendation for an embarrassing product eliciting a high sense of social presence should not increase recommendation acceptance.

Participants were 356 undergraduate students (205 Female, M_{age} = 18.63, SD_{age} = .81) from a large European university subject pool. Two factors, Social Presence (high vs. low) and Product Type (non-embarrassing vs. embarrassing) were varied between subjects.

On arrival at the lab, participants were led to a large room with panel-separated, computer-equipped desks. On-screen instructions guided them throughout the study, but a study assistant was in the room the entire time, in case they had questions.

Participants would be asked to imagine that they were considering buying a certain type of product. In the non-embarrassing product condition, the product was a "latex wine bottle cap," and in the embarrassing product condition, the product was a "latex condom." (Being similar in terms of their features and application, these two products allowed us to vary the embarrassment level while keeping the review content identical, which helped us pre-empt potential alternative explanations of our results.) After reading a review for an unknown brand of the product they had been randomly assigned, participants indicated their likelihood of purchasing it. Next, participants reported their level of embarrassment when buying that product, as well as basic demographics.

Social presence was manipulated as in the previous experiments by varying the review's narrative style.

1.6.1. Pre-test

We ran a pretest to verify that the narrative style manipulation influenced social presence perceptions in the expected way. Two-hundred and two prolific academic users (128 female; M_{age} = 35.08, SD_{age} = 12.88) read a review for an unknown brand of condom, either in first person or in objective narrative format (sample in Appendix A - Table 19). Social presence was then measured using the same items as in the previous studies. The

review written in first person narrative format elicited higher perceived social presence (M = 4.93; SD = 1.07) than the review written in objective narrative format (M = 4.46; SD = 1.37; t(183.02) = 2.67; p = .008; 95% CI [.12, .81]), confirming that the manipulation worked as intended.

1.6.2. Measures

Participants indicated their willingness to take the recommendation by answering: "Would you take this recommendation?" (1: Definitely not, 7: Definitely Yes) and "How likely is it that you buy this product?" (1: Extremely unlikely, 7: Extremely likely). One item measured their level of embarrassment when buying latex condom/wine cap (1: "I do not feel embarrassed in the least" vs. 7: "I feel totally embarrassed"). The study ended with a basic demographic survey.

1.6.3. Results

Confirming that the product embarrassment level manipulation worked, participants reported feeling more embarrassed about buying condoms (M = 3.57; SD = 1.89) than about buying latex wine caps (M = 2.40; SD = 1.71; t(351.27) = 6.14; p = .000; 95% CI [.80, 1.55]).

Given that condoms are not gender-neutral, we included gender as a factor in our analysis. The result of a 3-way ANOVA showed significant main effects of product type (F(1, 348) = 22.30; p = .000) and gender (F(1, 348) = 4.54; p = .034), but not of social presence (F(1, 348) = .015; p = .904). The expected 2-way interaction between product type and social presence was only marginally significant (F(1, 295) = 2.81; p = .094). However, the 2-way interaction between gender and social presence (F(1, 295) = 4.88; p = .028), and the 3-way interaction between gender, product type, and social presence were significant (F(1, 295) = 4.53; p = .034).

Post-hoc comparisons revealed that male participants were more likely to accept the recommendation for the non-embarrassing product, when social presence was high (M = 5.37; SD = 1.19) than when it was low (M = 4.51; SD = 1.76; p = .004; 95% CI [.28, 1.44]), replicating previous experiments' results. However, consistent with our expectation, social presence failed to increase recommendation acceptance for the embarrassing product (M $_{high}$ = 5.71; SD $_{high}$ = .99; M $_{low}$ = 5.92; SD $_{low}$ = .94; p = .502; 95% CI [-.67, .14]). These results did not replicate for female participants, however: Social presence failed to affect likelihood of accepting the recommendation for either the non-embarrassing product (M $_{high}$ = 5.27; SD $_{high}$ = 1.56; M $_{low}$ = 5.63; SD $_{low}$ = 1.29; p = .174; 95% CI [-.87, .16]) or the embarrassing product (M $_{high}$ = 5.79; SD $_{high}$ = 1.30; M $_{low}$ = 6.02; SD $_{low}$ = 1.12; p = .368; 95% CI [-.81, .40]; Appendix A - Table 20).

1.6.4. Discussion

This experiment provided further evidence of the role of visualizing the presence of another human when social presence increases. We chose a setting where presence of others would hinder the appeal of the product. In doing so, we identify a boundary condition of our proposed effect, namely that when the product type is embarrassing, increasing social presence has no incremental effect on the probability of accepting the reviewed product. We found the proposed effect only for the male participants. One explanations for this gender specific finding is that the used products in this study are more relevant to men than to women. Universally, men are more involved in alcohol consumption than women (Wilsnack et al. 2009) and condoms are mainly used by men.

Relevance is an important predictor of engagement with persuasive information (Campbell and Wright 2008; Drossos and Giaglis 2005; Pechmann and Stewart 1990). So, the male specific products in this study might have desensitized female participants to the manipulation.

1.7. General Discussion

This paper builds on the e-WOM literature by expanding our understanding of the effect of social presence in the acceptance of online recommendations, and of the mechanism underlying its persuasive effect. We provide experimental evidence that mental simulation of an interaction with the reviewer is a key driver of the effect. We conduct five experiments to test our hypotheses that higher perceived social presence fosters an enhanced visualization of the communication with the reviewer, which, in turn, improves attitudes toward her/him, ultimately increasing review persuasiveness.

Although social presence is highest in face-to-face interactions, social cues (e.g., photos and socially rich texts), which are usually abundant in online reviews (Berger and Buechel 2012; Berger and Schwartz 2011; Wojnicki and Godes 2008), have been shown to often generate a sense of presence. This paper provides support to the idea that, when reading an online review, consumers may sense that they are in the company of the reviewer and spontaneously engage in an imaginary social interaction with them. As the "sense of being with" the reviewer becomes stronger and the imagined social interaction becomes more salient, the consumer's attitude toward such reviewer would become more favorable, thus, increasing the likelihood of recommendation acceptance.

Five studies tested our hypotheses that higher perceived social presence improves attitudes toward the reviewer because of the enhanced visualization of what could have been a face-to-face interaction. Study 1's findings supported that social presence triggered by online book reviews posted on Goodreads.com was associated with an increased number of likes by Goodreads.com readers. Four-hundred and fifty book reviews downloaded from Goodreads.com were rated for their level of social presence by independent coders. Social presence was positively associated with the number of likes, providing initial, real-world evidence for our proposed relationship between social presence and positive attitude towards the review. Study 2 was conducted at a university lab. Students tried an online coffee-ordering application prototype. The app displayed a review for a special coffee flavour, written to induce either high or low social presence. The results showed that high (vs. low) social presence led to more positive attitudes towards the reviewer, which increased the likelihood of ordering the recommended coffee. Study 3, conducted online, and tapped into the mental imagery process behind the proposed effects of social presence. Through manipulating mental resources, we hindered some participants' ability to generate imagery, pre-empting the hypothesized recreation of an imagined interaction with the reviewer, leading to no effect in the attitude towards the reviewer or likelihood of recommendation acceptance. Only when mental resources necessary for imagery generation were unconstrained did the hypothesized pattern of effects emerge. Experiment 4 shed additional light on the role of positive attitude towards the reviewers in the proposed mediation process by manipulating how informational this piece of information was in consumers' decision-making. If a consumer already likes or wants the item that is being recommended, having a positive attitude towards the reviewer should be inconsequential to their decision of whether to accept the reviewer's recommendation or not. Results showed that, although high (vs. low) social presence significantly enhanced attitudes towards the reviewer, when the recommended product

was a previously favoured (vs. non-favoured) option, positive attitudes failed to predict willingness to accept the recommendation. Finally, experiment 5 examined the hypothesized boundary condition for the effects of social presence. If the reviewed product is an embarrassing (vs. non-embarrassing) one, a higher sense of presence should *not* increase the likelihood of recommendation acceptance. Our results were consistent with this final hypothesis.

In this paper, we are primarily interested and focused on positive persuasive reviews. The reason for this decision is that negative reviews introduce a confounding factor into the equation. They have been shown to be less informative and associated with irrationality (Kim and Gupta 2012). Understanding how social presence would influence in dissuading reviews is a research avenue that can be further explored.

Social presence is fundamental in social interactions and has been studied in multiple contexts, from distant learning to virtual reality (Gefen and Straub 2003; Lowenthal 2010). However, the role of social presence in the context of online reviews had not yet been addressed. This research begins to fill this gap. It not only provides evidence for the role of social presence in online reviews, but also explains the mechanism underlying its effect.

Our results converge in showing that if the reviews and recommendations induce higher perceived social presence, there will be greater enthusiasm for the endorsed item (i.e. coffee, travel destination, book), even if the endorsed item happens to be a non-favored one. In addition, presence relies on the same mental resources required for constructing mental images. Thus, another source of contribution comes from confirming that the persuasive power of online product reviews relies on using cues that create a sense of social presence so that the imaginary social interaction goes beyond mere sender-receiver neutrality into a positive affective reviewer response.

Online reviews and recommendations are nowadays an inseparable and very influential part of the purchase process. In this research, we identify an important process, which may significantly enhance the persuasive value of those reviews: the visualization of the reviewer and the interaction with her/him. In particular, strategic deployment of social cues is likely to stimulate mental imagery.

It is worth highlighting that in these experiments, the observed effects are based on just one (experiments 2 and 5) or at most three reviews (experiment 3), which underscores the impact of social presence in the real world: Market statistics show that consumers read on average 10 online reviews to form trust, with 70% of them reading at least 4 reviews (BrightLocal, 2017).

These findings are particularly relevant since consumers now learn about products and make decisions mainly using online product reviews. On top of that, online retailers enrich their medium with consumer-generated social cues that could potentially trigger social presence (Kaplan and Haenlein 2010; Liu and Park 2015). This work also provides actionable insights for brands, social media, and recommendation platforms.

Chapter 2

The Scale Effect: How Rating Scales Affect Product Evaluation

Joint with Gael Le Mens

2.1.   Introduction

People frequently consult online ratings before purchasing goods or services (BrightLocal 2017). Review websites provide ratings on different scales. Amazon relies on a 5-star rating scale, Trustpilot on a 0-to-10 Trust Score, and Consumer Reports on a 100-point scale. In this paper, we focus on a setting in which a consumer has access to two ratings about the same product expressed on two different scales and measure the relative effects of the two ratings on product evaluation. Answering this question is important because product review websites are only a few keystrokes away from each other, and consumers are thus likely to aggregate information from these sources to form opinions about products and services.

The diversity of rating scales seems to imply that evaluations can be made, communicated, and interpreted equally effectively on any rating scale. Yet, research on numerosity and fluency casts doubt on this possibility without providing a clear suggestion as to which type of scale will be more influential. According to the numerosity heuristic, ratings expressed on larger scales such as 1-to-100 would have a stronger effect on product evaluations than ratings expressed on smaller scales such as 1-to-5 (Pandelaere, Briers, and Lembregts 2011). But if people are less familiar with larger scales than with smaller scales, they will process large-scale ratings less fluently than small-scale ratings. Research on fluency suggests that their product evaluations will be less affected by large-scale ratings than by small-scale ratings (Lembregts and Pandelaere 2012).

In 4 studies we measured the relative effects of ratings expressed on larger versus smaller scales. We consistently found that ratings expressed on larger scales have a stronger effect on product evaluation. We call this phenomenon the "scale effect." This finding extends prior research on the effect of rating scales on product valuation. Prior research has focused on settings where consumers compared products with their attributes expressed either on expanded or contracted scales (Burson, Larrick, and Lynch Jr 2009; Lembregts and Van Den Bergh 2019; Lembregts and Pandelaere 2012; Monga and Bagchi 2012; Pandelaere, Briers, and Lembregts 2011). We extend this research by focusing on settings where information is displayed on both the expanded and the contracted scales simultaneously and judgments have to be made by *aggregating* ratings provided on both scales. Our findings suggest that the scale effect is not due to a systematic difference in information processing of ratings from larger scales versus smaller scales. Instead, this effect results from a deliberate intention to give more weight to ratings expressed on larger scales.

2.1.1.   *Theoretical Framework*

Product rating scales vary both between and within review websites. For instance, Amazon customer review has a 5-star rating scale whereas Angie's list that has an A-to-F grade scale. In Trustpilot average ratings are displayed by a 0-to-10 "TrustScore". On the Consumer Reports website, products are scored on a 100-point score range. Some online review platforms display several ratings on different scales simultaneously. Rotten Tomatoes presents the percentage of certified critics who felt positively about a given film together with the critics' average rating on a 10-point scale, audience score on both positive percentage basis, and 5-point average rating scale. Metacritic uses a 100-point rating scale for its Metascore made by the critics shown side by side with the User Score given by the users on a 10-point scale. The diversity of rating scales creates a challenge to understanding how ratings affect attitudes.

To address this challenge, we analyse product evaluation as an instance of multi-attribute attitude formation. Consumer decisions involve aggregating information from multi attributes of the product, its brand and its producer as well as attributes of other choice alternatives. A large amount of prior research has proposed models of multi-attribute attitude formation (Bruno and Wildt 1975; Currim and Sarin 1984; Kahn and Meyer 1991; Mazis, Ahtola, and Klippel 1975; Meyer and Sathi 1985; Wilkie and Pessemier 1973). An attitude can be seen as a function of perception and beliefs about the key attributes. The dominant multi-attribute models have an additive nature. At a descriptive level, it is suggested that attitudes are formed by combining attribute values. Summing and averaging are two of the simplest models proposed (Troutman and Shanteau 1976). The attitude towards an object, O with N attributes could be formulated as

$$E_O = \sum_{i=1}^{N} I_i V_i$$

where I_i is the belief or probability that O possesses the i-th attribute and V_i is the value importance of that attribute (Rosenberg 1956). With respect to this original model, the subsequent models varied a lot in terms of conceptualizations, semantics, and measurement (Wilkie and Pessemier 1973).

We apply this perspective to the formation of an attitude based on two ratings, seen as product attributes. Accordingly, we specify the attitude as a linear function of the ratings. To illustrate, consider an agent who evaluates a product, X, based on two ratings $R_S(X)$ and $R_L(X)$ each expressed on a different scale. We describe each scale as an interval of real numbers denoted $[Min_S, Max_S]$ for the small scale, and $[Min_L, Max_L]$ for the large scale. To render the ratings on the two scales comparable, we linearly rescale them to the 0 to 1 range. We call these rescaled ratings 'normalized ratings:'

$$\text{Normalized } R_S(X)\text{: } R_S(X) = \frac{R_S(X) - Min_S}{Max_S - Min_S} \qquad \text{EQ 1}$$

$$\text{Normalized } R_L(X)\text{: } R_L(X) = \frac{R_L(X) - Min_L}{Max_L - Min_L} \qquad \text{EQ 2}$$

Applying the multi-attribute model framework, the product attitude E(X) can be written as a weighted sum of the two normalized ratings:

$$E(X) = \delta_S R_S(X) + \delta_L R_L(X) \qquad\qquad \text{EQ 3}$$

where the weight of the small-scale rating δ_S reflects the 'association' between the small-scale rating and the attitude and δ_L reflects the association between the large-scale rating and the attitude. For simplicity, we will assume that the evaluation is a weighted average of the two ratings such that the two weights sum to one. Accordingly, we write:

$$E(X) = (1 - \delta)R_S(X) + \delta R_L(X), \qquad\qquad \text{EQ 4}$$

where δ is the weight of the large-scale rating.

In this paper, we are concerned with estimating δ. Our null hypothesis is that that two ratings receive the same weights ($\delta = .5$). Yet, prior research suggests that δ might be systematically different from .5. More specifically, research on numerosity implies that more weight will be given to ratings from the large scale ($\delta > .5$), whereas research on fluency implies that generally less weight will be given to ratings from the large scale ($\delta < .5$).

2.1.2. Numerosity

Numerical cognition has been widely studied in the context of quantitative product specifications and attributes judgement. Product attributes could be specified on different scales. For example, spatial measurements can be communicated by small units like centimetre that yield larger numbers (e.g., 0 to 200cm) or with large units like meter that yield smaller numbers (e.g., 0 to 2m).

Converging evidence suggests that when communicating information, the choice of scale can alter consumer's preferences. According to the numerosity heuristic (Bagchi and Davis 2016), when judging attributes, the perceived difference in quality between two options would increase when attributes are reported on large scales in comparison to small scales (Pandelaere, Briers, and Lembregts 2011). Values expressed on larger scales are associated with higher precision and reliability (Zhang and Schwarz 2011) and are given higher weights in decisions (Burson, Larrick, and Lynch 2009). Resource allocation decisions are also affected by numeric scales. Lower allocations are made to others when the monetary unit is smaller (e.g. cents versus dollars) (Shrivastava et al. 2017). It has been suggested that consumers can be nudged to pro-environmental choices by expressing the cost of conventional options (e.g. gas cost) per larger scale of consumption like 100,000 miles than 100 miles (Camilleri and Larrick 2014).

Even though this prior research has not focused on how people aggregated information from attributes expressed on different scales these findings suggest that ratings given on the larger scale will have a stronger weight on product attitudes ($\delta > .5$).

2.1.3. Fluency

When people process information experienced fluency affects the resulting judgments and attitudes (Schwarz 2004). Fluency can be experienced in various forms. Whether we retrieve information from memory, perceive external stimuli, or imagine hypothetical scenarios, we are subject to experiencing various levels of fluency (Alter and Oppenheimer 2009). Regardless of the source, easily processable information (conducive to an experience of higher fluency) is given more weight in judgments in comparison to information that is difficult to process (conducive to an experience of lower fluency) (Shah and Oppenheimer 2007). For example, enhancing the visibility of statements, thus making them easier to read, has been shown to positively affect judgments of truth compared to less visible versions of the same statements (Reber and Schwarz 1999). Also,

in the context of choice, options that resolve the difficulty in decision making are chosen not merely on the basis of their utility superiority but because of their potential to alleviate choice difficulty (Dhar and Simonson 2003).

Applied to the setting of product evaluation based on ratings expressed on different scales, we conjecture that differences in rating scale fluency will affect the relative weights of the two ratings. People are more familiar with some scales than others and familiarity has been shown to lead to higher processing fluency (Lembregts and Pandelaere 2012). Therefore, familiar scales should be more fluent for most people. Taking scale fluency into account, the value of δ in EQ 4 is expected to depend on the product rating scale that is the more familiar. If the larger scale is the more familiar, we expect $\delta > .5$. But if the smaller scale is the more familiar, we $\delta < .5$.

In the empirical studies we report below, the 1 to 5 point scale is generally the smaller scale. Observation of a variety of review websites reveals that this scale likely to be the most familiar rating scale to most customers in English-speaking countries (and probably in many other countries). Google, Amazon, Apple, Facebook, and Yelp all use the 1 to 5 point scale. This implies that in settings in which a customer aggregates one rating expressed on the 1 to 5 point scale and one rating expressed on a 1 to X point scale with X higher than 5, the 1 to 5 point scale will be the most familiar scale, and thus information expressed on that scale is likely to be processed more fluently. Research on fluency applied to this setting thus implies the rating expressed on the smaller scale will have a higher weight ($\delta < .5$). This prediction is opposite to what is implied by the numeracy-based argument outlined above.

2.1.4. *Numerical Impression vs Differential Weighting*

We expressed evaluation as a weighted average of the normalized ratings to specify a precise characterization of the 'scale effect' (EQ 4). Yet, we do not claim that this equation is a psychological model of how people form impressions based on the ratings they read. In particular, we do not expect them to transform the ratings they read into 'normalized ratings' according to equations 1 and 2. Basic math operations are challenging to many people (Ginsburg et al. 2005; Kirsch 1993) and the assumption of numerical equivalence is violated when interpreting the same numbers in different formats (e.g. .5 vs ½) (Cohen, Ferrell, and Johnson 2002). Numerical formats like fractions, decimals, and percentages are not intuitively processed and might be treated as whole numbers (Chen and Rao 2007; Kruger and Vargas 2008).

A more realistic psychological model formalizing the association between ratings and product evaluation assumes that people form an impression of each rating and then combine these impressions. More formally:

$$E(X) = (1 - \gamma)I_S(X) + \gamma I_L(X), \qquad \text{EQ 5}$$

where $I_L(X)$ and $I_S(X)$, denoted the subjective impression of the large-scale rating and the small-scale rating, and γ is the weight of the impression of the large-scale rating.

To understand how this equation can help clarify the mechanism producing the scale effect, consider products A and B such that their average normalized ratings are equal: $R_L(A) + R_S(A) = R_L(B) + R_S(B)$.

Suppose, without loss of generality, that the large-scale ratings favour product A and let ΔR denote the difference between normalized large-scale ratings: $\Delta R = R_L(A) - R_L(B) > 0$. The assumption of equal average normalized ratings implies that ΔR is also

the extent to which the small-scale ratings favour product B. $R_S(B) - R_S(A) = \Delta R$. Applying EQ4, we can write the difference in attitudes in terms of Δ:

$$\text{Diff}(A - B) = (2\delta - 1)\Delta R.$$

Whenever there is a scale effect ($\delta > 0$), A will be evaluated more positively than B: $\text{Diff}(A - B) > 0$. We can also write the difference in attitudes in terms of the rating impressions, using EQ5:

$$\text{Diff}(A - B) = \gamma\big(I_L(A) - I_L(B)\big) - (1 - \gamma)\big(I_S(B) - I_S(A)\big), \qquad \text{EQ 6}$$

where $I_L(A) - I_L(B)$ is the perceived advantage of A on the large scale and $I_S(B) - I_S(A)$ is the perceived advantage of B on the small scale.

This equation suggests that two distinct, non-exclusive, mechanisms could contribute to the scale effect. The first mechanism posits that the sensitivity of perceived rating impressiveness to ratings is stronger for large-scale ratings. This implies that $I_L(A) - I_L(B) > I_S(B) - I_S(A)$ even though $R_L(A) - R_L(B) = R_S(B) - R_S(A) (= \Delta)$. In particular, A will be evaluated more positively than B even if the perceived impressiveness of ratings from the two scales are weighted equally ($\gamma = .5$). More formally:

$$\text{Diff}(A - B) = .5\left(I_L(A) - I_L(B)\right) - .5\big(I_S(B) - I_S(A)\big) > 0. \qquad \text{EQ 7}$$

The second mechanism posits that the perceived impressiveness of the large-scale ratings is given greater weight than the perceived impressiveness of the small-scale rating: $\gamma > .5$. This implies that even if the perceived difference is of equal strength on the two scales ($I_L(A) - I_L(B) = I_S(B) - I_S(A)$), then A will be evaluated more positively than B.

In the rest of the chapter, we report four studies that document the scale effect and aim to measure the contributions of these two mechanisms. In study 1 we tested the scale effect in a joint evaluation setting. In study 2, we tested the scale effect in the absence of numerical values. This study provides evidence that the scale effect is not merely due to the differential numerical magnitude of ratings, ruling out a purely numeracy-based explanation. In study 3 we elicited the perceived impressiveness of the ratings from the two scales. We found that differences in perceived impressiveness are not enough to explain the scale effect. This study also provided evidence for the scale effect in a separate evaluation setting (only one product was evaluated at a time). In a complementary study, the fluency account was ruled out. Study 4 revealed that the scale effect results from deliberate process.

2.2. Study 1

The goal of study 1 was to test the scale effect in a joint evaluation setting. Participants were shown two products (A and B) each rated on two scales, the large-scale L (rating: 1 to L) and the small-scale S (rating: 1 to S). We used three pairs of scales with S-L value of 5-10, 10-100, and 5-100. For each pair of rating scales, S-L, three rating pairs were constructed such that their average normalized ratings were above the midpoint (.78), below the midpoint (.22), and equal to the midpoint (.50), for the details see Appendix B - Table 1. Rating pairs were selected such that the averages of the two normalized ratings were the same for products A and B: an agent who would give equal weights to the two normalized ratings ($\delta = .5$) would be indifferent between the two products.

For each combination of rating scales and normalized ratings there were two conditions: in the AL+ condition, A was rated higher (lower) than B on the larger (smaller) scale; in the AL- condition, A was rated lower (higher) than B on the larger (smaller) scale. We used mini portable speakers as the target products. On the main screen, the two products, A and B, were displayed next to each other. The two ratings for each product were displayed below the product pictures, Figure 2 - 1. Participants reported their purchase likelihood, the likelihood that each product has an acceptable standard quality, and the likelihood of recommending each product to others. All responses were recorded on 100-point sliders (1: Not at all likely, 100: Extremely likely). As a complementary dependent measure, participants indicated their willingness to pay on a given range of £10 to £150 for each product. They also selected which of the two products they would rather purchase.

| Review Website A | 3.55 (from 1 to 5) |
| Review Website B | 37.63 (from 1 to 100) |

| Review Website A | 2.48 (from 1 to 5) |
| Review Website B | 64.20 (from 1 to 100) |

| Review Website A | 64.11 (from 1 to 100) |
| Review Website B | 4.69 (from 1 to 5) |

| Review Website A | 92.4 (from 1 to 100) |
| Review Website B | 3.55 (from 1 to 5) |
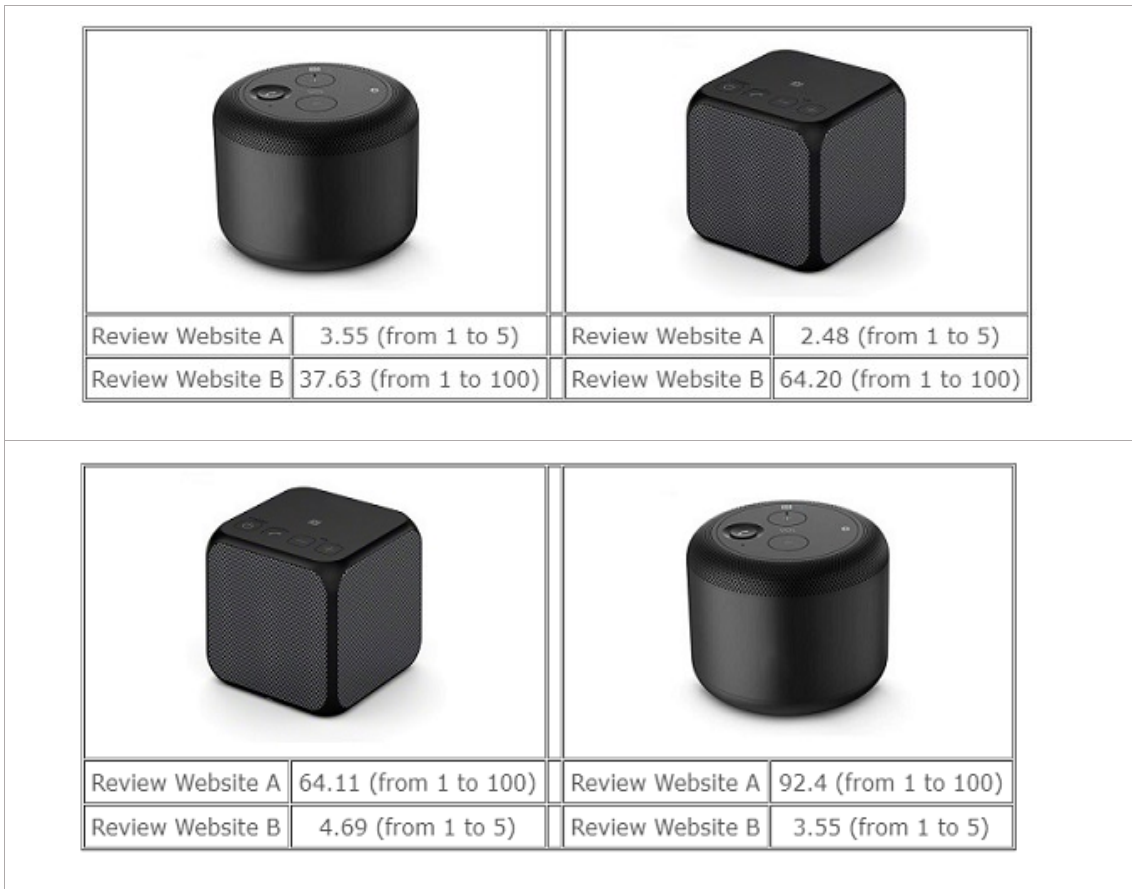
Figure 2 - 1: Unknown To Participants The Cubic Mini Speaker Was Labelled As Product A. Top Figure Is An Instance Of AL+,5-100, Cross Condition. Bottom Figure Is An Instance Of AL-, 5-100, Above Condition.

Consider a participant and her evaluations of the two products, $E(A)$ and $E(B)$. Our main dependent variable is $\text{Diff}(A - B) = E(A) - E(B)$. The ratings were constructed such that if the participant gave more weight to the large-scale rating ($\delta > .5$) she would evaluate A more positively than B. If she gave less weight to the large-scale rating ($\delta < .5$), she would evaluate B more positively. To see this, note that the ratings we used as stimuli imply the same difference in normalized ratings on the two scales: $R_L(A) - R_L(B) = R_S(B) - R_S(A)$.

For each participant we calculated δ based on her normalized reported product attitude, $E_N(X)$, given the ratings that she had seen:

$$\delta = \frac{[E_N(A) - E_N(B)] - [R_S(A) - R_S(B)]}{[R_L(A) - R_L(B)] - [R_S(A) - R_S(B)]} \qquad \text{EQ 8}$$

where δ > .5 for participants that exhibit the scale effect.

Participants were 541 Prolific users (334 Women; M_{age} = 36.24; SD_{age} = 13.10). Participants were randomly assigned to one of 18 conditions: 2(AL+, AL-) × 3(Scale: 100-point and 5-point (hereafter: 100-5), 100-point and 10-point (hereafter: 100-10), 10-point and 5-point (hereafter:10-5)) × (Average of the two normalized ratings: above the midpoint (hereafter: above), below the midpoint (hereafter: below), at the midpoint (hereafter: cross)). The order of product A and B photos (on the left or right) and the order of large scale and small scale ratings (at the top or on the bottom) were randomized.

2.2.1. Results

The independent variable was categorical such that AL+ = 1, and AL- = 0 (AL_Dummy). The product attitude difference score was calculated by taking the average of $Diff_{Intention}$, $Diff_{Quality}$, and $Diff_{Recommendation}$ (α = .88), For the descriptive results see Appendix B - Table 2.

To test for the presence of the scale effect, an ordinary least squares (OLS) regression was estimated for each of the dependent variables ($Diff_{Product\text{-}Attitude}$, $Diff_{WTP}$).

$$DV = \beta_0 + \beta_1 AL\_Dummy + \beta_2 ScaleSet^{10-100} + \beta_3 ScaleSet^{5-10} + \qquad \text{EQ 9}$$

$$\beta_4 Range^{Below} + \beta_5 Range^{Cross} + \beta_6 AL_{Dummy} \times ScaleSet^{10-100} +$$

$$\beta_7 AL_{Dummy} \times ScaleSet^{5-10} + \beta_8 AL_{Dummy} \times Range^{Below} +$$

$$\beta_9 AL_{Dummy} \times Range^{Cross} + \beta_{10} AL_{Dummy} \times ScaleSet^{10-100} \times$$

$$Range^{Below} + \beta_{11} AL_{Dummy} \times ScaleSet^{10-100} \times Range^{Cross} +$$

$$\beta_{12} AL_{Dummy} \times ScaleSet^{5-10} \times Range^{Below} + \beta_{13} AL_{Dummy} \times$$

$$ScaleSet^{5-10} \times Range^{Cross} + \beta_{14} ScaleSet^{10-100} \times Range^{Below} +$$

$$\beta_{15} ScaleSet^{10-100} \times Range^{Cross} + \beta_{16} ScaleSet^{5-10} \times$$

$$Range^{Below} + \beta_{17} ScaleSet^{5-10} \times Range^{Cross} + \varepsilon \quad .$$

where $ScaleSet^{10-100}$ and $ScaleSet^{5-10}$ are the scale set dummies (reference = 5-100), $Range^{Below}$ and $Range^{Cross}$ are the average rating range dummies (reference = above).

The only estimated coefficient significantly different from zero was the AL_Dummy independent variable. $Diff_{Product\text{-}Attitude}$ was more positive in the AL+ condition than in the AL- condition (β_1 = 17.42; 95% CI [10.67, 24.16]). The AL_Dummy had a similar effect on willingness to pay (β_1 = 15.41; 95% CI [7.07, 23.75]). For the summary of the regression analysis see Appendix B - Table 3.

We estimated a logit model to predict the choice of product A. The odds of choosing product A over B were significantly higher in AL+ than in Al- (OR = 5.75; 95% CI [1.97, 18.29]), Appendix B - Table 3. Across all the three measures, participants evaluated the target product more positively when it was rated more positively on the larger scale in

comparison to the other product (with larger numerical rating on the smaller scale), Figure 2 - 2. Moreover, Using EQ 8, the result showed that 68% of participants had δ larger than .5, $(F(.5) = P[\delta \leq .5] = .32)$. This provides strong evidence in favour of the scale effect.
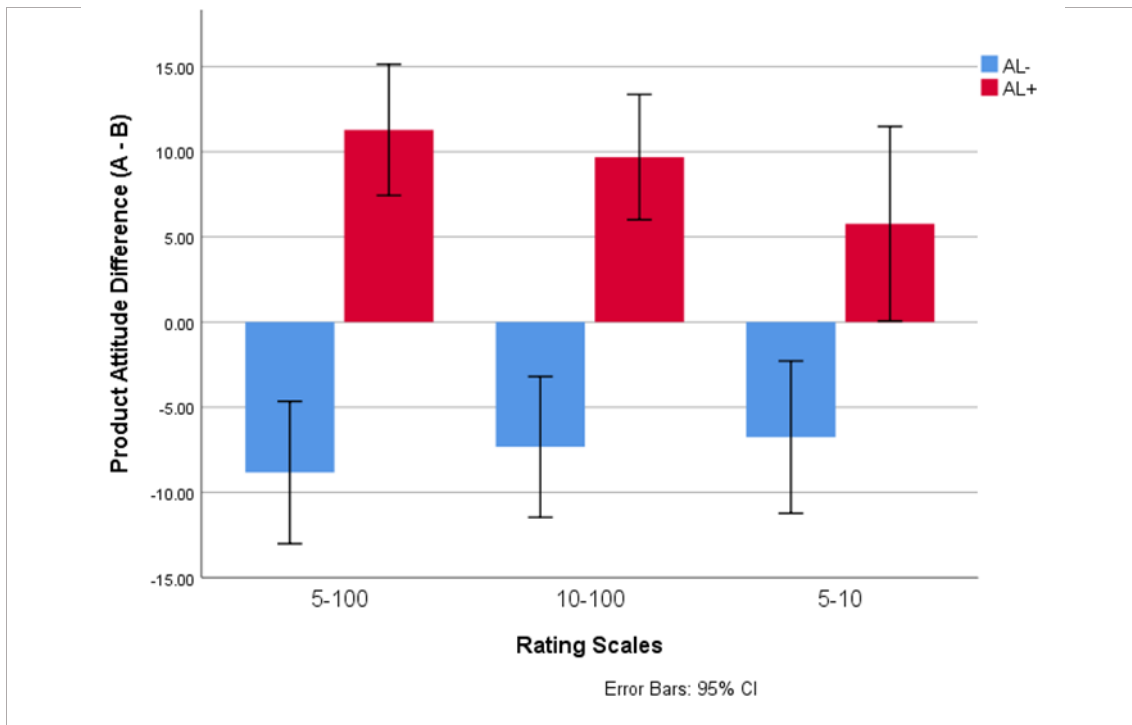
Figure 2 - 2: Study 1 - Product Attitude Difference (A - B)

2.2.2. Discussion

Study 1 provided consistent evidence for the scale effect. Our results showed a robust effect of the larger scales in product evaluation independent of the scale set and average rating. In this study, the average normalized ratings were equal for product A and B such that the difference between large scale ratings was equal to the difference between the small scale ratings: $R_L(A) - R_L(B) = R_S(B) - R_S(A)$. However, this does not necessarily mean that the perceived advantage of product A on the large scale is equal to the perceived advantage of product B on the small scale: $I_L(A) - I_L(B) = I_S(B) - I_S(A)$. In the next study, we aimed to make large-scale and small-scale ratings seem equally impressive by visualizing their numerical value on horizontal bars.

2.3. Study 2

We conjectured that representing ratings with a visual aid that provides an identical visual understanding of equivalent large-scale and small-scale ratings would make them seem similarly impressive. For example, visual representation of 5/10 and 50/100 would look identical on the same length horizontal bars, therefore the effect of numerical magnitude on the perceived impressiveness of the ratings would reduce. We used horizontal bars as the visual aid in this study because they provide an intuitive way of representing ratings that match the spatial representation of numerical magnitude from left to right, i.e., mental number line (Izard and Dehaene 2008). Using visual aids also alleviates numeracy deficits (Lurie & Mason, 2007). If the scale effect originates in inadequate basic number

competencies, then providing a visual aid that makes equal numerical values look identical irrespective of their numerical format would attenuate the effect.

We adapted the previous design, with three conditions that differed in terms of the rating display: numerical format (as in study 1), a pair of horizontal bars of the same length where the % fill was the normalized ratings and the ends of the bars were marked with the lower and upper boundaries of the scale (visual aid only) or a display of the numerical ratings and of the visual aid, For samples see Appendix B - Figure 1. Thus study 2 had a 2(AL+, AL-) × 3(Visual aid: Numerical only, Numerical+Aid, Aid only) × 2(Ratings sets: 5 and 10, 10 and 100) between subject design. We included the two sets for the sake of generalizability, Appendix B - Table 4. The order of product A and B photos (at the top or on the bottom) and the order of large scale and small scale ratings (at the top or on the bottom) were randomized.

We recruited 1201 participants via Prolific (739 Women; M_{age} = 36.24; SD_{age} = 13.10). They evaluated two toasters based on the displayed pictures and ratings followed by product evaluation questions as in study 1 but on a 7-point scale (1: Not likely at all, 7: Very likely).

2.3.1. Results

The product attitude difference score was calculated by taking the average of $Diff_{Intention}$, $Diff_{Quality}$, and $Diff_{Recommendation}$ (α = .81). The Summary of descriptive results is available in Appendix B - Table 5. As in study 1, we focused on the effect of the AL_Dummy variable (AL+ = 1, and AL- = 0). We regressed each dependent measure on the AL_Dummy using the following model for an ordinary least square regression of $Diff_{Product-Attitude}$, and $Diff_{WTP}$ and logistic regression of the choice of product A

$$DV = \beta_0 + \beta_1 AL\_Dummy + \beta_2 Num\_Aid + \beta_3 Aid\_Only + \qquad \text{EQ 10}$$

$$\beta_4 Scale + \beta_5 AL\_Dummy \times Num\_Aid + \beta_6 AL\_Dummy \times$$

$$Aid\_Only + \beta_7 AL\_Dummy \times Scale\_Set + \varepsilon \quad.$$

where Num_Aid and Aid_Only are the dummy variables representing numerical+aid and aid-only formats (reference category = numerical-only), and Scale is a dummy variable of scale sets we used (5-10 = 0, 10-100 = 1)

$Diff_{Product-Attitude}$ was more positive in the AL+ condition than in the AL- condition (β_1 = .71; 95% CI [.48, .94]). A similar difference characterized willingness to pay (β_1 = 6.26; 95% CI [4.29, 8.23]) and the odds of choosing product A over B (OR = 3.51; 95% CI [2.07, 5.93]), Appendix B - Table 6. Visual aid reduced the effect of the categorical independent variable for all the dependent measures implied by negative regression coefficients of their corresponding interaction terms. However, the drop in the effect of AL+/AL- manipulation reached conventional statistical significance level only for $Diff_{WTP}$ in aid-only conditions (β_6 = -3.30; 95% CI [-5.71, -.89]). The most noteworthy result is that the scale effect persisted even in the condition with just the visual aid, Figure 2 - 3.

Next, we used EQ 8 to calculate δ for each participant. In line with the scale effect the proportion of participants with δ > .5 was 39% which was larger than 29.6% with δ < .5 (χ^2 = 108.28; p < .001). Comparing with study 1, the proportion of participants with δ > .5 was much lower in study 2. We attributed this to the fact that we had used a 7-point

Likert scale to measure the product's attitude and there was not enough room for variation.
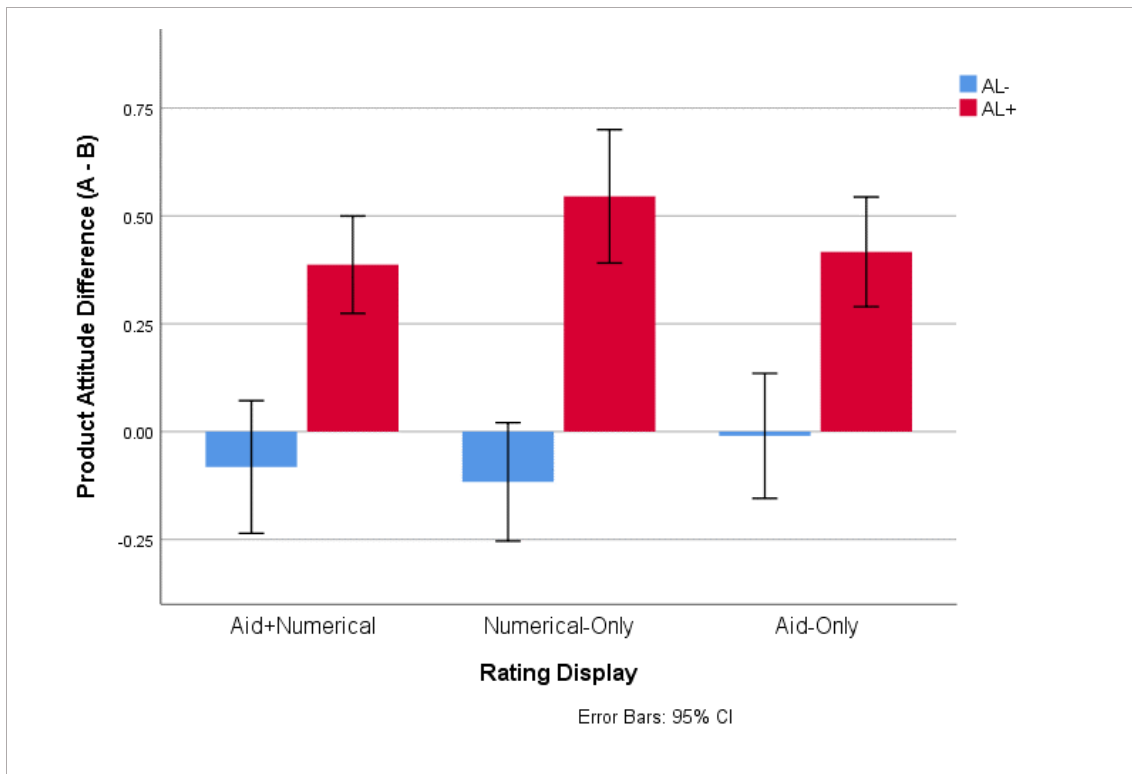
Figure 2 - 3: Study 2 - Product Attitude Difference (A - B)

2.3.2. Discussion

In study 2, Visual aids were used to communicate to participants that the average normalized ratings of the two products were the same. Even if participants lack the ability or motivation to convert numerical ratings to a common scale, with the visual aids it became immediately apparent that $.5R_L(A) + .5R_L(B) = .5R_S(A) + .5R_S(B)$. Yet, the scale effect persisted both in the numerical+aid and in the visual aid only conditions. These findings suggest that the scale effect is not a product of weakness in math abilities.

We conjectured that in the visual aid-only condition removing numerical values would reduce possible numerical magnitude effect. In the absence of numerical values participants would be equally sensitive to ratings expressed on different scales. In other words, ratings with equal numerical value would look equally impressive irrespective of their scale $(I_L(A) - I_L(B) = I_S(B) - I_S(A))$. However, the scale effect was not reduced. And maybe more importantly we found evidence of a scale effect even in the aid-only condition. This means that participants paid attention to the scale labels and gave more weight to the horizontal bars that were labelled with the larger scale endpoints even though the filled area of the horizontal bars were identical. We interpret this as suggestive evidence that the scale effect is not produced just by the numerical magnitude of the displayed ratings.

Yet, this study cannot rule out a numeracy based account for the scale effect: participants could still mentally construct the numerical values or ratings represented by the visual aids and react to these numbers. A limitation of this study pertains to the absence of explicit elicitation of the perceived impressiveness of the ratings. We

addressed this issue in the next study. Also, study 3 will test the scale effect in single evaluation context where participants get to evaluate single product over a wide range of ratings pair.

2.4. Study 3

Study 3 was comprised of two different tasks: a rating evaluation task and a product evaluation task. The order of the tasks were randomized. We used a set of 25 S-L pairs of ratings. In the rating evaluation task participants reported how impressive each rating in the rating set was perceived. Their answers were considered as proxies of I_L and I_S in EQ 5. In the product evaluation task, participants reported their purchase intention of a single product, E(X), 25 times. Each time, the product was accompanied with one of the 25 rating pairs. This setting allows us to disentangle the differential effect of perceived impressiveness of ratings' numerical magnitude from differential weights given to different scales in the product evaluation task.

We constructed 25 ratings on the 5-point scale (1.00, …, 5.00) and 25 ratings on the 100-point scale (1.00, … , 100). The ratings were corresponding to 25 equally spaced normalized ratings (.00, .04, .08, … , 1.00). Each rating set was divided to five levels {Very low, Low, Medium, Large, Very large}. The pairs were constructed to that ratings at each level were randomly paired with ratings of all five levels of the other scale, for details see Appendix B - Table 7.

In the rating evaluation task participants reported their impression of every single rating (I_S and I_L) by answering to "How impressive is each rating?" using a slider (1: Not impressive at all, 100: Very impressive). The ratings were displayed either in a *one per page* context or a *two per page* context. The context factor was introduced into the experimental design to account for ratings co-presence effect. As an example, 35 out of 100 might be (or not) perceived as more or less impressive when a rating from another scale is displayed simultaneously on the same page. Hence, in the *one per page* conditions participants indicated their impression of each of the 50 ratings on separate pages. In the *two per page* conditions, each rating was displayed together with its paired rating on the same page resulting in 50 evaluations over 25 pages. The experimental flow is illustrated in Figure 2 - 4.
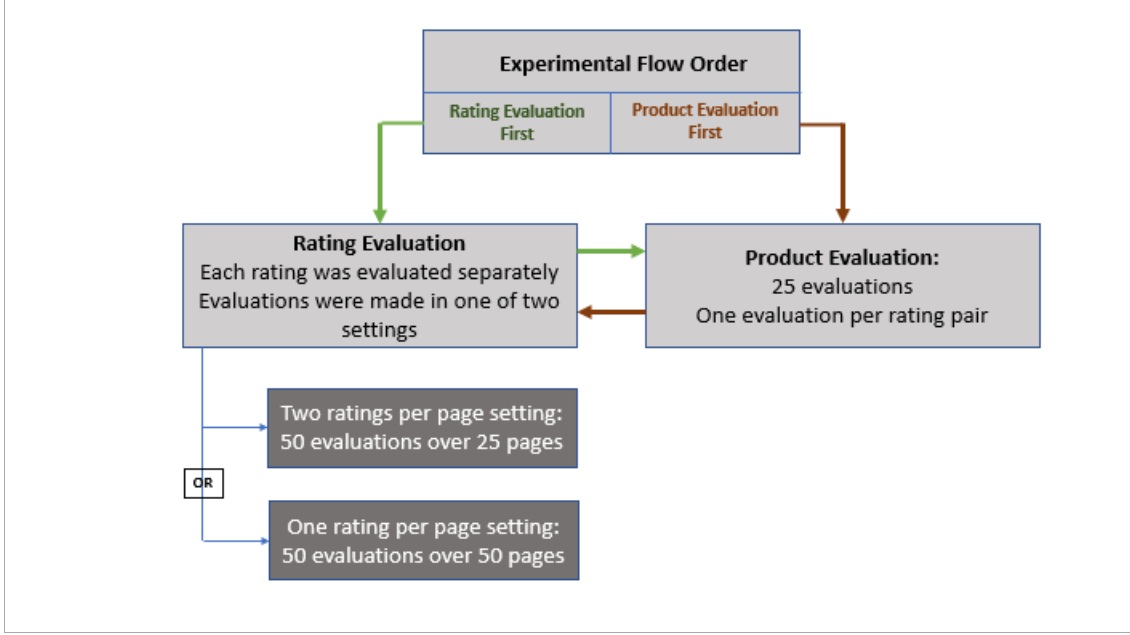
Figure 2 - 4: Study 3 - Experimental Flow

Participants reported their purchase likelihood in the product evaluation task on a 100 point scale (scale units were hidden) where 1 denoted "not at all likely", and 100 represented "very likely".

Study 3, thus, had a mixed factorial design with 2(context: one per page, two per page) × 2(order: rating evaluation first, rating evaluation last) between subject factors and product rating as the within subject factor. Participants were 151 Prolific users (85 Women; M_{age} = 36.50; SD_{age} = 13.29) that were randomly assigned to one of the four between subject conditions.

2.4.1. Results

To test if the scale effect, characterised in terms of normalized ratings, persists in single evaluation setting, we regressed product evaluation on the corresponding normalized ratings in each rating pair nRS_r and nRS_r using the following model

$$E_i = \beta + \beta_S nRS + \beta_L nRL + participant\_FE_i + \varepsilon_i \qquad \text{EQ 11}$$

The result provided evidence for the scale effect in single evaluation setting. Large-scale ratings had a larger impact on product evaluation (β_L = 11.37, 95% CI [9.34, 13.41]) than ratings on the smaller scale (β_S = 5.41, 95% CI [3.68, 7.14]; χ^2= 20.86; $p < .01$). In addition, for each participant we computed $\beta_L - \beta_S$ based on their 25 evaluations. 78% of the cases had $\beta_L - \beta_S > 0$.

We used a fixed-effect model to regress product evaluation, E, on the corresponding perceived impressiveness I_S and I_L obtained from the rating evaluation task. To isolate the effect of perceived rating impressiveness, controlling for displayed ratings and participants' effect on their repeated evaluation, we included rating pair and participants fixed effects:

$$E_{pi} = \beta + \beta_S I_S + \beta_L I_L + rating\_pair\_FE_p + participant\_FE_i + \qquad \text{EQ 12}$$

$$\varepsilon_{ip}$$

Estimations revealed that impressions from large-scale ratings was a significant predictor of product evaluation (β_L= .12; 95% CI [.05, .18], see Table 8). Impressions from small-scale ratings turned not to be a significant predictor of product evaluation (β_S = .05; 95% CI [-.01, .11]). Even though the coefficient for the small scale rating is smaller than for the large scale ratings, the difference does not reach conventional statistical significance (χ^2= 2.61; p = .11), Table 2 - 1. For each participant, we computed $\beta_L - \beta_S$ based on their 25 evaluations. 63.4% of the cases had $\beta_L - \beta_S > 0$, Figure 2 - 5. Taken together these two results provide moderate evidence that that impression of the large-scale rating, $I_L(X)$ in EQ 7, has more influence on product evaluation than the impression of small-scale ratings, $I_S(X)$.

Table 2 - 1: Fixed Effect Regression Table – Product Evaluation

DV: Product Evaluation	Estimate	Std. Erros	Low-CI	High-CI
IL	.12***	.03	.05	.18
IS	.05	.03	-.01	.11
R^2	.28			
R^2 Within	.01			
Observations = 3825; Participant Fixed Effects = 153; Rating Pair Fixed Effects = 25				
* Significant at the .05 level, ** Significant at the .01 level, *** Significant at the .001				
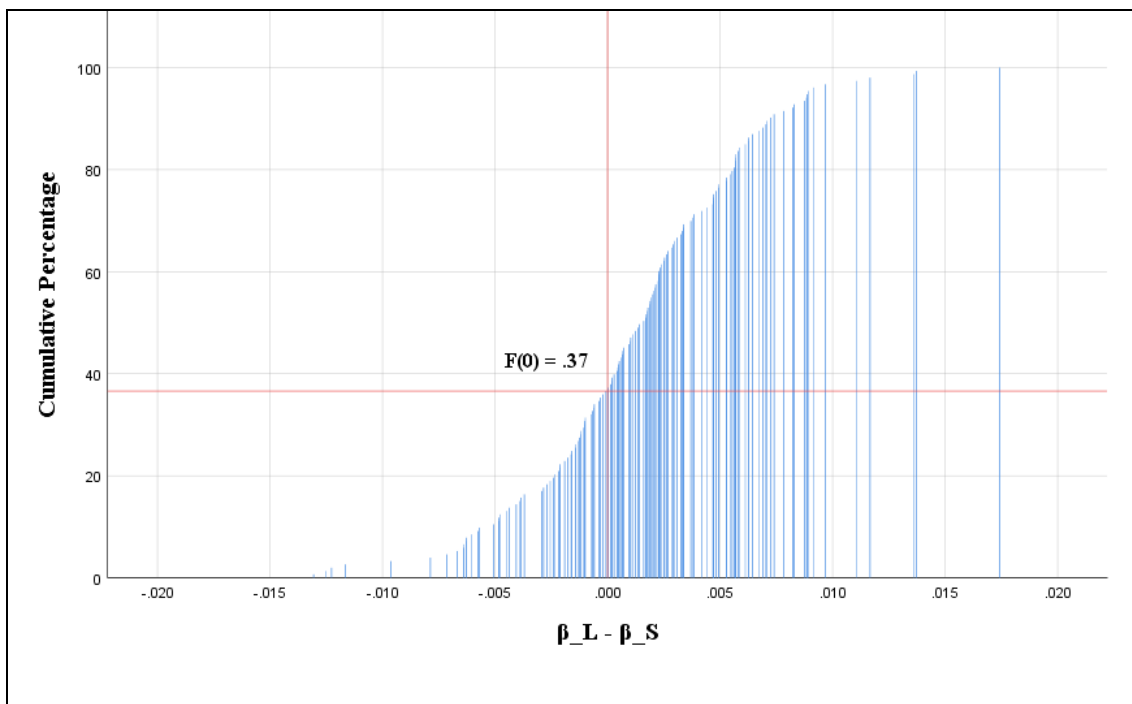
Figure 2 - 5: CDF Plot Of The Difference Between Regression Coefficients Of Large Scale And Small Scale Rating – Product Evaluation

Next, we tested if rating impressions differed depending on the rating scale. Let Imp_{ri} be the perceived impressiveness of rating r, for participant i. To measure the differential influence of ratings from the two scales on perceived rating impression we estimated the following linear model:

$$Imp_{ri} = \beta_r + \beta_S nRS_r + \beta_L nRL_r + participant\_FE_i + \varepsilon_{ri} \qquad \text{EQ 13}$$

where nRS_r and nRL_r are the normalized ratings ($nRS_r = 0$ if the evaluated rating is a large-scale rating, $nRL_r = 0$ if it is a small-scale rating), and $participant\_FE_i$ is a vector of participants' fixed effects. Surprisingly, small-scale ratings had a stronger effect on the perceived rating impressiveness ($\beta_S = 88.19$, 95% CI [84.05, 91.89]) than large-scale ratings ($\beta_L = 85.83$, 95% CI [82.42, 89.24]; $\chi^2 = 15.38$; $p < .01$), Table 2 - 2. Simply put, an increase in small-scale ratings is perceived as more impressive than an equal increase in large-scale ratings.

Table 2 - 2: Fixed Effect Regression Table – Rating Impression

DV: Rating Impression	Estimate	Std. Erros	Low-CI	High-CI
nRL	85.83***	1.74	82.42	89.24
nRS	88.19***	1.88	84.50	91.89
R^2	.79			
R^2 Within	.79			
Observations = 7650; Participant Fixed Effects = 153				
* Significant at the .05 level, ** Significant at the .01 level, *** Significant at the .001				

As a complementary analysis we investigated the conditional effect of scales on rating impression across the normalized rating range of 0 to 1 (Montoya 2019). The conditional effect at each rating level is: Impression$_{100\text{-point}}$ – Impression$_{5\text{-point}}$. Using Johnson-Neyman significance region technique revealed that when normalized-rating $\leq$ .81 participants' impression of ratings is higher when framed in a 5-point scale in comparison to 100-point scale. This difference disappears when normalized-rating $> .81$, Figure 2 - 6. In other words, not only large scale ratings are not perceived as more impressive, they actually look less impressive than their small scale counterparts for 80% of the rating range.
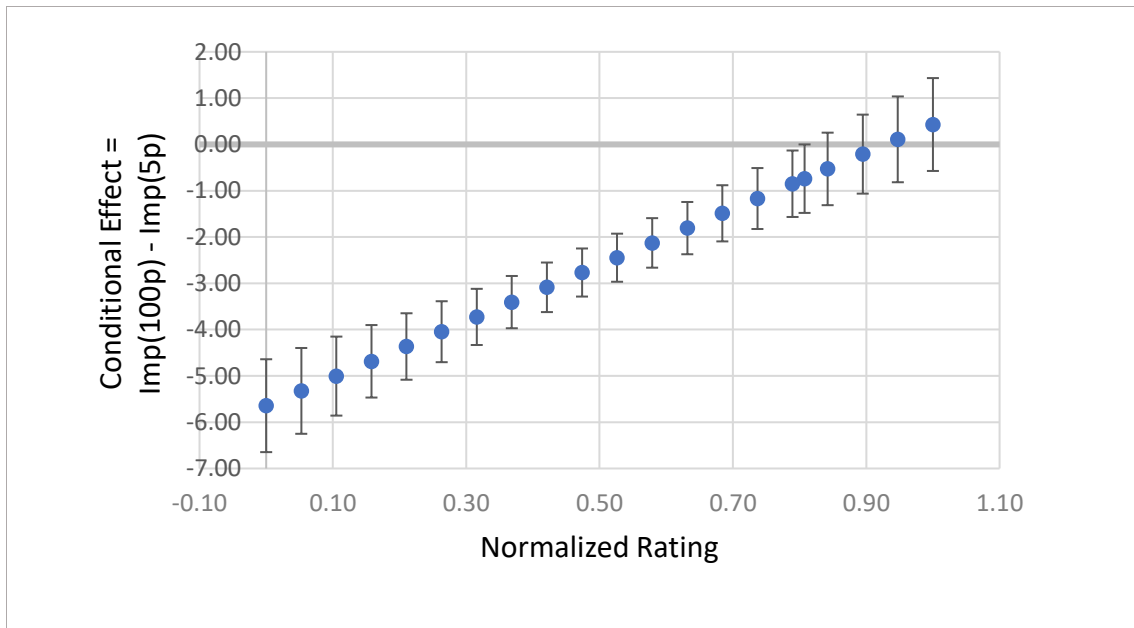
Figure 2 - 6: Conditional Effect Of Scales On Perceived Impressiveness Of The Ratings

2.4.2. Discussion

Study 3 provides evidence for the scale effect in a single evaluation context. More importantly, in study 3 we tested if the impression caused by the numerical magnitude of ratings can explain the scale effect. The perceived rating impressiveness with respect to displayed ratings was not stronger for the large-scale ratings than for the small-scale ratings. If anything, the result of the rating evaluation task showed that for the most part of the rating range, ratings seemed more impressive when displayed on the smaller scale. Yet, when impressions were used to predict product evaluation, the scale effect emerged (to some extent). In other words, impressions from ratings on larger scales were given higher weight in the evaluations. As an example, 64 (from 1 to 100) looks less impressive than 3.6 (from 1 to 5) although their numerical values are equal. However, when aggregating ratings 64 is given more weight in the final evaluation.

2.4.3. Complementary Study: Fluency

A theoretically possible explanation for the findings of study 3 consists of more fluent processing of 100-point scale because of more familiarity with it than 5-point scale. To test if this is the case we conducted a complementary study with the same participant population as used in study 3.

We measured participants' familiarity with a set of rating scales. Participants indicated how often they see each of them when consulting review websites on a 7-point Likert scale (1:Never, 7:Very often). They also ordered the scales from the most familiar to the least familiar. 99 Prolific users (70 Women; $M_{age} = 35.45$; $SD_{age} = 13.21$) participated in this study.

Familiarity score with 5-point scale ($M = 6.37$; $SD = 1.02$) was higher than 100-point scale ($M_{difference} = 3.58$; 95% CI [3.16, 4.01]). Moreover, 90% of the participants ranked 5-point scale as the most familiar scale. Given this result, it is very unlikely that our finding in study 3 is explained by familiarity with the provided scales and processing fluency.

2.5. Study 4

In study 2, the scale effect persisted even when the numerical values of the ratings were not displayed and the visual aids helped participants to easily notice equal average ratings. This means that participants, at least, paid attention to the scale labels. Otherwise, the scale effect could not have emerged. This raises a question about the nature of the scale effect; if participants paid attention to the scale labels, did they deliberately decide to give more weight to the larger scale? In other words, is giving more weight to large-scale ratings something they think they should do to make an accurate judgment or is the underlying process of the scale effect so unconscious that they could not prevent it from happening once they realized that the scales are of different sizes?

To answer this question we decided to manipulate deliberate thinking about the aggregation process. More specifically by triggering reflection on the rating aggregation process before product evaluation, we hoped to activate deliberate thinking. If the scale effect is primarily driven by intuitive thinking, activating deliberate thinking should reduce the scale effect. We used a one factor two-level design. The two-level factor was time at which the reflection task occurred in the study: ex-ante and ex-post. In the ex-ante condition the reflection task was administered before the product evaluation task. In the ex-post condition the reflection task came after the product evaluation task.

In the reflection task, participants saw two products (toasters) and their ratings with the same format as study 1. We used integer numbers for 100-point rating and 10-point ratings rounded to one decimal place to keep the granularity of scales constant, Appendix B - Table 8. Using a 7-point scale, participants indicated the extent their product evaluation should be influenced by each of the two scales in order to make an accurate judgment: 1-All the weight to the ratings on the 10-point scale,… 4- Equal weight to the ratings on both scales,… 7- All the weight to the ratings on the 100-point scale. The end labels were counterbalanced. The product evaluation task used the same design as study 1. The data was collected from 402 Prolific users (158 Women; M_{age} = 33.24; SD_{age} = 12.86).

2.5.1. Results

We first compared the reflection task responses in the ex-post and ex-ante conditions. Kolmogorov-Smirnov test suggested that the distribution of response counts over the response categories did not differ between the ex-ante and ex-post conditions ($D(402)$ = .06; Z = .65; p = .80), Figure 2 - 7. The responses to the reflection question suggest that 47% of the participants thought that they should give equal weight to ratings on both scales to make an accurate judgment. 34% of the reported weights favoured the 100-point scale. This is larger than the 20% of responses that favoured the 10-point scale (χ^2 = 18.51; p < .001).
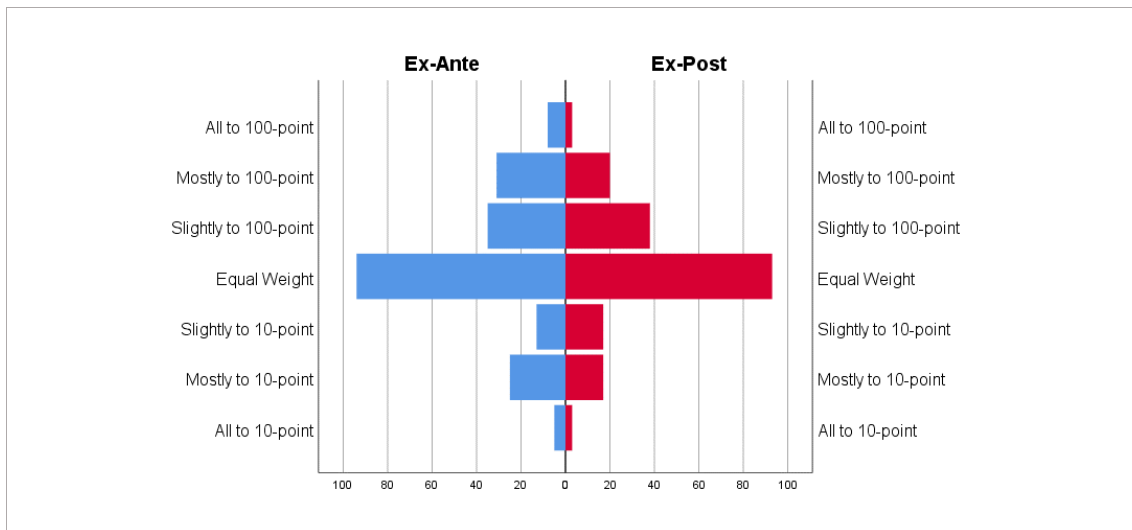
Figure 2 - 7: Distribution Of Reported δ Across The Ex-Ante And Ex-Post Conditions

The product attitude difference score was calculated by taking the average of Diff$_{Intention}$, Diff$_{Quality}$, and Diff$_{Recommendation}$ (α = .74). To test the effect of the reflection manipulation we used Diff$_{Product-Attitude}$ and Diff $_{WTP}$ as the dependent measures in the following ordinary least squares (OLS) linear regression model

$$DV = \beta\_0 + \beta\_1 \, AL\_Dummy + \beta\_2 \, refl\_Dummy +$$
$$\beta\_3 \, AL\_Dummy \times refl\_Dummy + \varepsilon$$

EQ 14

where AL_Dummy is our independent variable (AL+ = 1, and AL- = 0) and refl_Dummy represents reflection task factor (ex-post = 0, and ex-ante = 1).

AL_Dummy was the only variable in EQ *8* that could significantly predict $Diff_{Quality}$ (β= 5.94; 95% CI [2.22, 9.66]) and $Diff_{Recommendation}$ (β= 52.29; 95% CI [.28, 4.29]). This result replicated the scale effect observed in the previous studies when the granularity of the scales remained equal.

We had hypothesized that if the underlying process of the scale effect is unconscious, reflecting on the right way of aggregating ratings from different scales would help participants to be more aware of their evaluation process which would mitigate the scale effect. However, β_3 did not appear to be different from zero, Table 2 - 3. Thinking about how one should give weights to ratings from different scales does not have an effect on how they do it in practice. The pattern of the results looked the same for $Diff_{WTP}$, Table 2 - 3. These results are inconsistent with the hypothesis that the scale effect results from an unconscious process.

Table 2 - 3: Study 4 - OLS Regression Table

DV	$Diff_{Product\text{-}Attitude}$						$Diff_{WTP}$					
	Model 1			Model 2			Model 1			Model 2		
	β	L-CI	U-CI	β	L-CI	U-CI	β	L-CI	U-CI	β	L-CI	U-CI
Intercept (β_0)	1.34	-1.23	3.90	4.17 ***	2.31	6.03	1.73 *	.34	3.11	2.82 **	1.82	3.82
AL_Dummy (β_1)	5.94 **	2.23	9.65	5.94 **	2.22	9.66	2.29 *	.28	4.29	2.29 *	.28	4.29
Refl-Dummy (β_2)				-.85	-4.57	2.87				-.17	-2.18	1.83
AL*Refl (β_3)				-2.01	-9.46	5.44				-1.93	-5.94	2.09
R^2	.02			.03			.01			.01		
N = 402	F(1, 400) = 9.89**			F(3, 398) = 3.45*			F(1, 400) = 5.04*			F(3, 398) = 1.98		
* Significant at the .05 level, ** Significant at the .01 level, *** Significant at the .001												

For each participant, we computed their observed δ using EQ 8. Overall the observed δ (M = .55; SD = .35) was larger than .5 ($M_{difference}$ = .05; 95% CI [.02, 08]). 59% of our participants had an observed δ higher than .5. Administering the reflection task ex-ante did not have an impact on the average δ (M = .56; SD = .37) in comparison to the conditions where the reflection task was answered ex-post (M = .54; SD = .32; $M_{difference}$ = .02; 95% CI [-.05, .08]), Figure 2 - 8. This lack of difference between observed δ across reflection conditions is one more piece of evidence against the hypothesis the scale effect results from an unconscious process.
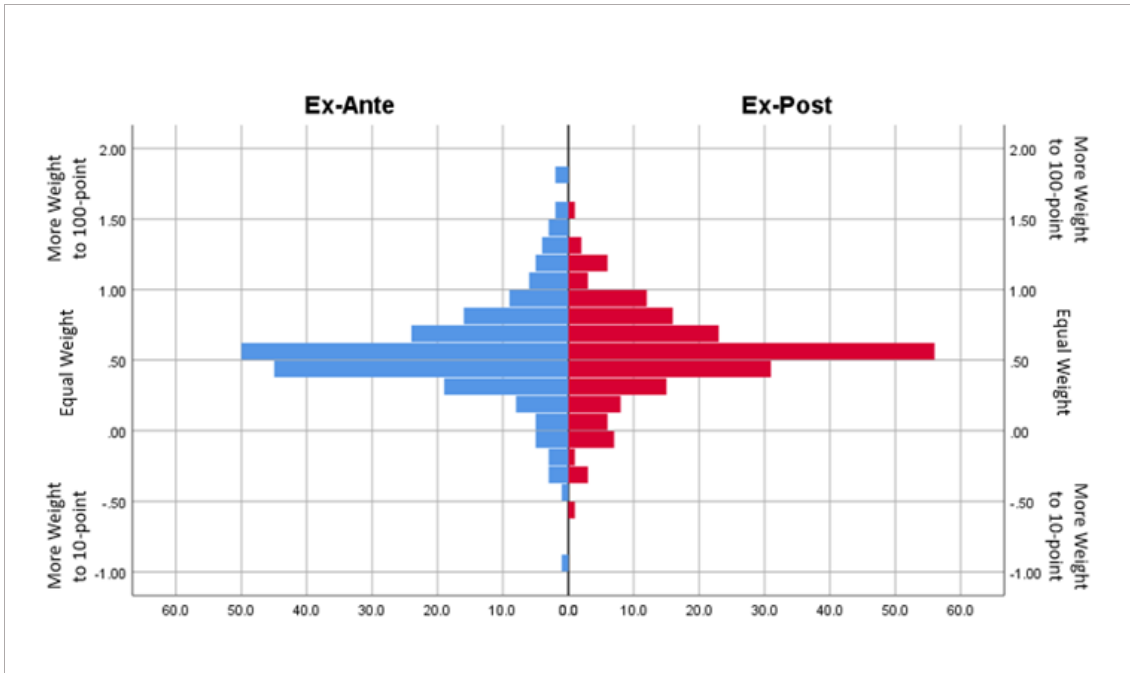
Figure 2 - 8: Distribution Of Observed δ Across The Ex-Ante And Ex-Post Conditions

Participants seemed to be quite consistent with what they said they should do to have an accurate judgment and what they did in the evaluation task. Participants who had reported that they should give more weight to the small scale to have accurate judgment had an average observed δ (M = .41; SD = .39, N=80) that was less than .5 ($M_{difference}$ = -.09; 95% CI[-.18, -.01]). Participants who reported that they should give equal weight to both scales had an average δ (M = .53; SD = .25; N = 187) that was very close to .5 ($M_{difference}$ = .03; 95% CI [-.01, .06]). Those participants that had given more weight to the larger scale in the reflection task, had an average δ (M = .67; SD = .40, N = 135) greater than .5 ($M_{difference}$ = .17; 95% CI [.10, .23]), Figure 2 - 9.
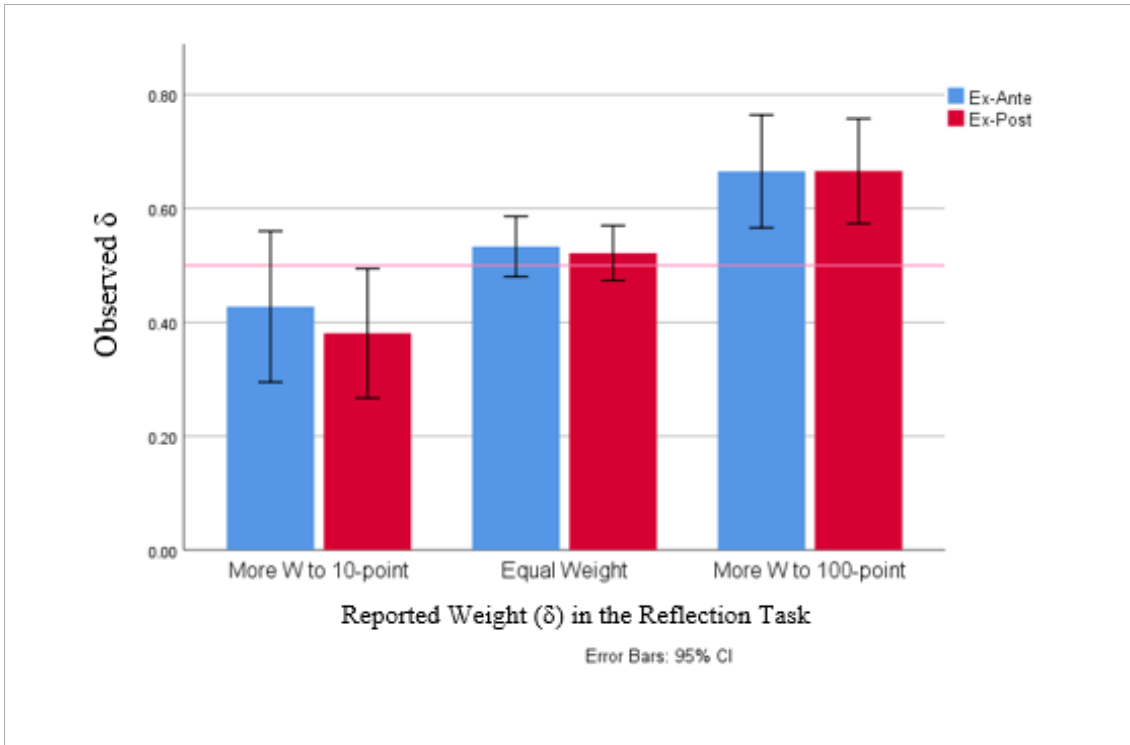
Figure 2 - 9: Observed δ In Each Response Category Of The Reflection Task

2.5.2. Discussion

Study 4 replicated the scale effect keeping the scales granularity similar. But, this study served other purposes as well. First, we wanted to know what people think is the right way of aggregating ratings from different scales to make an accurate judgment. The results suggest that about half of the sample believed that they should give equal weight to both scales. The majority of the remaining half, however, reported that to have an accurate judgment they should give more weight to the larger scale, consistent with the scale effect.

Second, we hypothesized that if the scale effect is unconscious then becoming aware of it should mitigate the effect. The reflection task in the ex-ante condition meant to make participants aware of how they aggregate ratings. But our findings did not support any effect of the deliberation task on the scale effect. However, the result of the evaluation task showed that participants were quite consistent with what they believed they should do and what they did. That is, those who said they should give more weight to the small scale had an observed δ less than .5, those with the response of equal weight distribution had an observed δ equal to .5 and those who believed that more weight should be given to the large scale exhibited the scale effect with δ larger than .5. These findings suggest that the scale effect, at least to a large extent, is a conscious process where people aggregate the ratings the way they think they should do.

2.6. General Discussion

Our four studies provide support for what we call the scale effect. When forming an attitude toward a product rated on two different scales, people seem to be more strongly influenced by the ratings provided on the larger scale.

Our findings suggest that the scale effect occurs in both joint and separate evaluation settings and is not explained by a superior fluency of large scale ratings. The scale effect was quite robust and strong in study 1 where we tested it across a wide range of ratings. In studies 2 and 3 we tried to isolate the effect of rating numerical magnitude from disproportionate weight distribution. The scale effect persisted even in the absence of numerical ratings when visual aids simplified rating comprehension and made it salient that the average ratings of two products were equal. Surprisingly, we found that not only large scale ratings are not perceived as more impressive, they actually seem less impressive than their small scale counterparts for more than two-third of rating range. However, when aggregating ratings to form an attitude larger scale ratings carry greater weight. These findings suggest that numerical magnitude and mere impressiveness are not driving the effect. The result of study 4 sheds light on the mechanism. We found that the scale effect is driven by the motivation for accurate judgment as large scales are associated with more accuracy.

Assuming that ratings of different scales are interchangeable numerical formats, the disproportionate weight in favour of large scale ratings deviates from the seemingly natural way of aggregating ratings. However, we are prudent not to label the scale effect as a bias. The scale effect could be an adaptive response to how ratings are generated. Previous research has shown that scale formats change response behaviour in self-report questionnaires (Cabooter et al. 2016). Similarly, the scale size may influence how ratings are given in the first place. In the absence of evidence from prior research we cannot make the claim that the scale effect leads to inferior choices. It could be possible that reviewers use larger scales in a more thoughtful way than smaller scales. If this is the case, participants could be right in giving more weight to large scale ratings.

Our findings contribute to our understanding of how ratings are interpreted and used. From a numerical perspective, ratings are fractions. Fractions are unintuitive and difficult to comprehend and numerically equivalent fractions are interpreted differently depending on their format (Bonato et al. 2007; Siegler et al. 2013). The numerosity heuristic (Bagchi and Davis 2016) and the whole number bias (Bonato et al., 2007) both predict better perceived value for large-scale ratings than small-scale ratings. But the result of study 3 suggests the opposite. Participants found rating on the small scale rating more impressive than ratings on the large scale rating. The scale effect emerges only when ratings are aggregated. This discrepancy would imply that ratings could be better understood not merely in terms of the numerical value they represent. They carry information about the unobservable qualities of different options. They serve the specific function of reducing choice uncertainty. Therefore, the same numerical mindset interpreting numbers might not be necessarily aligned with the goal of using ratings.

In the presence of alternative choices, evaluations are made either simultaneously (joint evaluation), one at a time (single evaluation), or some mix of the two (Hsee et al. 1999). According to the evaluability hypothesis, when there is a trade-off between easy-to-evaluate and hard-to-evaluate attributes, the former becomes more attractive in single evaluation settings and the latter in joint evaluation settings (Hsee 2000). According to our complementary study the most familiar scale, and hence the most evaluable scale, is the 5-point scale. This is also the smallest scale in our studies. Applying evaluability heuristic into our context then we should expect $\delta_{Joint} > .5 > \delta_{Single}$. However, we did not find such a reversal in our studies. The results showed that the scale effect appears in both the joint evaluation and single evaluation settings.

Our data cannot explain whether the mechanism that underlies the scale effect is similar in joint and single evaluation settings. In studies 1, 2, and 5 the ratings were chosen such that $R_L(A) - R_L(B) = R_S(B) - R_S(A)$. Given that both products A and B were displayed jointly, participants could evaluate the products either by two separate comparisons within rating scales or by comparing the aggregate ratings. For instance, in AL+ condition the two separate comparisons would be $R_L(A) > R_L(B)$, and $R_S(A) < R_S(B)$. At an aggregate level, comparisons would be made after evaluating each product: $E(A) = (1 - \delta)R_S(A) + \delta R_L(A)$, $E(B) = (1 - \delta)R_S(B) + \delta R_L(B)$. In both cases, giving more weight to large-scale ratings would result in favouring product A over B. But, if large scale ratings become more evaluable in a joint evaluation setting in addition to being associated with more accuracy we can predict $\delta_{Joint} > \delta_{Single} > .5$.

Symbolic information like numbers and words can be represented in various formats. The way information is presented influences decision making (Grüne-Yanoff and Hertwig 2016; Kelton, Pennington, and Tuttle 2010; Zipkin et al. 2014). We also tried to eliminate the scale effect by providing participants with a visual representation of the ratings. Humans have a specialized skill in retrieving information from visual stimuli. Leveraging this skill, visual representations are often used to facilitate decision making (Lurie and Mason 2007). However, the scale effect persisted even when visual "access" to the numerical value of ratings was provided. This result attests to the strength of the scale effect. This can be seen as a double-edged sword of persuasion. While the scale effect can be used as a nudge to promote choices for wellbeing, it can be misused as a manipulative device to cause a disproportionate affinity towards particular products.

As the indicators of quality and performance, ratings are consequential in many domains of judgment and decision making. In this paper we were mainly interested in online product ratings, however, our findings can be applied to other domains. For instance, ratings are very influential in university degree admission, job vacancy, and performance appraisals. Hiring managers have to form their decisions based on various ratings. Given that grading and performance measure scales vary across countries, and professional development institutes, hiring managers will be susceptible to the scale effect. In such scenarios, the scale effect could a relevant factor to the fairness of the evaluation process. Putting the consequential effects of ratings into perspective, we propose that understanding how ratings are made and interpreted is crucial in making informed decisions and providing decision aids. With the scale effect project, we aimed to uncover only one facet of this underexplored area.

Chapter 3

Objectification: Unforeseen Effects of the "Thumb Culture"?

Joint with Gert Cornelissen

3.1. Introduction

Online dating has revolutionized the courtship culture in today's tech-savvy civilization. In masses, people have turned to the screen to try their luck on finding love via a swipe. Only in the U.S., more than 62 million adults (3 out of 10) are estimated to have used an online dating site or app (Anderson, Vogles, & Turner, 2020). Tinder alone reported 1.6 billion swipes a day and 1 million dates per week made by its 57 million users, resulting in $1.15 billion revenue in 2019 (Iqbal, 2020).

Online dating websites and applications are acclaimed for their convenience in creating quick access to a sizable choice set of available partners. They have introduced efficiency in the dating market, in response to today's busy life style (Hobbs, Owen, and Gerber 2017). These platforms connect users of diverse backgrounds and socio-psychological profiles that, otherwise, would have had many social barriers to find a match. They also eliminate the laborious and, sometimes, emotionally taxing process of engaging in social interaction, identifying potential dating opportunities, and exposing oneself to the risk of rejection in order to secure a date.

However, given the "lean" nature of online communication, characterized by frequent, fast and superficial conversations, it might very well be conceivable that the novel mode of interaction affects *how* people see and treat others, also outside of a dating context. Online dating apps are criticized by its users, commentators, and scholars for triggering a "market mindset", leading to an impoverished perception of other people, reducing them to commodities and products that can be browsed, filtered, added to a shopping cart, and discarded (Frost et al. 2008; Heino, Ellison, and Gibbs 2010). The common concern in these allegations lies in the notion that the market mindset deprives commodified others of humanness and, with that, of the intimacy, emotional connectedness and fair treatment that humans are entitled to (Mead and Stuppy 2014).

Despite the abundance of anecdotes and commentaries on how online dating triggers a market mindset, relatively little quantitative or qualitative research has addressed this issue. In this paper, we investigate whether searching for a match via swift evaluation of profile photos, as done in Tinder, the most widely used online dating app, would promote a commodified view of other people. In pursuit of this inquiry we have conducted four studies. The first two studies provided suggestive but not conclusive evidence for a reduced perception of humanness, and lower fairness considerations after a date search task. In the last two studies (study 3a and 3b) we tested a possible explanation for the failure in finding our proposed effect. More concretely, we found that a focus on *rejecting* undesirable dating targets as opposed to a focus on *choosing* desirable ones could lead to opposing effects. Rejecting others as a potential date seems to facilitate perceiving

humanness in others and promote prosocial behavior, whereas choosing others as a potential date generate the opposite pattern.

In what follows, we disclose the theoretical framework of the project providing a literature review of both scientific and mass-media communities. In the methodology section we describe four studies and their findings. The conclusions, limitations, and our proposal for extending the project are noted in the general discussion section.

3.1.1. To Swipe or Not To Swipe: Pros and Cons

"*We're not trying to take the love out of love. We're just trying to make it more efficient.*" — Jeff Tarr in 1966.

This quote illustrates the discourse revolving around "online dating" at its dawn in 1965, when a team of Harvard undergrads created the world's first computer dating service: Operation Match. The technology behind Operation match is very similar to its modern descendants. Users would fill out questionnaires and receive a list of potential matches, at a cost of $3. Interestingly, just as its underlying technology, the sentiment around online dating is similar 55 years later. People still debate what is sacrificed when dating moves online and gains in efficiency: the quantity-quality tradeoff.

Online dating is convenient; it enables easy interaction without much time commitment for today's hectic lives. The elimination of the initial awkward steps of approaching someone and attempting to strike up a conversation, while exposing oneself to explicit evaluation by others, makes the dating process less emotionally taxing, and allows the socially timid ones to circumvent what for them is an intimidating experience. The fun and gamified interface of dating apps has expanded the market reach by appealing to a wide range of people (Abolfathi & Santamaria, 2020). Thanks to the ever improving matching algorithms, online dating enhances the chance of finding a match with a specific profile of interest (Finkel et al. 2012). Signing up for an account on online dating apps is not restricted to any sociodemographic or sociopsychological profiles which creates an inclusive environment that promotes diversity (Potarca 2017).

Some online dating apps, especially Tinder, are known in the pop culture as "hook-up" apps that promote and facilitate casual sex (Sales, 2015). It's been argued that the "supply" of sexual partners empowers women in that they can exercise more control over choosing their preferred relationship type, whether it's a one-night stand or longer term relationships (Timmermans and Courtois 2018). As such, online technologies are reconstructing social categories such as gender and what they were used to connotate (Ganito 2017).

The list of benefits associated with online dating apps is arguably substantial. However, those benefits do not exempt online dating platforms from criticism. Starting from more obvious ones, the location-sharing technology of dating apps facilitates susceptibility to harassment and privacy violation. In one survey, 28% of respondents reported at least some level of abuse through online dating platforms (Gillett 2018). Sexually transmitted infections (Bhattacharya 2015) form another risk that grows with frequent use of online dating apps.

The evaluation of available users based on their appeal as dating partners is dominated by visual information collected from profile photos. The ability of evaluating dozens to hundreds of people in a few seconds, merely based on their photos, puts less attractive users in a very disadvantaged position, with some having to wait months to get a match. For this reason, many users find the partner search mediated by online dating

apps superficial and beneficial only for the attractive ones who outcompete the others (Hobbs, Owen, and Gerber 2017). Being dumped by one or two or a handful of dates (Telegraph, 2014) in real life dating is definitely a painful experience but, at least, it leaves some room to psychological projection of the problem. The lack of attention received on a dating app, when one's profile is viewed by hundreds of users, however, is difficult not to be taken personally. For example, one user described his experience waiting for a match as pulverizing his "carefully crafted concept of what makes me" (Moses, 2017). This very well summarizes the threat to self-worth caused by constant rejection. Research found that the use of online dating apps is associated with low body image satisfaction and body shaming (Strubel and Petrie 2017). For the confident ones, however, frequent use of mobile dating apps might increase the perceived amount of available partners and the intention toward infidelity (Alexopoulos, Timmermans, and McNallie 2020).

"Efficiency", the hallmark of online dating apps, is a double-edged sword. Dating apps provide access to a large network of potential partners whom to choose from. However, just like for objects, when the offer is overabundant, individual alternatives become easily discardable and interchangeable without much emotional investment (Whitley, 2018; Dao, 2014). Such a view of others, as discardable and interchangeable, undermines the appreciation of the other as a whole person, deserving of a full range of emotional and moral considerations, and strips away certain human qualities (i.e., dehumanization).

In this research we explore the possibility that the superficial consideration of other people as appealing or not, as is typical for dating apps, might result in a dehumanized view on others. More specifically, we focus on search tasks where users get to reject or choose potential matches based on visual information. We acknowledge that photo-based evaluation may not be the only search strategy in online dating apps (Jung et al. 2019; Rosenfeld 2018). However, the dominant experience on online dating apps is one of quick and superficial browsing of visual user profiles in search for a potential match (Baxter & Cashmore, 2013; Dunn, 2017; Hobbs et al., 2017).

As a precautionary note, we are not claiming that online dating services are the only cause of dehumanization and harassment. However, given the mounting reports and anecdotes about online dating facilitating dehumanization we believe this relationship is worth studying.

3.1.2. *RelationShopping, Figuratively and Literally*

People construct reality and meaning through interaction with our environment. From this perspective, "technology can be understood as artifacts which may be both shaped by and shaping of the practices humans use in interaction with, around and through them" (Hutchby 2001). Technological artifacts serve predetermined functionalities with certain goals. However, given the possibilities and limitations that they introduce to human's interaction with them, and through them with others, unintended meanings and experiences may emerge from these interactions that are different from their primary goal (Hutchby 2001; Scherling and DeRosa 2020). In the case of online dating apps, the objective of increasing the pool of potential dates and widening the set of alternatives necessitates a market-like environment working under the economic principal of supply and demand. So, while the main goal of online dating apps could be to facilitate finding a dating partner, they also "represent an embodiment, or visualization of the sexual marketplace (Thompson 2018) where rejecting or accepting a potential match may be experienced as "shopping in an online store like Zalando, but for a partner instead of a pair of shoes" (van Gelder, 2019).

One of the criticisms to online dating apps that shapes the pivot of this research is the experience of being in a supermarket and picking a potential partner "off a supermarket shelf" (Maccabe, 2016), a metaphor also labeled as "relationshopping". The market analogy originates in perceived similarities between the search task in online dating apps and going on a shopping trip (Finkel et al. 2012). Some of these similarities between the activity of shopping, and selecting potential dates on a dating app are inherent in the availability of numerous options. In order to deal with choice overload, users have to apply certain filters to reduce the choice set. However, the available filters are nothing but searchable and phenotypical characteristics such as location, height, and eye color that might trigger a feature based view on the possible matches (Frost et al., 2008; Kibbe, 2020; Seal, 2020) "encouraging a ruthless mind-set of assigning objective values to potential partners and to ourselves" (Fetters & Tiffany, 2020). With more time spent on online dating apps people develop skills for filtering others (Best and Delmege 2012) and become more judgmental with their primary focus on attractiveness and interests (Hazell, 2012). This "check-list" approach is very similar to shopping experience in the market and can activate a market mindset that facilitates the treatment of others as products (Heino, Ellison, and Gibbs 2010).

Various accounts of dating app users corroborate the suggestion that, on the one hand, the search for a suitable match is like choosing the right product on Amazon.com. On the other hand, dating app users do not only take on the role of consumers, but also of marketers. In that role, users are encouraged to use marketing techniques to "brand" themselves in order to appeal to their "target market" (Fottrell, 2018). In line with this second role, app users report engaging in strategic self-presentation (Whitty 2008) and self-commodifying by using sexualized photos (Anderson et al. 2018). In extreme cases like WhatsYourPrice platform, online dating is actually a market based on money transaction. Just like an auction, bidding members place their bids. If the bid is accepted, the bidding member is expected to pay the agreed-upon amount during the date, including all date expenses (Doucette, 2012).

3.1.3. Market (for) Relationships

Relationships mediated by online dating apps are perceived to be "transactional" (Kiberd, 2017; Kassel, 2018; Schwartz, 2019). This view resonates with the recurring "market" metaphor used to describe online dating applications. After all, a "market is a place where buyers and sellers can meet to facilitate the exchange or transaction of goods and services" (Kenton, 2020).

When relationships are established on an exchange basis, behaviors are driven more by expected payoff than by intimacy and emotional connectedness (Mead and Stuppy 2014). Prioritizing cost/benefit entails disregarding the cost borne by others. Such view about others weakens social bonds, objectifies social relationships and, consequently, reduces altruistic motives (Heyman and Ariely 2004) and increases the likelihood of unethical behavior (Kouchaki et al. 2013). Similarly, it has been shown that activating a market mindset hinders ascription of fully humanizing traits to others (Henkel et al. 2018). The dehumanizing effect of market mindset could be explained by reduced activity in the brain network responsible for social cognition, when thinking of others in terms of market value (Harris et al. 2014).

3.1.4. Online Dating and Perceived Humanness

When people attribute the presence of mind to someone, they recognize the other's ability to feel emotions and have thoughts, as well as the content of those emotions and thoughts

(theory of mind). Recognizing humanness in others, requires the attribution of mind to those others and distinguishing them from machines and animals (Haslam, Loughnan, and Holland 2013). Attributing mind to someone is a necessary condition to recognize humanness in others, but not sufficient. Mind is perceived along two dimensions: experience and agency. Experience refers to the capacity to feel sensations such as hunger, fear, and pain. Agency refers to the ability for self-control, morality, planning, and experience. Various forms of being (e.g., objects, animals, fetuses, adults, or corpses) could be ascribed to possess certain level of mind depending on where it is perceived to be located on the experience-agency coordinate system (Gray, Gray, and Wegner 2007). Given that any form of being could be credited with mind, the specific quality required to recognize someone's humanness is further defined according to the attributes that contrast humans with nonhumans (machines and animals).

What separates humans from machines are the human nature traits which are innate, and cross-culturally universal. They "involve emotionality, interpersonal warmth, and openness", e.g. emotional responsiveness versus inertness. Uniquely human traits, however, distinguish humans from animals. They "are understood to reflect gradual social learning" and "tend to revolve around civility, refinement, and higher cognition", e.g. moral sensibility versus amorality, (Haslam 2006; Haslam et al. 2012). In order to empathize with others, and treat them as a being deserving of morality, an appreciation of their humanness is essential. A being devoid of humanness is denied the capacity for suffering and, with that, denied of moral consideration. Failing to assign humanness to human subjects is referred to as dehumanization.

The manifestation of dehumanization falls along a spectrum. It could be as subtle and implicit as a lack of activation of social cognition networks in the brain (Harris and Fiske 2006). Or, it could be explicitly exhibited in behavior such as referring to others as animals, objectifying women, or engaging in abuse and violence (Haslam and Loughnan 2014).

In the context of online dating apps, existing evidence suggests that there could be a relationship between the use of dating apps and dehumanization, expressed in various forms. As reported by a recent study, in comparison to non-users, online dating app users were more likely to be sexually abused (Choi, Wong, and Fong 2018). Catcalling, aggressive sexual invitations, threats of sexual violence and victim-blaming are common on online dating apps with women being the main target (Shaw 2016; Thompson 2018). "Not hot enough" discourses, for instance by calling women "fat" and "ugly", are dominant in men's response to rejection, arguably, to lessen women's worth in the sexual marketplace (Thompson 2018). Rather shockingly, these intrusive behavior has been treated by social media commentators as humorous at the peril of normalizing intimacy intrusions (Gillett 2018). Suffering harassment in the context of online dating is not unique to women though. For example, catfishing and deception is reported to be widely experienced by men from sexual minority communities (Lauckner et al. 2019).

3.1.5. Current Project

The large choice set of potential partners on online dating apps and the layout and functionalities of those apps, inevitably, make the search for dates similar to the act of shopping (Heino, Ellison, and Gibbs 2010). We argue that the quick browsing through available profiles facilitates the reduction of other people to commodities and undermines the experience of true human connectedness, and the attribution of humanness to others. Across 4 studies we investigated whether engaging in an online dating search task could lead to dehumanization of others. In study 1 we tested whether execution of an online

date search task leads to dehumanization of others. Then, in study 2 we tested the effect of an online dating search task on a societal consequence of dehumanization, namely prosocial behavior.

To get more of an insight in the reasons why the evidence in favor of the hypothesized effect is weak in Study 1 and 2, in study 3a and 3b we tested if focusing on rejecting versus choosing during the search task would lead to different levels of dehumanization (3a) and prosocial behavior (3b).

3.2.   Study 1

In study 1 we tested the relationship between engaging in an online dating search task and the dehumanization of others. If executing an online dating search task does, as we argued, generate a mindset that equates partner selection to shopping then it is reasonable to expect that the targets that one evaluates become perceived as commodities (i.e., inanimate objects). In order to measure degrees of dehumanization, we used a paradigm developed to measure the threshold of mind perception in human faces (Hackel, Looser, and Van Bavel 2014). In this paradigm the threshold is called point of subjective equality (PSE). It is measured by presenting participants with a set of morphs, gradually evolving from a human face to an inanimate face, see Figure 3 - 1. Participants are asked for each image to indicate to which extent they attribute human characteristics (in our case: the capacity to experience pain) to what they see on the image. The PSE represents the point at which a face is equally likely to be perceived as an object and human. The lower the PSE, the "later" in the evolution of the morph from human face to inanimate face, participants stop attributing human characteristics to the target. The higher the PSE, the "earlier" participants stop attributing human characteristics are attributes to the target. In other words, the higher the PSE, the more dehumanization occurs. We hypothesized that if engaging in an online dating search task makes people reduce others to commodities, the less likely they should be to "perceive mind". In other words, PSE should increase in comparison to the reference point.
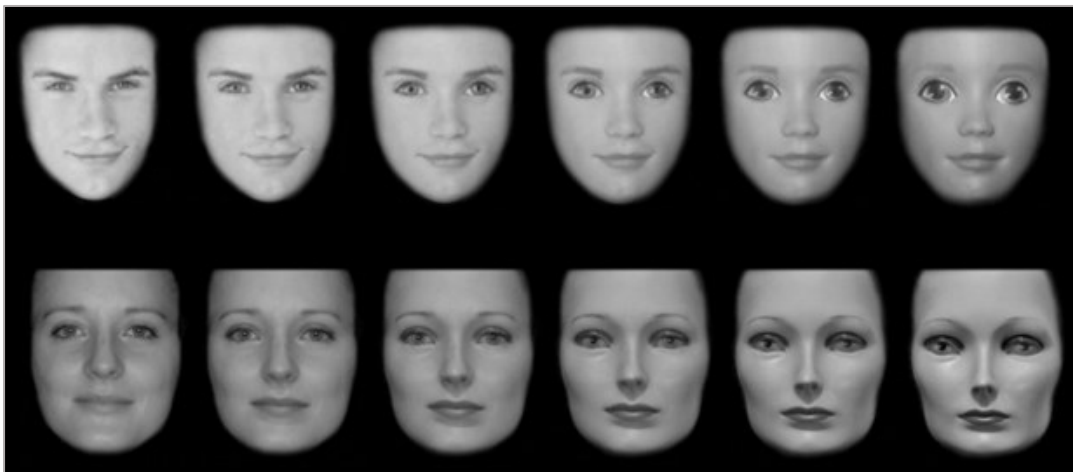
Figure 3 - 1: Six Sample Morph Stimuli (Of 11) For Two Morph Identities (Participants Saw Morphs In Color). Participants Saw Morphs Between Well-matched Human And Inanimate Faces Along 11 Equidistant Points (Hackel, Looser, And Van Bavel 2014)

3.2.1. Method

We recruited 100 undergraduate students from the Bess_Lab (Universitat Pompeu Fabra) subject pool (64 Women, $M = 21.04$; $SD = 4.15$). The experimental sessions took place in a university behavioural lab. Participants were randomly assigned to one of the two conditions, Tinder versus Coffee. In the Tinder condition participants saw 35 photos of different people whose gender matcher participants' dating gender of interest. The photos were validated as suitable for a Tinder task by previous research (Pronk and Denissen 2020). For each photo participants indicated whether they are interested in dating that person or not using keyboard keys A and L. To mitigate the effect of any unforeseen association of letters and choice the two keys' functions were counterbalanced across participants. In the Coffee condition, participants saw the same set of photos but with a different task. They were requested to guess whether the person in the photo is a "coffee person" or a "tea person". The answers were recorded by keystrokes as in the Tinder condition.

After doing the Tinder or Coffee task, the PSE was measured by presenting participants 33 morphed images (3 sets, 11 morphed images per set: 1:fully inanimate, 11:fully human) and asking them to rate each image on a 9-point scale (1: not able to feel pain, 9: able to feel pain). The gender of the morphs matched participants' dating gender of interest. In the end, to make sure that participants had understood the PSE task, they were asked to report what they did in that task. The reason for adding a comprehension question was that, first, the PSE task was reported as confusing in a pretest. Second, it was important that participants indicate the perceived *ability* of feeling pain by each morph and not whether the morph is perceived to be in pain. Participants' answers to the comprehension question was coded as "accepted" if it could be inferred that the participant understood the task and "denied" if the participant had reported having done a different task than what was asked. We dropped 14 data point from further analysis.

3.2.2. Results

For each participant we collected 33 responses (3 morphs, 11 morphed images per morph), on a 9 point scale. All the datapoints were linearly transformed to binary ratings (0 = inanimate, to 1 = animate). We calculated point of subjective equality (PSE) at both the aggregate level and the individual level.

At the aggregate level, all the ratings in each condition (N = Number of Participants × 33 data points) were fit with a cumulative normal function (CDF) to allow calculation of the PSE in each condition: PSE = $F(.5) = P(X \leq .5)$. In other words, the PSE is the probability that the displayed morphs are perceived to be, at most, equally capable and incapable of feeling pain. The larger the PSE, the less likely morphs are perceived as capable of feeling pain (i.e., more dehumanization).

A Kolmogorov-Smirnov test suggested that the rating distributions were different between the two conditions ($D = .06$; $p < .01$). Moreover, PSE in the tinder condition ($F(.5) = .62$) was larger than PSE in the coffee condition ($F(.5) = .57$). In other words, those in the Tinder condition dehumanized more than those in the Coffee condition.

At the individual level, for each participant we calculated the PSE by fitting all the 33 ratings to cumulative normal function and calculating $F(.5)$. As for individual PSEs, overall the mean was higher in the Tinder condition ($M = .64$; $SD = .15$) than in the Coffee condition ($M = .57$; $SD = .17$; $t(84) = 1.99$; $p = .05$; 95% CI [.00, .14]).

3.2.3. Discussion

Denying mind to humans is a necessary condition for dehumanization to occur (Gray, Gray, and Wegner 2007; Hackel, Looser, and Van Bavel 2014; Haslam, Loughnan, and Holland 2013). The result of study 1 suggests that online dating search task suppresses mind perception, and hence the perception of humanness. In study 2 we explore a societal consequence of dehumanization caused by online dating search task, namely a reduction in prosocial behavior others.

3.3. Study 2

Dehumanizing others disentitles them from moral and fair treatment (Haslam et al. 2012) and undermines altruism (Heyman and Ariely 2004). As a result, we hypothesize that performing an online dating search task will reduce levels of prosocial behavior. We used a modified and hypothetical version of the dictator game (Kahneman, Knetsch, and Thaler 1986) as a measure for prosocial behavior (Caviola and Faulmüller 2014).

Participants were 178 Prolific Academic users (80 Women, $M = 25.47$; $SD = 5.59$). The data of two respondents were dropped because their answer to an open ended question created the suspicion of being generated by a bot. The manipulation was identical to Study 1.

After going through the Tinder or Coffee task participants read a hypothetical scenario. Specifically, they were asked to imagine themselves as the director of knowledge management in a videogame development company. The job required working with an employee who was in charge of cataloguing files. The gender of the employee was randomized to dissipate a possible gender effect. Next, participants were told that the annual performance evaluation of the company was very satisfactory for their department. As a reward, the company paid them $1000. As the director of knowledge management unit participants were asked to indicate the amount of money they will share with their employee (Minimum=0, Maximum=1000). The study was finalized by an open end question inviting participants to share possible issues that could have happened during the study.

3.3.1. Result

We used the amount shared with the employee as the dependent variable. On average participants in the Tinder condition ($M = 331.98$; $SD = 154.09$) shared a lower amount in comparison to those in the Coffee condition ($M = 366.48$; $SD = 127.70$). However the difference did not reach the conventional significance level ($t(174) = -1.62$; $p = .11$; 95% CI [-76.52, 7.53]).

Given that we had a balanced number of men and women in the participants, we did an exploratory analysis to test whether gender had any impact on the amount shared, Table 3 - 1. We did a two-way ANOVA with task and gender as the independent variables. There was a trend in the expected direction for the main effect of the task ($F(1, 172) = 2.83$; $p = .09$). Nor gender ($F(1, 172) = .07$; $p = .79$), Neither their interaction between gender and the task ($F(1, 172) = .64$; $p = .42$) turned out to have a statistically significant effect on the shared amount.

Table 3 - 1: Study 2 - Descriptive Results – Shared Money

		Tinder	Coffee
Women	M	319.49	372.76

50

	SD	126.37	128.29
	N	39	41
	M	342.34	361.22
Men	SD	174.47	128.30
	N	47	49

3.3.2. Discussion

Participants in the Tinder condition shared a smaller proportion of their hypothetical reward than those in the Coffee condition. However, the difference was not statistically significant. We try to address the lack of conclusive findings in the next study.

3.4. Study 3

The results of the first two studies did not consistently reach conventional significance levels, and therefore, one should be careful about drawing conclusions based on these studies. One explanation for the weak result could be statistical fluke, but we acknowledge some shortcomings in the design of these studies as well as alternative explanations for the inconclusive results. One of the possible shortcomings of our experimental design is lack of control over participants' understanding of the Tinder task. Do they understand it as a choosing task or as a rejecting task? Although this problem could be generalized to real online dating, it could be particularly relevant to an experimental setting where participants are requested, albeit in the context of voluntarily participation in a study, to evaluate possible dating options.

Being rejected is something that almost everyone has experienced at some point. It is painful. There is abundant research on the distressing effect of being rejected (for a review, see Williams, 2007) with mounting evidence that physical and social pain overlap in their underlying neural circuitry (Eisenberger and Lieberman 2004). But, we know that given the experience-based common knowledge about the pain induced by being rejected, the act of rejecting others is a painful experience as well (Chen et al. 2014). Translating these findings to the Tinder task, the other-regarding emotional concerns of rejecting others could parse-out the self-interested market mindset. That is, rejecting others should not lead to dehumanization, as opposed to choosing others. Furthermore participants could use the dictator game task as a means for mood repair. To compensate for the discomfort about the inflicted pain, they may choose to act more prosocially and giving out a larger share of their reward.

We tested this possibility by framing the tinder task in terms of either rejecting or choosing a potential dating partner in a search task. In Study 3a we contrasted the effect of rejection versus choice on mind perception (as in study 1). In Study 3b we explored the contrast in a sharing task (as in study 2).

3.4.1.1.Method: Study 3a

Participants were 137 Prolific Academic users (80 Women, $M = 23.09$; $SD = 4.05$). They were randomly assigned to one of two conditions: Reject or Choose. In both conditions, participants saw 20 pairs of photos of potential targets of their gender of interest with the names of those targets displayed below the photos. In the Reject condition participants were instructed to decide which of the two they do not want to date and to write a rejection message according to the provided template in the provided text entry box below the photos. For instance if they did not want to date Emma they should write "Emma, I reject you" in the box. In the Choose condition, however, participants were instructed to decide

which person, out of each pair, they would want to date and write a choice message with a specific template in the text entry box below the photos. For instance if they had an interest in Emma as a dating partner, the message should have been "Emma, I choose you". The writing task was intended to enforce participants to think in terms of rejection or choosing.

In real life, Tinder users do not know whether they have been evaluated as a target by any of the people whose photos they are swiping. If they have been and both have indicated to like each other, then both users are informed that there is a match. So there is always a chance that the person whose photo a user is looking at has already showed interest in dating the user. In our context we made it clear in the instruction that the participant is the first one to evaluate the targets and there is no chance that the targets have evaluated them already. We used this format to make sure that "rejection" has the same connotation for all targets and participants know that a rejection means ruling out a certain dating partner, rather than declining a direct request for a date.

After the Tinder task participants did the same mind perception task as in study 1. Next, participants were asked to reflect on the dating app task and report their mood while doing the Tinder task, using the Self-Assessment Manikin (Bradley and Lang 1994). As in Study 1, participants answered a task comprehension question to make sure that they had understood the mind perception task. The study was finalized by a demographic survey including an item asking whether participants were in a meaningful relationship.

3.4.1.2. Results: Study 3a

Consistent with Study 1, we dropped the participants who had misunderstood the mind perception task (N = 19).

We had expected that the act of rejecting others should dampen participants' mood valence due to its unsettling nature. We did a multivariate ANOVA using the reported arousal, valence, and dominance (i.e., the three components of mood as measured by the Self-Assessment Manikin) as the dependent variables and the task (Reject vs Choose) as the between subject factor. Valence was affected by the manipulation ($F(1, 116) = 13.87$; $p < .001$). As we had hypothesized participants in the Reject condition reported lower emotional valence ($M = 3.17$; $SD = .89$) than participants in the Choose condition ($M = 3.74$; $SD = .79$; $t(116) = -3.73$ $p < .001$; 95% CI [-.88, -.27]). Arousal and dominance were not affected by the manipulation at statistically significant level, see Table 3 - 2.

Table 3 - 2: Study 3-a - Descriptive Results - Mood

		Reject	Choose
Arousal	M	2.48	2.59
	SD	1.05	1.27
Valence	M	3.17	3.74
	SD	.89	.78
Dominance	M	3.48	3.45
	SD	.85	.94
	N	60	58

At the aggregate level the rating distributions of the mind perception task were different between the two conditions ($D = .07$; $p < .001$). Moreover, PSE in Reject condition ($F(.5) = .54$) was smaller than PSE in the Choose condition ($F(.5) = .60$). In other words, the threshold of perceiving mind for participants in the Reject condition was

lower than participants in the Choose condition: choosing people leads to more dehumanization that rejecting people does.

Confirming the result at aggregate level, the average individual PSE in Reject condition (M = .54; SD = .17) is smaller than in Choose condition (M = .60; SD = .15; p < .05; 95% CI [-.12, .00]).

3.4.1.3. Method: Study 3b

Participants were 98 Prolific Academic users (37 Women, M = 25.90; SD = 5.62). The manipulation tasks were similar to 3a except for the template that participants were instructed to use to write their rejection or acceptance messages. Specifically, participants used "left" or "right" to refer to the person they decided to date or not in their messages: "I reject left" or "I choose left" in Reject or Choose conditions respectively. The reason for this modification was to reduce social concerns about how the recipients of rejection messages would feel. Participants were told that their messages would be used to train a matching algorithm to improve its target recommendation match index. In both conditions participants knew that the scenarios are hypothetical.

As the dependent measure we used the hypothetical dictator game used in study 3. In the end, the Self-Assessment Manikin (Bradley and Lang 1994) was administered.

3.4.1.4. Result: Study 3b

We could not replicate the effect of the task on mood. Although the reported valence was lower in the Reject condition (M = 3.61; SD = .75) than Choose condition (M = 3.75; SD = .82) the difference did not reach statistical significance levels ($t(95)$ = -.85; p = .40), Table 3 - 3. One possibility for this finding is that in study 3b the messages that participants wrote were less personal than what they had to write in study 3a.

Table 3 - 3: Study 3b - Descriptive Results - Mood

		Reject	Choose
Arousal	M	2.74	2.55
	SD	1.10	1.12
Valence	M	3.61	3.75
	SD	.75	.82
Dominance	M	3.26	3.49
	SD	.91	.90
	N	46	51

Despite lack of replication, the average shared amount in the dictator game task in the Reject condition (M = 450.72; SD = 176.14) was higher than the amount shared in the Choose condition (M = 369.31; SD = 201.88; $t(95)$ = -2.11; p < .05; 95% CI [4.66, -158.15]). The result of the two-way ANOVA suggested that the finding was independent of participant gender ($F(1, 93)$ = 1.33; p = .25), Table 3 - 4.

Table 3 - 4: Study 3-b - Descriptive Results – Shared Money

		Tinder	Coffee
Women	M	423.08	300.00
	SD	191.07	185.92
	N	13	24
Men	M	461.61	430.93
	SD	171.78	198.54

	N	33	27

3.4.2. Discussion

We conducted study 3a and 3b to better our understanding the inconclusive findings in Studies 1 and 2. The findings suggest that the hypothesized consequences of online dating search task would partly depend on whether people think of the task as a choosing or a rejecting task. Assuming that online dating search task would generate a market mindset, focus on the act of rejecting others would attenuate its hypothesized consequences such as commodification of others (as shown by lower mind perception threshold in the Reject condition in study 3a) and weakened prosocial behavior (as shown by larger shared amount in the Reject condition in study 3b).

3.5. General Discussion

The metaphor of a "market for dates" has been used to describe online dating platforms where online pretenders shop for potential dates. The metaphor is based on similarities with economic market practices (Blue 2020; Heino, Ellison, and Gibbs 2010). There is anecdotal evidence that the market metaphor oversteps the boundary of figurative realm and is experienced in literal sense. Considering the potentially substantial fallout of adopting a market mindset we aimed to study its emergence as a consequence of online dating search task.

In Study 1 and Study 2 studies we tested whether participating in a dating search task would influence mind perception and prosocial behavior. While our finding is suggestive of lower mind perception (an antecedent of dehumanization) and weakened prosocial behavior as results of online dating search tasks, the strength of the results is not compelling.

We acknowledge the shortcomings of our approach and tried to address a part of them in the last two studies. Study 3a and 3b shed light on the importance of having a better understanding what the search task means to them. Being focused on rejecting targets versus choosing them wheels the effect into different directions resulting in an observed nil effect at the aggregated level.

This project is still at early steps of its development. Given that our findings are inclusive thus far, the priority for the next move is finding an experimental paradigm that would sort out the rejecting/choosing frame of mind in the online dating search task. This is crucial in order to make sure whether any modification to our original Tinder paradigm (used in Study 1 and 2) is externally valid.

By relying on anecdotal evidence and qualitative work we argued that online dating might activate a market mindset. However, instead of testing this conjecture directly we tested two hypothesized corollaries of the activation of such mindset. Apart from the fact that we did not provide evidence for this effect, there are at least three more concerns. First, our experimental setting is several steps removed from reality where the one of main driving goals is casual sex (Alexopoulos, Timmermans, and McNallie 2020; Timmermans and Courtois 2018). Sexual goals trigger dehumanization (Vaes, Paladino, and Puvia 2011) and given the risk involved in online dating, online daters may have specific personality profile that would let them install the app to begin with (Sevi 2019). As such, the anecdotal market mindset could be an artifact of a self-selection bias inflating certain personality and thus culture in online dating apps that cannot be captured in an

experimental setting with participants randomly selected from a more heterogenous sample.

Second, even if dehumanization and a pro-self attitude are among the consequences of online date searching, as our findings modestly suggest, there could be alternative explanations for them. If we think of finding a match as a psychological reward in the form of casual sex or a sense of social approval, then operant conditioning may explain why users are encouraged to continue the search for rewards by non-stop swiping (Schacter, 2015). The gamified design of online dating apps and the need for the psychological reward can lead to a restricted perspective of others in which they are reduced to tools in a game that provides psychological rewards.

Third, to increase the chance of finding a match online dating users develop self-presentation strategies to attract others by using sexualized photos (Anderson et al. 2018; Lemke and Merz 2018; De Vries and Peter 2013). Exposure to sexualized photos depicting revealing clothes and suggestive gestures has been linked to dehumanization and ascription of less morality to the person in the photo (Lemke and Merz 2018). So, the hypothesized dehumanization effect could be a product of "branding" strategies users apply to showcase themselves regardless of a market mindset.

Tinder has made it its mission to make "being single more fun and rewarding by connecting people" (Tinder, 2020). As important as this mission might be, we should make sure that solving a problem does not generate bigger ones. The design could contribute to dehumanization of other users by reducing them to products on the Tinder shelves to be picked, or characters in a game devoid of feelings. To the extent that user experience ethics is concerned "dating apps should not forgo authentic forms of connection, and by extension, the dignity of a fellow user" (Scherling and DeRosa 2020).

Disregarding the human behind a profile can spill over into offline interactions and eventually become a norm. The "glossary of love" has seen a surge in new terminologies that imply undervaluing human worth (Navarro et al. 2020). For instance, "benching" is now a frequent experience on online dating where users do not get to meet the match in person. All they receive from their potential date is online messages every now and then (Kohn, 2019). These people are essentially being kept on the bench while the match tries out other options. One of the common complains about online dating is "ghosting". This happens when a seemingly good relationship stops unilaterally without any warning. The ghosting partner disappears and will not respond back to any messages. These behaviors are being normalized and referring to them with humorous names serves as a coping strategy for benched or ghosted users to deal with the emotional aftermath (Bishop, Ross, & Diamond, 2019).

Whether this is a positive evolution or not is open to debate. But either way it attests to the significance our research question and encourages us to improve the experimental paradigm and move the project forward.

APPENDIX

4.1. Appendix A: Chapter 1 – Additional Material

4.1.1. Study 1

Appendix A - Table 1: Distribution Of Number Of Participants That Rated The Reviews

Number of participants per review	Frequency	Percentage
9	1	.2
10	4	.9
11	31	6.9
12	121	26.9
13	292	64.9
14	1	.2
Total	450	100.0

Appendix A - Table 2: Intercorrelations And VIF Of The Variables In The Negative Binomial Regression Model

		1	2	3	4	5	VIF
1	Review Likes Count	1					
2	Review Age	.033	1				1.085
3	Review Extremity	-.035	-.061	1			1.125
4	Review Length	.250**	.212**	-.288**	1		1.213
5	Social Presence	.116*	.074	-.249**	.310**	1	1.142
* Significant at the .05 level, ** Significant at the .01 level							

Appendix A - Table 3: Distribution Of Cronbach's Alpha Across Reviews

Cronbach's alpha	Frequency	Percentage
Below .4	8	1.8
.4 - .5	7	1.6
.5 - .6	14	3.1
.6 - .7	27	6.0
.7 - .8	77	17.1
.8 - .9	174	38.7
Above .9	143	31.8
Total	450	100.0
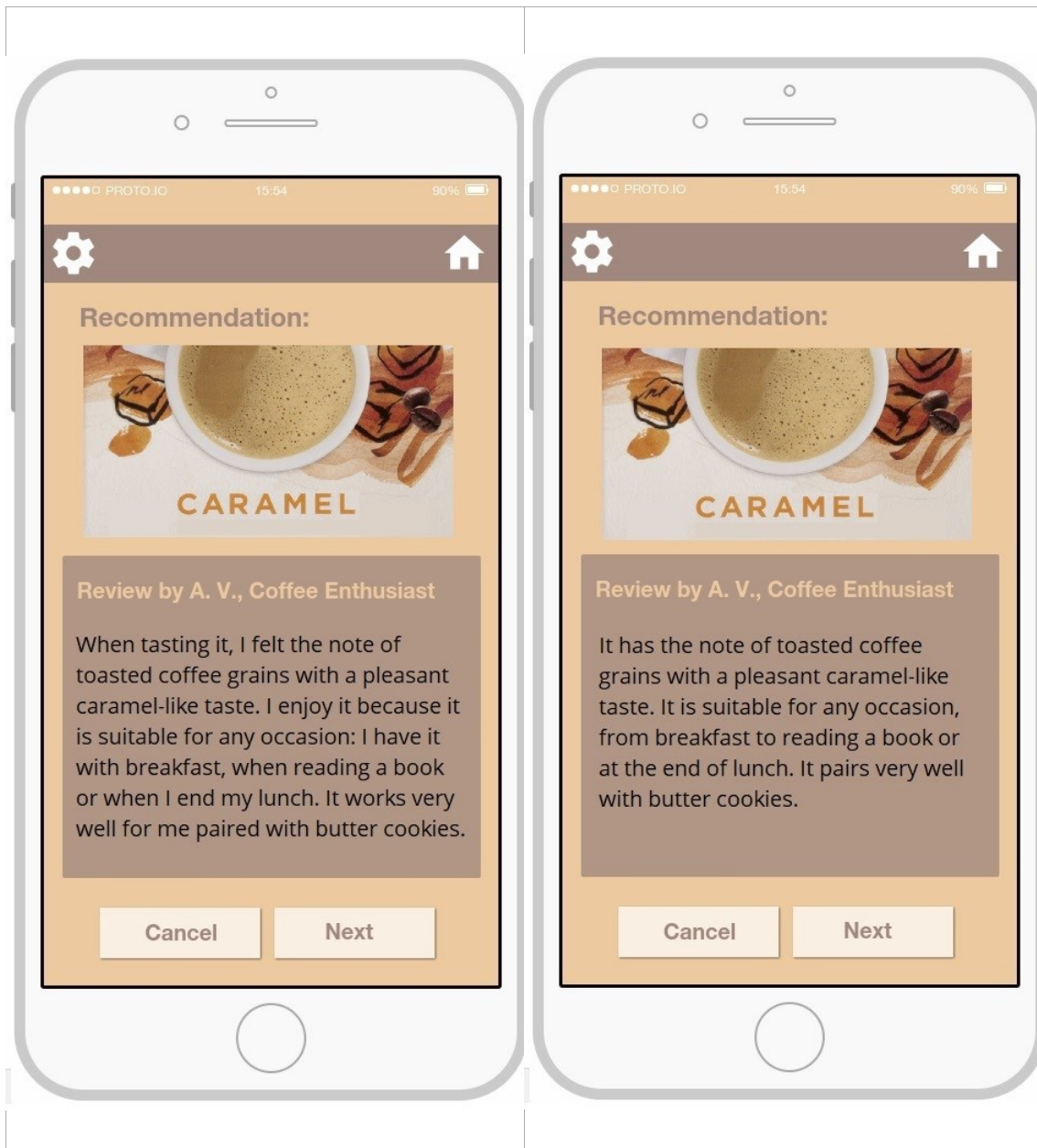
Appendix A - Figure 1: An Example Of The Reviews Used In Study 2. Left Figure: High Social Presence. Right Figure: Low Social Presence

Appendix A - Table 4: Social Presence Scale Adopted From Gefen & Straub, 2003.

| I felt a sense of human contact when reading the review. |
| I felt a sense of personalness in the review. |
| I felt a sense of sociability in the review. |
| I felt a sense of human warmth when reading the review. |

Appendix A - Table 5: Study 2 - Descriptive Results

Social Presence Condition		Social Presence	Attitude towards the reviewer	Coffee Ordering Likelihood	Coffee Habits	Starbucks Purchase Habit	Online Food Ordering Experience
High N = 86	M	4.78	5.25	5.01	4.34	3.56	3.77
	SD	1.33	1.09	1.74	2.19	1.93	2.20
Low N = 82	M	4.21	4.91	4.46	4.61	3.61	3.57
	SD	1.21	1.12	1.91	2.00	2.03	2.05
Total N = 168	M	4.51	5.08	4.74	4.47	3.58	3.67
	SD	1.30	1.12	1.84	2.10	1.97	2.12

Appendix A - Table 6: Likelihood Of Ordering The Recommended Coffee For Each Recommended Coffee Flavor

Flavor		Chocolate	Caramel	Vanilla	Spice
High Social Presence	M	4.95	5.03	5.74	4.28
	SD	1.35	1.77	1.48	2.08
	N	19	30	19	18
Low Social Presence	M	5.29	4.42	4.64	3.75
	SD	1.59	2.04	1.92	1.77
	N	14	26	22	20
Total	M	5.09	4.75	5.15	4.00
	SD	1.44	1.91	1.80	1.92
	N	33	56	41	38

Appendix A - Table 7: Study 2 - Mediation Analysis

Indirect Effect				
	Indirect β	St. Err.	95% *CI* Low	95% *CI* High
Social presence → Attitude towards the reviewer → Recommendation acceptance likelihood	.29	.15	.01	.60
Total Effect				
DV: Recommendation acceptance likelihood	β	St. Err.	95% *CI* Low	95% *CI* High
Social presence: High= 1 Low = 0	.55*	.20	.00	1.10
Constant	4.46***	.28	4.01	4.86
R^2	.02*		F(1, 166) = 3.80	
DV: Recommendation acceptance likelihood	β	St. Err.	95% *CI* Low	95% *CI* High
Social presence: High= 1 Low = 0	.25	.24	-.23	.73
Attitude towards the reviewer	.86***	.11	.65	1.08

Constant	.22	.56	-.89	1.34
R^2	.29***	F(2, 165) = 33.80		
DV: Attitude towards the reviewer	β	St. Err.	95% *CI* Low	95% *CI* High
Social presence: High= 1 Low = 0	.34*	.17	.00	.68
Constant	4.91***	.12	4.67	5.15
R^2	.02	F(1, 166) = 4.00		
Indirect effect using online food ordering experience as the covariate				
	Indirect β	St. Err.	95% *CI* Low	95% *CI* High
Social presence → Attitude towards the reviewer → Recommendation acceptance likelihood	.25	.13	.00	.53

* Significant at the .05 level, ** Significant at the .01 level, *** Significant at the .001

4.1.2.1. Study 2 – Results Including Covariates

As a robustness check we ran an ANCOVA with the same dependent and independent variables as used in the Student's t-test above, including coffee drinking habits (M = 4.47; SD = 2.11), Starbucks visiting frequency (M = 3.58; SD = 1.97), and online food ordering experience (M = 3.67; SD = 2.12) as covariates. Only online food ordering experience was a significant predictor of the likelihood of ordering the recommended coffee (F(1, 163) = 9.91; *p* = .02); Starbucks visiting frequency (F(1, 163) = .30; *p* = .59), and coffee drinking habit (F(1, 163) = .58; *p* = .45) were not. Importantly, social presence remained a significant predictor (F(1, 163) = 3.69; *p* = .056).

Given that online food ordering experience was the only covariate that could significantly predict the likelihood of ordering the recommended coffee, we included it as a covariate in the mediation analysis. The result of the mediation did not differ (Indirect Effect = .25; SE = .13; 95% CI [.00, .53]).

4.1.2.2. Study 2 – Results Including Dropped Participants

Composite scores were calculated for social presence (α = .88) and attitude towards the reviewer (r = .80 ; p = .000). Social presence was successfully manipulated (M_high = 4.73, SD_high = 1.32; M_low = 4.24, SD_low = 1.27; t(221) = 2.83; *p* = .005; 95% CI [.15, .83]). He difference between Attitude towards the reviewer in high social presence and low social presence was marginally significant (M_high = 5.21, SD_high = 1.10; M_low = 4.93, SD_low = 1.63; t(221) = 1.86; *p* = .064; 95% CI [-.02, .58]).

Participants in the high social presence condition exhibited a higher likelihood of ordering the recommended coffee (M = 4.91, SD = 1.78) than participants in the low social presence condition (M = 4.59, SD = 1.84). However, the difference did not reach the statistical significance level (t(221) = 1.30; *p* = .194; 95% CI [-.06, .79]).

4.1.3. *Study 3*

Reviewed November 25, 2017

Wholesome Dishes

When visiting Tbilisi, I loved how life revolved around food—its thriving restaurant scene being proof of it. It is impossible for me now to picture Georgian cuisine without their freshly baked breads, roasted meats, dried fruit leathers, ample use of walnuts, and roasted vegetable dishes to give ratatouille a run for its money.

M. G
148 60

Reviewed November 7, 2017

Georgian Wine

Before visiting Tbilisi, I used to associate wine to France. But after visiting Tbilisi I learned that the Georgian tradition of winemaking actually originated long before the French started making their own wine. In Tbilisi, when I went to social gatherings, wine was always a trademark; it is in fact a staple and pastime of daily life.

A. V
168 68

Reviewed October 20, 2017

A Perfect Start

For me, a perfect day in Tbilisi starts with a street-food indulgence. Khachapuri is my all-time favourite Georgian breakfast delicacy. It consists of a boat-shaped bread stuffed with molten cheese and topped with slabs of butter and a runny egg. This rich morning delight gave me the boost I needed for a nice long walk.

R. H
29 5

Appendix A - Figure 2: The Reviews With High Social Presence Used In Study 3; City: Tbilisi, Suitable For Foodie Travelers

Appendix A - Figure 3: The Reviews With Low Social Presence Used In Study 3; City: Tbilisi, Suitable For Foodie Travelers

Appendix A - Figure 4: Working Memory Manipulation. Top Figure: Verbal-Load. Bottom Figure: Visual-Load.

Appendix A - Table 8: Narrative Transportation Scale Used In Pretest – Study 3 - Pretest

While reading the reviews, I could easily picture the events in my mind.
While reading the reviews, I could picture myself in the scene of the events described in them.
While reading the reviews, it felt like I was experiencing what was being described.

Appendix A - Table 9: Credibility Scale Used In Pretest – Study 3

1: Not Credible – 7: Credible
1: Uninformative – 7: Informative
1: Unhelpful – 7: Helpful

Appendix A - Table 10: Imagined Interaction Scale

While you were reading the review(s), how much did you feel as if the reviewer(s) was (were) talking to you?
While reading the review(s), how vividly could you imagine the reviewer(s)?
How involving was reading the review(s)?
How much attention did you pay to what was being said?
To what extent did you have a sense of interacting with the reviewer(s)?

Appendix A - Table 11: Positive Attitude Towards The Reviewer Scale

I felt favorably about the reviewers.
I felt positive towards the reviewers.
I think the reviewers share similar preferences with me.
I think I have very much in common with the reviewers.
I think the reviewers were knowledgeable and had a good level of expertise.
I had the feeling that I could trust the reviewers.
I think the reviewers were sincere people.
I would like to have a face-to-face meeting with the reviewers.

Appendix A - Table 12: Study 3 - Descriptive Results

Working Memory Condition		No Load			Verbal Load			Visual Load		
Social Presence		High	Low	Total	High	Low	Total	High	Low	Total
Social Presence	M	5.08	4.52	4.78	4.64	4.51	4.57	4.84	4.68	4.77
(Likert Scale)	SD	.89	.89	1.15	1.05	1.19	1.12	1.09	1.30	1.19
Social Presence	M	5.29	4.68	4.96	4.90	4.95	4.93	5.13	5.24	5.18
(Semantic Scale)	SD	.93	1.24	1.14	1.13	1.24	1.18	1.07	.96	1.02
Imagined	M	4.72	424	4.47	4.01	4.15	4.13	4.40	4.50	4.45
Interaction	SD	1.00	1.06	1.06	1.05	1.30	1..18	1.70	1.82	1.17
Attitude towards	M	4.80	4.37	4.57	4.67	4.55	4.51	4.67	4.66	4.67
the Reviewers	SD	.76	1.34	.94	.90	1.13	1.02	.90	1.06	.97
Recommendation	M	5.25	4.62	4.92	5.31	5.28	5.30	5.07	5.11	5.09
acceptance	SD	1.07	1.42	1.30	1.03	1.42	1.25	1.32	1.22	1.27
Travelling Habit	M	4.49	4.05	4.25	3.66	3.88	3.77	3.87	4.33	4.07
	SD	1.31	1.78	1.59	1.52	1.91	1.73	1.77	1.70	1.75
Travelling	M	5.41	5.03	5.21	4.93	4.57	4.74	5.15	5.37	5.25
Attitude	SD	1.31	1.70	1.54	1.42	2.04	1.77	1.59	1.43	1.52
	N	49	57	106	44	49	93	52	43	95

Appendix A - Table 13: Recommendation Acceptance Likelihood By The Recommended Destination

Condition	Working Memory	Recommended City	Mean	SD	N
Low Social Presence	Un-Constrained	Tbilisi	4.57	1.51	22
		Belgrade	4.11	1.78	9
		Torun	4.35	1.58	10
		Rijeka	5.16	.83	16
		Total	4.62	1.42	57
	Constrained	Tbilisi	5.39	1.32	41
		Belgrade	4.78	1.53	16
		Torun	5.07	1.49	14
		Rijeka	5.26	1.03	21
		Total	5.21	1.32	92
High Social Presence	Un-Constrained	Tbilisi	5.26	1.02	17
		Belgrade	5.71	1.07	7
		Torun	5.00	1.28	15
		Rijeka	5.30	0.79	10
		Total	5.26	1.07	49
	Constrained	Tbilisi	5.15	0.93	36
		Belgrade	4.79	1.41	17
		Torun	5.00	1.43	17
		Rijeka	5.60	1.17	26
		Total	5.18	1.20	96
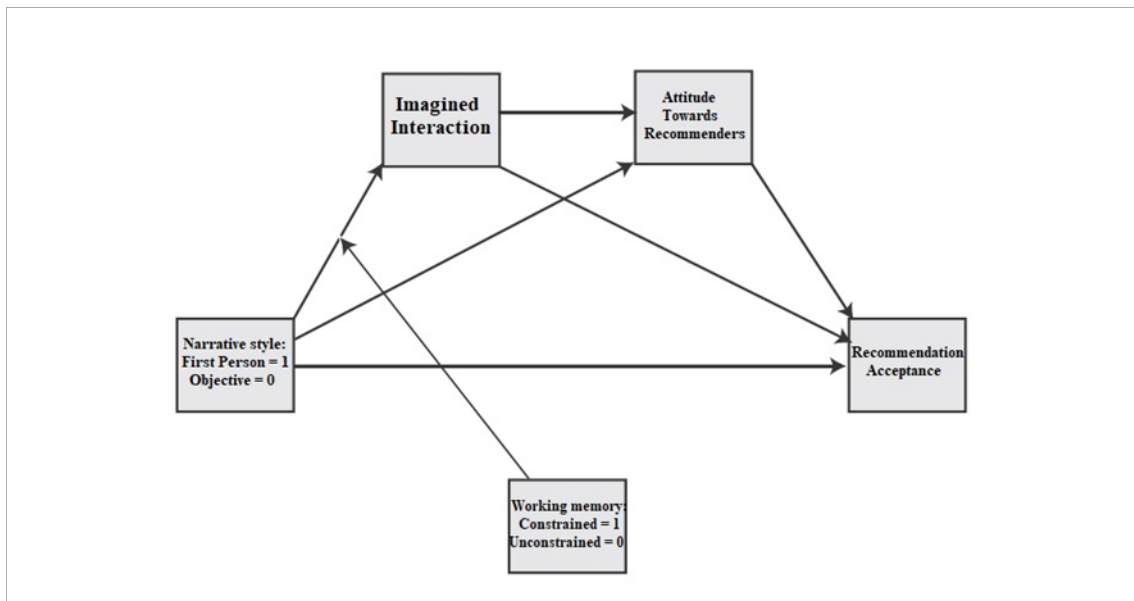
Appendix A - Figure 5: Moderated Serial Mediation - Study 3

Appendix A - Table 14: Study 3 - Moderated Serial Mediation Analysis

	Index	St. Err.	95% *CI* Low	95% *CI* High
Moderated mediation	-.25	.13	-.52	-.01
Indirect Effect				
	Indirect β	St. Err.	95% *CI* Low	95% *CI* High
Condition:	.22	.10	.04	.43

Unconstrained Working Memory				
Condition: Constrained Working Memory	-.02	.08	-.19	.15

DV: Recommendation acceptance likelihood	β	St. Err.	95% *CI* Low	95% *CI* High
Social Presence: High = 1 Low = 0	.13	.13	-.12	.39
Imagined interaction	-.16*	.08	-.32	.00
Attitude towards the reviewer	.78***	.08	.61	.97
Constant	2.11***	.32	1.50	2.74
R^2	.26**		F(3, 290) = 34.68	

DV: Imagined interaction	β	St. Err.	95% *CI* Low	95% *CI* High
Social Presence: High = 1 Low = 0	.48*	.22	.05	.92
Working memory: Constrained = 1 Unconstrained = 0	.07	.19	-.31	.45
Social Presence x Working memory	-.53 (p = .054)	.28	-1.07	.01
Constant	4.24***	.15	3.95	4.54
R^2	.02		F(3, 290) = 2.19	

DV: Attitude towards the reviewer	β	St. Err.	95% *CI* Low	95% *CI* High
Social Presence: High = 1 Low = 0	.06	.08	-.10	.21
Imagined interaction	.61***	.04	.54	.68
Constant	1.89***	.16	1.58	2.21
R^2	.51***		F(2, 291) = 153.98	

Indirect Effect After including travelling attitude as a covariate				
	Indirect β	St. Err.	95% CI Low	95% CI High
Condition: Unconstrained Working Memory	.19	.10	.01	.39
Condition: Constrained Working Memory	-.03	.08	-.18	.13
Indirect Effect Index	-.22	.12	-.48	.02

* Significant at the .05 level, ** Significant at the .01 level, *** Significant at the .001

4.1.3.1. Study 3 – Results Including Covariates

We also did an ANCOVA test using recommendation acceptance likelihood as the dependent measure, social presence manipulation and working memory capacity as the factors, participants travelling habit (M = 4.04; SD = 1.69) and traveling attitude (M = 5.07; SD = 1.62) as covariates. Travelling habit did not have a significant effect on the recommendation acceptance likelihood (F(1, 288) = .74; *p* = .392). Travelling attitude significantly predicted recommendation acceptance likelihood (F(1, 288) = 7.03; *p* = .008). The social presence manipulation had a statistically marginal effect on recommendation acceptance likelihood (F(1, 288) = 3.11; *p* = .079). Working memory

capacity could significantly predict the dependent measure (F(1, 288) = 4.06; p = .045) and the interaction was still a relevant predictor of it (F(1, 288) = 3.71; p = .055).

We included travelling attitude as the covariate in the mediation analysis, the index of moderated mediation became marginally significant (Indirect Effect = -.22; SE = .12; 95% CI [-.48, .02]). The result showed that the predicted mediated effect was in place only when the was no working memory constrain (Indirect effect = .19; SE = .09; 95% CI [.01, .39]), and not when the working memory was constrained (Indirect effect = -.03; SE = .08; 95% CI [-.18, .13]).

4.1.3.2. Study 3 – Semantic Social Presence (Manipulation Check)

In line with our hypothesis, only in the unconstrained working memory conditions did a social presence was increased significantly in high social presence condition (Semantic scale: M $_{low}$ = 4.68, SD $_{low}$ = 1.24; M $_{high}$ = 5.29, SD $_{high}$ = .93; t(104) = 2.85; p = .006; 95% CI [.17, 1.03]). Social presence was not significantly different between high social presence and low social presence conditions when there was a verbal-load condition (M $_{low}$ = 4.95, SD $_{low}$ = 1.24; M $_{high}$ = 4.90, SD $_{high}$ = 1.13; t(91) = -.23; p = .82; 95% CI [-.55, .43]) or a visual load (M $_{low}$ = 5.24, SD $_{low}$ = .96; M $_{high}$ = 5.13, SD $_{high}$ = 1.07; t(93) = -.54; p = .59; 95% CI [-.53, .30]). In summary the same pattern of result was obtained using semantic social presence scale as we got from the Likert social presence scale.

4.1.3.3. Study 3 – Results Including the dropped participants

A two-way ANOVA with recommendation acceptance likelihood as dependent variable and social presence (high/low) and working memory capacity (unconstrained/constrained) conditions as independent variables showed a significant main effect of social presence (F(1, 309) = 5.81; p = .016). The interaction between working memory capacity and social presence came out as marginally significant (F(1, 309) = 2.85; p = .092). There was not a main effect of working memory capacity on recommendation acceptance (F(1, 309) = 1.63; p = .203).

Finally, we conducted a moderation-serial mediation analysis using PROCESS v3.3 model 83 (Appendix C; Hayes, 2012, 2017) to test our hypotheses. Bootstrapping tests (5,000 resamples) indicated that the hypothesized indirect effect through the two serial mediators (extent of "imagined interaction" and attitude towards the reviewer) was not moderated by whether working memory capacity was unconstrained or not (Index of moderated mediation = -.22; SE = .12; 95% CI [-.46, .01]). However, when looking at each mediations separately, in the case of unconstrained working memory, the influence of social presence on recommendation acceptance likelihood was serially mediated by imagined interaction with the reviewer followed by a more positive attitude towards the reviewers (Indirect effect = .22; SE = .10; 95% CI [.04, .43]). But mediating pattern did not hold when working memory was constrained (Indirect effect = .01; SE = .08; 95% CI [-.14, .02]).

In conclusion, the general pattern of the result when including those participants who were dropped because of their score in the recall task was similar to the result we obtained excluding them. The difference were in the significance of the moderates mediation index and the interaction between social presence and working memory on the likelihood of accepting the recommendation. This study was done online without any monitoring of the participants. Given that the dropped participants had a very low recall score, it could be that they did not follow the instruction and did not memorize the number or the grid, therefore we should not expect to observe the same result as the rest who followed the

instruction. Therefore, this could explain why the predicted effect was attenuated in the analysis including all participants.

4.1.4. Study 4

Appendix A - Figure 6: An Example Of The Graphical Recommendation In Study 4

Appendix A - Table 15: Study 4 - Descriptive Results

Condition		Unfavored Book N = 91	Favored Book N = 101	Total N = 192
Social Presence (Likert Scale)	M	3.93	4.43	4.19
	SD	1.37	1.23	1.32
Social Presence (Semantic differential scale)	M	4.47	4.65	4.56
	SD	1.20	1.12	1.62
Imagined Interaction	M	3.80	4.26	4.04
	SD	1.11	1.10	1.24
Attitude towards the recommenders	M	3.87	4.54	4.22
	SD	1.04	.88	1.01
Recommendation Acceptance	M	4.05	6.79	5.49
	SD	2.16	1.69	2.36
Reading Habit	M	5.65	5.25	5.44
	SD	1.62	1.60	1.62
Online Book Purchase Experience	M	5.16	5.54	5.36
	SD	2.26	1.90	2.08
Perceived Realisticness	M	3.86	4.42	4.15
	SD	1.70	1.58	1.66
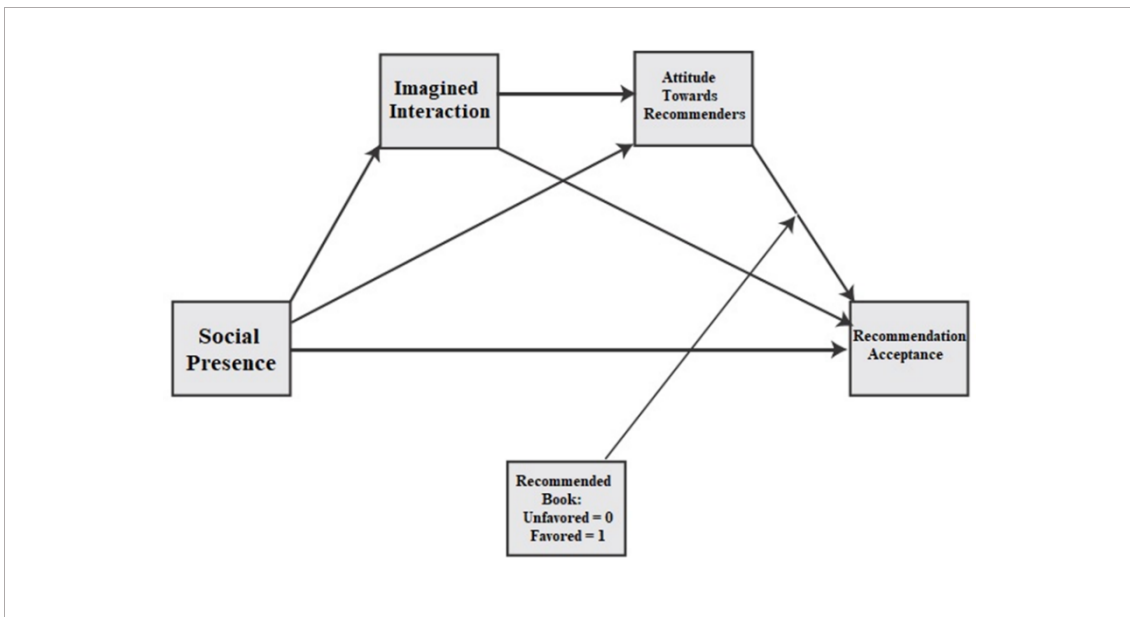
Appendix A - Figure 7: Study 4 - Moderated Serial Mediation

Appendix A - Table 16: Study 4 - Moderated Serial Mediation Analysis

	Index	St. Err.	95% *CI* Low	95% *CI* High
Moderated mediation	-.19	.08	-.36	-.04
Indirect Effect				
	Indirect β	St. Err.	95% *CI* Low	95% *CI* High
Condition: Unfavored recommendation	.23	.07	.10	.39
Condition: Favored recommendation	.04	.07	-.09	.17
DV: Recommendation acceptance likelihood	β	St. Err.	95% *CI* Low	95% *CI* High
Social Presence	.34*	.16	.03	.66
Imagined interaction	-.04	.20	-.43	.35
Attitude towards the reviewer	.45*	.19	.05	.80
Condition: Unfavored recommendation = 0 Favored recommendation = 1	2.02***	.26	1.50	2.55
Attitude towards the reviewer x Condition	-.66**	.27	-1.19	-.13
Book cover Attractiveness	.25***	.08	.10	.40
Constant	3.44***	.70	2.06	4.82
R^2	.51***	F(6, 185) = 32.40		
DV: Imagined interaction	β	St. Err.	95% *CI* Low	95% *CI* High
Social presence	.68***	.04	.61	.76
Book cover Attractiveness	0.00	.03	-.06	.06
Constant	1.18***	.18	.83	1.53
R^2	.64***	F(2, 189) = 167.59		
DV: Attitude towards the reviewer	β	St. Err.	95% *CI* Low	95% *CI* High

Social presence	.22**	.06	.10	.35
Imagined interaction	.41***	.07	.27	.56
Book cover Attractiveness	.05	.03	-.01	.11
Constant	-2.79***	.20	-3.18	-2.39
R^2	.54***	F(3, 188) = 73.73		

Moderated mediation using book reading habit, online book purchase experience and perceived realism as covariates				
	Index	St. Err.	95% *CI* Low	95% *CI* High
Moderated mediation	-0.12	0.06	-0.26	-0.02
* Significant at the .05 level, ** Significant at the .01 level, *** Significant at the .001				

4.1.4.1. Study 4 – Results Including the dropped participants

The result of analysis including the 10 participants who were dropped did not yield any different results in comparison to what we already found excluding them.

Appendix A - Table 17: Descriptive Results Study 4 - Including The Dropped Participants

Condition		Unfavored Book N = 96	Favored Book N = 106	Total N = 202	*t*(200) CI - M$_{difference}$
Social Presence (Likert Scale)	M	3.99	4.40	4.20	2.22*
	SD	1.39	1.23	1.32	[.05, .77]
Social Presence (Semantic differential scale)	M	4.49	4.65	4.57	.99
	SD	1.20	1.12	1.16	[-.16, .48]
Imagined Interaction	M	3.86	4.24	4.06	2.47**
	SD	1.14	1.08	1.13	[.08, .70]
Attitude towards the recommenders	M	3.89	4.57	4.25	5.05**
	SD	1.03	.89	1.01	[.41, .95]
Recommendation Acceptance	M	4.02	6.83	5.49	1.28**
	SD	2.16	1.66	2.37	[2.27, 3.35]
Reading Habit	M	5.68	5.32	5.49	-1.55
	SD	1.63	1.64	1.64	[-.81, .10]
Online Book Purchase Experience	M	5.26	5.59	5.44	1.04
	SD	1.88	2.23	1.64	[-.24, .91]
Perceived Realisticness	M	3.90	4.44	4.18	2.35*
	SD	1.72	1.59	1.67	[.09, 1.01]

Appendix A - Table 18: Moderated Serial Mediation Index - Study 4 - Including Dropped Participants

DV: Likelihood of accepting the recommendation				
IV: Social presence Likert Scale				
M1: Imagined interaction				
M2: Attitude towards the recommender				
Covariate1: Recommended book cover design				
N = 202				
	Index	St. Err.	95% *CI* Low	95% *CI* High
Moderated mediation	-.16	.08	-.33	-.02
Indirect Effect				
	Indirect β	St. Err.	95% *CI* Low	95% *CI* High
Condition: Unfavored recommendation	.23	.07	.10	.39
Condition: Favored recommendation	.07	.06	-.04	.21
Moderated mediation using book reading habit, online book purchase experience and perceived realisticness as covariates				

	Index	St. Err.	95% *CI* Low	95% *CI* High
Moderated mediation	-.11	.06	-.24	-.02
* Significant at the .05 level, ** Significant at the .01 level, *** Significant at the .001				

4.1.5. Study 5

Appendix A - Table 19: The Reviews Used In Study 5

Low social presence	Review by G. M. It is easy to put on. It's soft, and comes in different colors and fragrances and does not have that terrible rubber smell when in action. It is not too thick, and it fits well even if it has to be put on in a rush. It always stays in place; it does not slip off or stretch out like other brands. It glides on easily without making a mess and is noiseless when pulling it out. It is resistant and doesn't leak. It feels secure, without breaks many trials in a row. The packaging is good and compact; it can easily be carried in one's wallet in case it is needed at short notice.
High social presence	Review by G. M. I find it easy to put on. It's soft and comes in different colors and fragrances and I never notice that terrible rubber smell when in action. It is not too thick, and it fits well even if I have to put it on in a rush. Whenever I use it, it stays in place; it does not slip off or stretch out like other brands. It glides on easily, helping me not to make a mess, and is noiseless when I pull it out. It is resistant and doesn't leak. I feel secure with it, having tried many of these without any breaks. The packaging is good and compact; I can easily carry one in my wallet in case I need it at short notice.

Appendix A - Table 20: Study 5 - Descriptive Results

Product	Social Presence	Gender	Mean	SD	N
Wine Cap	Low	Female	5.63	1.29	51
		Male	4.51	1.76	38
		Total	5.15	1.60	89
	High	Female	5.27	1.56	48
		Male	5.38	1.19	40
		Total	5.32	1.40	88
	Total	Female	5.45	1.43	99
		Male	4.96	1.55	780
		Total	5.23	1.50	177
Condom	Low	Female	6.02	1.12	46
		Male	5.92	0.94	42
		Total	5.97	1.03	88

	High	Female	5.79	1.30	60
		Male	5.71	0.99	31
		Total	5.76	1.20	91
	Total	Female	5.89	1.22	106
		Male	5.83	0.96	73
		Total	5.87	1.12	179
Total	Low	Female	5.81	1.22	97
		Male	5.25	1.55	80
		Total	5.56	1.41	177
	High	Female	5.56	1.44	108
		Male	5.52	1.11	71
		Total	5.54	1.32	179
	Total	Female	5.68	1.34	205
		Male	5.38	1.37	151
		Total	5.55	1.36	356

4.2. Appendix B: Chapter 2 – Additional Material

4.2.1. Study 1

Appendix B - Table 1: Displayed Product Ratings In Study 1

Scales	Rating	Above the Mid-Point AL+: A($R_L > R_S$) B($R_L < R_S$)		Below the Mid-Point AL+: A($R_L > R_S$) B($R_L < R_S$)		Equal to the Mid-Point AL+: A($R_L > R_S$) B($R_L < R_S$)	
		Product A	Product B	Product A	Product B	Product A	Product B
100-point & 5- point scales	Large (Normalized)	92.40 (.92)	64.11 (.64)	36.40 (.36)	8.44 (.08)	64.20 (.64)	37.63 (.37)
	Small (Normalized)	3.55 (.64)	4.69 (.92)	1.30 (.08)	2.43 (.36)	2.48 (.37)	3.55 (.64)
	Average (Normalized)	.78	.78	.22	.22	.50	.50
10-point & 5- point scales	Large (Normalized)	9.31 (.92)	6.74 (.64)	4.22 (.36)	1.68 (.08)	6.75 (.64)	4.33 (.37)
	Small (Normalized)	3.55 (.64)	4.69 (.92)	1.30 (.08)	2.43 (.36)	2.48 (.37)	3.56 (.64)
	Average (Normalized)	.78	.78	.22	.22	.50	.50
100-point & 10- point scales	Large (Normalized)	92.4 (.92)	64.80 (.64)	36.40 (.36)	8.70 (.08)	64.20 (.64)	6.75 (.37)
	Small (Normalized)	6.80 (.64)	9.31 (.92)	1.70 (.08)	4.22 (.36)	4.30 (.37)	37.30 (.64)
	Average (Normalized)	.78	.78	.22	.22	.50	.50

Appendix B - Table 2: Study 1, Descriptive Results

			Mean (SD) AL+	Mean (SD) AL-	Effect Size*	nAL+, nAL-
5-100	Above	Product Attitude	10.90 (24.34)	-11.18 (16.97)	1.06	30, 31
		WTP	8.80 (17)	-6.61 (16.7)	.91	
		Choice A	.67 (.09)	.26 (.08)	5.78	
	Below	Product Attitude	13.71 (19.84)	-2.87 (19.69)	.84	30, 30
		WTP	5.67 (14.23)	-2.8 (11.16)	.66	
		Choice A	.80 (.07)	.27 (.08)	10.81	

	Cross	Product Attitude	14.97 (16.16)	-11.26 (21.94)	1.36	30, 30
		WTP	13.77 (16.02)	-8.20 (21.22)	1.17	
		Choice A	.87 (.06)	.23 (.08)	22.4	
10-100	Above	Product Attitude	14.17 (12.62)	-5.80 (14.09)	1.49	31, 31
		WTP	11.13 (15.64)	-6.90 (14.81)	1.18	
		Choice A	.77 (.08)	.35 (.09)	6.22	
	Below	Product Attitude	5.94 (20.6)	-6.57 (25.19)	.54	28, 31
		WTP	4.29 (16.79)	-6.13 (26.3)	.47	
		Choice A	.68 (.09)	.52 (.09)	1.96	
	Cross	Product Attitude	8.54 (18.14)	-9.70 (19.46)	.97	30, 30
		WTP	5.47 (12.13)	-6.20 (16.00)	.82	
		Choice A	.80 (.07)	.30 (.08)	2.23	
5-10	Above	Product Attitude	2.78 (29.79)	-7.43 (13.67)	.45	29, 31
		WTP	8.14 (20.73)	-6.10 (13.78)	.81	
		Choice A	.66 (.09)	.26 (.08)	5.52	
	Below	Product Attitude	13.71 (19.84)	-2.87 (19.69)	.84	30, 30
		WTP	5.67 (14.23)	-2.80 (11.16)	.66	
		Choice A	.80 (.07)	.27 (.08)	10.81	
	Cross	Product Attitude	.36 (28.89)	-9.96 (28.68)	.36	28, 30
		WTP	3.27 (18.52)	-5.30 (15.34)	.51	
		Choice A	.50 (.09)	.30 (.08)	2.33	

*Odd's ratio was used as the effect size of Choice. For the rest, Cohen's d was used.

Appendix B - Table 3: Study 1, OLS And Logistic Regression Table

	DV	Product attitude (A – B)	WTP (A – B)	Choice: A = 1 B = 0	
Constant	β_0	-.28	.99	OR	.35***
	SE	2.66	2.12		
	CI	[-5.52, 4.95]	[-3.18, 5.16]	CI	[.15, .75]
AL_Dummy: AL+ = 1, AL- = 0	β_1	22.08***	15.41***	OR	5.75**
	SE	5.33	4.25		
	CI	[11.61, 32.55]	[7.07, 23.75]	CI	[1.97, 18.29]
Rating 10-100	β_2	4.34	1.00	OR	1.58
	SE	3.75	2.99		
	CI	[-3.03, 11.72]	[-4.87, 6.88]	CI	[.54, 4.83]
Rating 10-5	β_3	-2.11	-.07	OR	1.00
	SE	3.78	3.01		
	CI	[-9.54, 5.33]	[-5.99, 5.86]	CI	[.32, 3.16]
Midpoint: Below	β_4	2.26	.33	OR	1.23
	SE	3.77	3.00		
	CI	[-5.14, 9.66]	[-5.57, 6.22]	CI	[.40, 3.85]
Midpoint: Cross	β_5	1.97	1.65	OR	.87
	SE	3.78	3.01		
	CI	[-5.46, 9.40]	[-4.27, 7.57]	CI	[.27, 2.83]
AL_Dummy × 10-100	β_6	-2.12	2.62	OR	1.08
	SE	7.51	5.98		
	CI	[-16.86, 12.63]	[-9.13, 14.37]	CI	[.22, 5.29]
AL_Dummy × 10-5	β_7	-11.87	-1.18	OR	.95
	SE	7.57	6.03		
	CI	[-26.74, 3.00]	[-13.02, 10.67]	CI	[.20, 4.59]
AL_Dummy × Below	β_8	-10.02	-9.29	OR	1.16
	SE	7.54	6.00		
	CI	[-24.82, 4.79]	[-21.09, 2.50]	CI	[.24, 5.70]
AL_Dummy × Cross	β_9	4.14	6.55	OR	3.71
	SE	7.57	6.03		
	CI	[-10.73, 19.01]	[-5.29, 18.40]	CI	[.67, 22.74]
AL_Dummy × 10-100 × Below	β_{10}	2.56	1.68	OR	.27

	SE	10.68	8.51		
	CI	[-18.43, 23.55]	[-15.05, 18.40]	CI	[.03, 2.46]
AL_Dummy × 10-100 × Cross	β₁₁	-5.86	-12.92	OR	.40
	SE	10.68	8.51		
	CI	[-26.84, 15.12]	[-29.63, 3.80]	CI	[.04, 4.35]
AL_Dummy × 10-5 × Below	β₁₂	16.39	3.53	OR	1.73
	SE	10.70	8.53		
	CI	[-4.64, 37.41]	[-13.23, 20.28]	CI	[.18, 17.01]
AL_Dummy × 10-5 × Cross	β₁₃	-4.04	-12.22	OR	.11
	SE	10.77	8.58		
	CI	[-25.20, 17.12]	[-29.08, 4.64]	CI	[.01, 1.16]
10-100 × Below	β₁₄	-6.72	-3.31	OR	1.57
	SE	5.34	4.26		
	CI	[-17.21, 3.78]	[-11.67, 5.05]	CI	[.34, 7.23]
10-100 × Cross	β₁₅	-6.73	-4.09	OR	.89
	SE	5.34	4.25		
	CI	[-17.22, 3.77]	[-12.44, 4.27]	CI	[.18, 4.39]
10-5 × Below	β₁₆	5.44	.12	OR	.84
	SE	5.35	4.26		
	CI	[-5.07, 15.96]	[-8.25, 8.50]	CI	[.17, 4.22]
10-5 × Cross	β₁₇	-4.45	-3.65	OR	1.41
	SE	5.39	4.29		
	CI	[-15.03, 6.13]	[-12.08, 4.78]	CI	[.28, 7.23]
R2		.17***	.15***	AIC = 669.09	
F(17, 523)		6.21	5.61		
N		541			

* Significant at the .05 level, ** Significant at the .01 level, *** Significant at the .001

4.2.2. Study 2
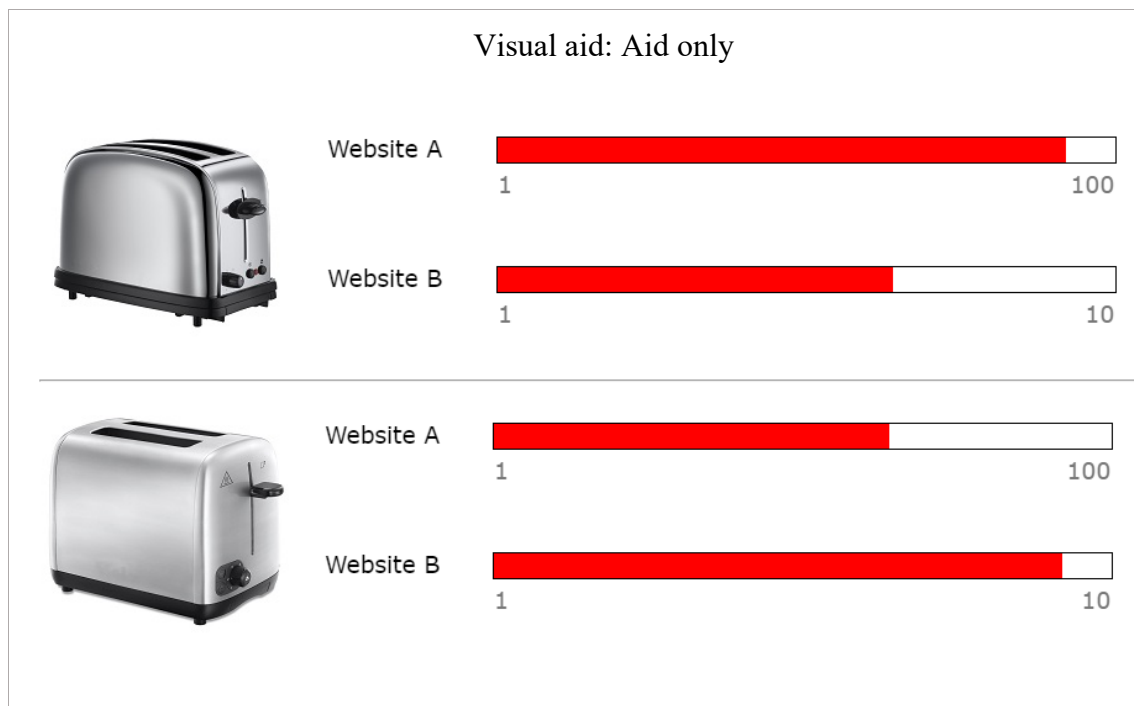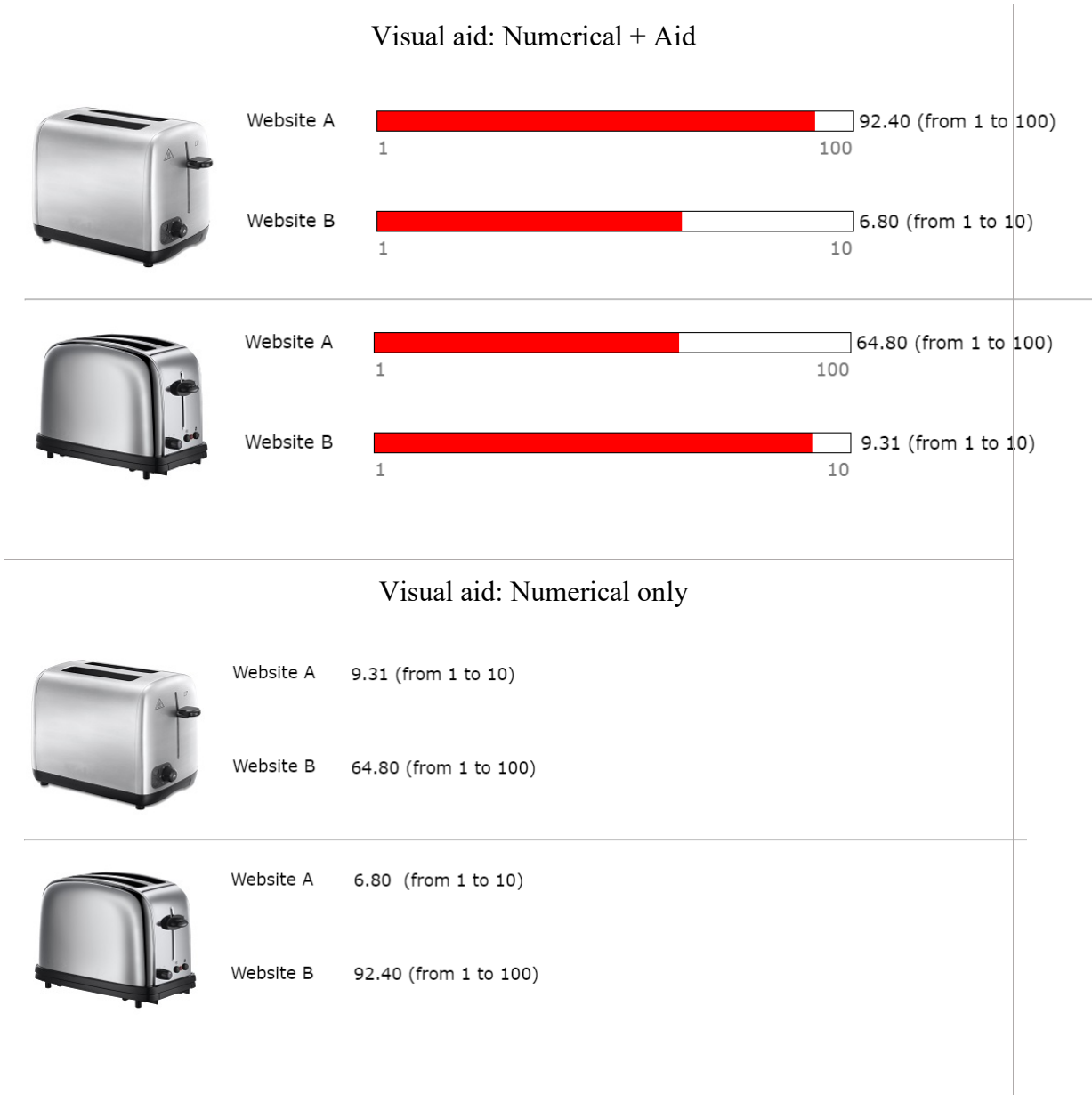
Appendix B - Figure 1: The Top Figure Is An Instance Of AL+, 10-100, Visual Aid Only Condition. The Figure In The Middle Is An Instance Of AL-, 10-100, Visual + Numerical Condition. The Bottom Figure Is An Instance Of AL+, 10-100, Numerical Only Condition. The Figures Are Rescaled To Fit Into This Document.

Appendix B - Table 4: Study 2 - Ratings And Filled Area Specification

		10-point & 5- point scales		100-point &10- point scales	
		AL+: A($R_{L-N} > R_{S-N}$) B($R_{L-N} < R_{S-N}$)		AL+: A($R_{L-N} > R_{S-N}$) B($R_{L-N} < R_{S-N}$)	
		Product A	Product B	Product A	Product B
	Rating	4.22	1.68	92.4	64.80
R_L	Normalized Rating	.36	.08	.92	.64
	Coloured length (px)	180	40	460	320
	Rating	1.30	2.43	6.80	9.31
R_S	Normalized Rating	.08	.36	.64	.92
	Coloured length (px)	40	180	320	460

Appendix B - Table 5: Study 2 - Descriptive Results

			Mean (SD) AL+	Mean (SD) AL-	Effect Size*	nAL+, nAL-
5-10	Numerical-Only	Product Attitude	.80 (1.28)	-.20 (1.07)	.81	99, 101
		WTP	7.20 (10.28)	.10 (8.33)	.77	
		Choice A	.80 (.04)	.50 (.05)	4.00	
	Aid-Only	Product Attitude	.30 (.91)	.20 (1.13)	.16	102, 100
		WTP	3.40 (7.41)	1.80 (6.76)	.22	
		Choice A	.90 (.03)	.80 (.04)	2.25	
	Numerical+Aid	Product Attitude	.40 (.8)	-.20 (1.18)	.58	98, 100
		WTP	4.90 (8.29)	.00 (9.86)	.54	
		Choice A	.80 (.04)	.50 (.05)	4.00	
10-100	Numerical-Only	Product Attitude	.30 (.83)	-.10 (.91)	.43	99, 102
		WTP	5.10 (7.96)	1.50 (8.86)	.42	
		Choice A	.90 (.04)	.60 (.05)	6.00	
	Aid-Only	Product Attitude	.50 (.91)	-.20 (.92)	.75	98, 102
		WTP	3.00 (7.39)	.50 (8.17)	.32	
		Choice A	.90 (.04)	.60 (.05)	6.00	
	Numerical+Aid	Product Attitude	.40 (.82)	.00 (1.00)	.38	101, 99
		WTP	5.00 (9.53)	2.90 (10.44)	.21	
		Choice A	.80 (.04)	.60 (.05)	2.67	

* Odd's ratio was used as the effect size of Choice. For the rest, Cohen's d was used.

Appendix B - Table 6: Study 2 - OLS And Logistic Regression Table

		A - B		Choice:	
		Product attitude	DIFFERENCE (WTP)	A = 1 B = 0	
Constant	β_0	-.11	.30	OR	1.24
	SE	.08	.71		
	CI	[-.27, .05]	[-1.08, 1.69]	CI	[.9, 1.72]
AL_Dummy: AL+ = 1 AL- = 0	β_1	.71***	6.26***	OR	3.51***
	SE	.12	1.00		
	CI	[.48, .94]	[4.29, 8.23]	CI	[2.09, 5.98]
Numerical+Aid	β_2	.03	.64	OR	1.16
	SE	.10	.87		
	CI	[-.16, .23]	[-1.06, 2.34]	CI	[.78, 1.73]
Aid-Only	β_3	.11	.35	OR	1.72**
	SE	.10	.86		
	CI	[-.09, .30]	[-1.35, 2.04]	CI	[1.15, 2.58]
Scale-Set 5-10 = 0 10-100 = 1	β_4	-.01	1.01	OR	1.02
	SE	.08	.71		
	CI	[-.17, .15]	[-.37, 2.4]	CI	[.74, 1.42]
AL_Dummy × Numerical+Aid	β_5	-.19	-1.85	OR	.81
	SE	.14	1.23		
	CI	[-.47, .09]	[-4.26, .57]	CI	[.43, 1.54]
AL_Dummy × Aid-Only	β_6	-.24	-3.30**	OR	.82
	SE	.14	1.23		
	CI	[-.51, .04]	[-5.71, -.89]	CI	[.42, 1.62]
AL_Dummy × Scale-Set	β_7	-.10	-1.85	OR	.98
	SE	.12	1.00		
	CI	[-.32, .13]	[-3.81, .12]	CI	[.57, 1.67]
R^2		.06	.05	AIC: 1365.7	
F(7, 1193)		9.64***	9.64***		
N		1201			

4.2.3. Study 3

Appendix B - Table 7: Rating Pairs Used In Study 3

100p-scale		5p-scale		Rating Pair
Very Low	13	1.3	Very Low	1
	1	2.3	Low	2
	9	2.7	Medium	3
	5	3.7	High	4
	18	4.7	Very High	5
Low	34	1.0	Very Low	6
	26	2.2	Low	7
	22	3.3	Medium	8
	38	4.0	High	9
	30	4.3	Very High	10
Medium	59	1.2	Very Low	11
	55	2.0	Low	12
	46	3.0	Medium	13
	42	3.5	High	14
	51	5.0	Very High	15
High	79	1.7	Very Low	16
	63	2.5	Low	17
	75	2.8	Medium	18
	71	3.8	High	19
	67	4.5	Very High	20
Very High	84	1.5	Very Low	21
	100	1.8	Low	22
	88	3.2	Medium	23
	92	4.2	High	24
	96	4.8	Very High	25

4.2.4. Study 4

Appendix B - Table 8: Ratings Used In Study 4

Rating	AL+: A($R_L > R_S$) B($R_L < R_S$)	
	Product A	Product B
100-p: R_L (Normalized)	92 (.92)	64 (.64)
10-p: R_S (Normalized)	6.8 (.64)	9.3 (.92)
Average (Normalized)	.78	.78

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