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‘Looking sharp’: Price typeface influences awareness of spending in mobile payment

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21

ABSTRACT

22

23 We investigate whether the typeface used to display the purchase amount in the context of
24 mobile payment influences consumers' awareness of spending. The evidence suggests that
25 prices displayed in angular (vs. round) typeface increase the awareness of spending in the
26 context of mobile payment via the perceived harshness of the typeface and the experienced
27 pain of payment (Studies 1-3, 5, and 6). Angular (vs. round) typeface also has downstream
28 consequences for payment behavior, indicating that the amount displayed with the angular
29 typeface increases the hesitation to press the "pay" button (Studies 2 and 6). Our results also
30 demonstrate that the typeface effect on the awareness of spending is moderated by the purchase
31 amount (Study 3). The robust typeface effect documented for Japanese participants (Studies 1-
32 3) is not observed in North Americans (Studies 4 and 5), highlighting the role of culture. Finally,
33 we replicate the price typeface effect (Studies 1-3) in a situation that is closer to the context of
34 real mobile shopping and demonstrate that price typeface impact people's willingness to spend
35 on the next grocery shop (Study 6). Our research contributes to the scarce literature on
36 addressing the profligacy issues associated with mobile payments and broadly cashless
37 payments.

38 *Keywords:* Typeface, Angularity, Pain of payment, Awareness of spending, Profligacy, Mobile
39 payment, Cashless payment.

40 **1. Introduction**

41 With the popularity of mobile phones and the rise of mobile technology (e.g., mobile
42 Internet), mobile payment has become a ubiquitous part of daily life for many consumers.
43 Mobile payment refers to the use of mobile devices to initiate, authorize, and confirm payment
44 transactions for goods and services (Au & Kauffman, 2008). Examples currently include Apple
45 Pay, Google Pay, and AliPay. The mobile payments market was valued at USD 1,450 billion
46 in 2020 and is expected to reach USD 5,400 billion by 2026, growing at a compound annual
47 rate of 24.5% over the forecast period (2021 – 2026; Mordor Intelligence, 2021). The COVID-
48 19 pandemic has also helped to accelerate the adoption of mobile payment as a contactless
49 method of payment that can potentially help to minimize the transmission of the virus (Liu et
50 al., 2021).

51 As mobile payment systems are highly efficient and convenient in transactions,
52 consumers and retailers have welcomed and adopted mobile payment as one of the main
53 methods of cashless payment (Boden et al., 2020). Additionally, it has been argued that an
54 increase in the social adoption of cashless payment systems can help to stimulate economic
55 growth, consumption, and trade (Hasan et al., 2012; Tee & Ong, 2016).

56 However, emerging research suggests that the use of mobile payment may lead to
57 unintended consequences amongst consumers, such as the possibility of profligacy or excessive
58 spending (Boden et al., 2020; Falk et al., 2016; Liu et al., 2021; Manshad & Brannon, 2021).
59 Adding to these findings, recent studies have suggested that an awareness of spending, which
60 refers to the subjective perception of monetary loss associated with payment, is lower when
61 people use mobile payments than when using other types of cashless payment (e.g., credit
62 cards; Boden et al., 2020; Liu & Chou, 2020; Manshad & Brannon, 2021). Studies of cashless
63 payment also suggest that the profligacy induced by cashless payment may not only result in
64 financial problems such as indebtedness (Awanis & Cui, 2014; Stewart, 2009; Pirog & Roberts,

65 2007) but also to an increase in unhealthy consumption (Park et al., 2021; Soman, 2003;
66 Thomas et al., 2011).

67 As mentioned above, recent studies have highlighted that the low awareness of
68 spending in the context of mobile payment can result in problems associated with overspending.
69 Considering the rapid growth of the mobile payments market, surprisingly little effort has been
70 devoted to exploring how to deal with, and thereafter to solve, possible overspending issues in
71 mobile payment. As far as we are aware, to date, only a single study has addressed the issue.
72 In particular, focusing on the role of haptic input, Manshad and Brannon (2021) examined the
73 influence of providing vibrotactile feedback on people's awareness of mobile spending. They
74 expected two possibilities. One was that high-intensity vibration (vs. no vibration) would
75 increase the awareness of spending in the context of mobile payment since high- (vs. low-)
76 intensity vibrations are perceived as more annoying or startling. The other was that low-
77 intensity vibration (vs. no vibration) would increase the awareness of mobile spending since
78 low- (vs. high-) intensity vibrations are associated with more negative and low arousal
79 emotions such as sadness. The results supported the latter suggestion demonstrating that low-
80 intensity vibration feedback (vs. no vibration) can potentially increase people's awareness of
81 mobile payment spending and thus reduce their willingness to spend.

82 The studies reported here are the first to demonstrate that, focusing on the visual design
83 of price format, merely altering the shape of the typeface displaying the payment amount for
84 mobile payment is sufficiently powerful to influence the consumers' awareness of spending
85 and their intention to pay. Across six studies, we report evidence that the purchase amount
86 displayed with an angular (round) typeface increases the awareness of spending in mobile
87 payment via the perceived harshness of the display typeface and the experienced pain of
88 payment (Studies 1-3, 5, and 6). We also show that the angular (vs. round) display typeface has
89 a downstream effect on people's payment behavior, indicating the amount with angular (vs.

90 round) typeface display increases their hesitation when it comes to pressing the “pay” button
91 (Studies 2 and 6). We also demonstrate that the display typeface effect on the awareness of
92 spending is moderated by the payment amount (Study 3). We further document how the robust
93 price typeface effect found amongst Japanese participants in Studies 1-3 is not observed
94 amongst North American consumers (Studies 4 and 5). Finally, we replicate the price typeface
95 effect found in Studies 1-3 in a context that is closer to real mobile shopping and demonstrate
96 the price typeface indeed impacts the willingness to spend in the next grocery shopping (Study
97 6). These findings contribute to the scarce literature on dealing with the problem of profligacy
98 in cashless payments and the effect of sensory elements of price format (e.g., price color) on
99 price perception. Our research also adds to the understanding of the effect of shape perception
100 on consumer behavior more generally (see Velasco & Spence, 2019).

101

102 **2. Theoretical background and hypotheses**

103 *2.1. Payment methods and the awareness of spending*

104 Previous studies have consistently highlighted the influence of payment format on
105 people’s willingness to pay (e.g., Feinberg, 1986; Liu et al., 2021; Prelec & Simester, 2001;
106 Runnemark et al., 2015; Soman, 2003). Generally-speaking, shoppers tend to spend more when
107 they pay with cashless methods such as credit cards and mobile payments than with cash.

108 The level of payment transparency negatively influences consumers’ willingness to
109 spend (Falk et al., 2016; Raghubir & Srivastava, 2008; Soman, 2003). Payment transparency
110 refers to “the relative salience of the payment, both in terms of physical form and the amount”
111 (Soman, 2003, p. 175). While the salience of physical form is the degree to which it is easy to
112 experience that money is being spent, the salience of the amount refers to the degree to which
113 it is easy to track the total amount spent (Falk et al., 2016; Soman, 2003). In general, when
114 comparing cash, card, and mobile, transparency is highest for cash (high salience of physical

115 form and amount), the lowest in the case of mobile payment (low salience of physical form and
116 low-medium salience of amount), and intermediate in the case of card (medium salience of
117 physical form and low salience of amount) (Boden et al., 2020; Falk et al., 2016; Liu & Chou,
118 2020; Manshad & Brannon, 2021). Mobile payment is the least transparent of the currently
119 available payment methods since it does not require the consumer to bring cash or card and
120 take physical action such as handing over cash, signing a receipt, or entering a security code
121 for card authorization.

122 The research that has been published to date on payment format also suggests that the
123 experienced pain of payment, the negative emotion that consumers experience in parting with
124 their cash, mediates the influence of payment methods on the awareness of spending (Liu &
125 Chou, 2020; Prelec & Simester, 2001; Raghurir & Srivastava, 2008; Shah et al., 2016; Soman,
126 2003). Payment transparency positively influences the experienced pain of payment
127 (independent of how much is paid for a particular purchase), and the experienced pain
128 subsequently increases the awareness of spending. Therefore, people tend to spend more when
129 their payment is cashless (such as using mobile phones) than when it is made with cash, since
130 cashless (vs. cash) payment elicits less pain associated with the payment.

131 Relatedly, recent research suggests that the use of mobile payment may lead to
132 unintended consequences amongst consumers, such as the possibility of profligacy or excessive
133 spending (Boden et al., 2020; Falk et al., 2016; Liu et al., 2021; Manshad & Brannon, 2021).
134 The possible spending problem is, of course, not a new issue in the literature on cashless
135 payment. A number of studies have already demonstrated that people tend to spend more when
136 they make cashless payments, such as paying by credit or debit card, rather than when paying
137 with cash (Feinberg, 1986; Hirschman, 1979; Liu & Chou, 2020; Park et al., 2021; Prelec &
138 Simester, 2001; Raghurir & Srivastava, 2008; Runnemark et al., 2015; Soman, 2001, 2003).

139 Cashless (vs. cash) payments tend to encourage lavish spending and impulse purchases

140 (e.g., Erasmus & Lebani, 2008; Feinberg, 1986; Raghurir & Srivastava, 2008; Soman, 2003).
141 What is more, it has been suggested that the profligacy induced by cashless payment may result
142 in indebtedness and even bankruptcy for some individuals (Awanis & Cui, 2014; Pirog &
143 Roberts, 2007; Stewart, 2009). Furthermore, recent studies have demonstrated that the
144 profligacy induced by cashless payment may not only lead to financial problems but also to an
145 increase in unhealthy consumption (Park et al., 2021; Soman, 2003; Thomas et al., 2011).

146 While it is already known that payment format influences spending, there is perhaps,
147 a more subtle way in which spending behavior is influenced, that is, by means of the sensory
148 elements of the price format (e.g., shape, size, color). Previous studies have demonstrated that
149 the sensory elements of price format, such as the color in which the price information is
150 presented (e.g., Puccinelli et al., 2013; Ye et al., 2020), price font size (e.g., Coulter & Coulter,
151 2005), and price font clarity (Mead & Hardesty, 2018) sometimes affect consumer's price
152 perception. In the present research, we look, in particular, at how typeface, as a potentially
153 salient sensory element of price format may influence consumers' awareness of spending in
154 the context of mobile payment.

155

156 *2.2. Typeface shape and awareness of spending*

157 Although the terms typeface and font are used interchangeably in daily language,
158 considering the difference between the two is important as far as understanding type design is
159 concerned (Brownlee, 2014, Velasco & Spence, 2019). Typeface refers to a family of related
160 fonts which follow the same design principle. Meanwhile, font refers to specific subsets of a
161 typeface. For example, Arial 12pt in italics is a different font than Arial 10 without italics,
162 while Arial constitutes a different typeface than Times New Roman.

163 Typeface design is crucial for branding (Henderson et al., 2004) as typeface and font
164 can convey a wide range of different brand associations and meanings such as product

165 attributes (Childers & Jass, 2002; de Sousa et al., 2020; Gupta & Hagtvedt, 2021; Liu et al.,
166 2019; Schroll et al., 2018; Velasco et al., 2018; Venkatesan et al., 2020), product category
167 (Doyle & Bottomley, 2004, 2006; Wang et al., 2020; Zhou et al., 2021), brand personality
168 (Grohmann et al., 2013; Mackiewicz & Moeller, 2004), brand gender (Grohmann, 2016), brand
169 premiumness (Yu et al., 2021), purchase intention (Mead et al., 2020) and even exotic, or
170 national, associations (Celhay et al., 2015).

171 Typeface curvature (which refers to the roundness or angularity of a letterform) is one
172 of the fundamental attributes of typeface design (Henderson et al., 2004; van Leeuwen, 2006).
173 While round typefaces are conventionally perceived to be soft and feminine, angular typefaces
174 are perceived to be hard and masculine (Grohmann, 2016; Wang et al., 2020). In addition,
175 round (vs. angular) typefaces generally induce feelings of pleasantness and friendliness
176 (Henderson et al., 2004; Pombo & Velasco, 2021). Furthermore, a separate line of crossmodal
177 research has shown that round typefaces tend to be associated with a sweet taste, whereas
178 angular typefaces tend to be matched with bitter, sour, and salty tastes instead (Velasco et al.,
179 2018; Velasco & Spence, 2019; Velasco et al., 2014).

180 People tend to associate angular shapes with attributes such as hard, harsh, and
181 masculine while associating round shapes with attributes such as soft, mild, and feminine (e.g.,
182 Blazhenkova & Kumar, 2018; Liu & Kennedy, 1997; Lundholm, 1921). In addition, numerous
183 studies have demonstrated a general tendency to prefer round over angular shapes (Bar & Neta,
184 2006, 2007, 2008; Blazhenkova & Kumar, 2018; Gómez-Puerto et al., 2016; Larson et al.,
185 2009; Palumbo et al., 2015; Wang et al., 2020; Westerman et al., 2012). A bias to prefer round
186 shapes has also been documented in 1 week-old infants (Fantz & Miranda, 1975) and even
187 amongst non-human primates (Munar et al., 2015).

188 Of particular relevance to the aims of the present study, studies reveal that people
189 perceive angular (vs. round) shapes as less attractive and pleasing since angular shapes may

190 induce a vague sense of threat (Bar & Neta, 2006, 2007, 2008; Larson et al., 2009; Palumbo et
191 al., 2015). For example, using human neuroimaging, Bar and Neta (2007) found that everyday
192 sharp objects (such as a sofa with sharp corners) elicit significantly greater amygdala activation,
193 which is involved in fear processing, than do curved objects (e.g., a sofa with curved corners).
194 Relatedly, Palumbo et al. (2015; Experiment 1) used the Implicit Association Test to
195 demonstrate that curved shapes are associated with safe (e.g., comfort, secure) and positive
196 (e.g., lucky, success) concepts, whereas angular shapes are associated with danger (e.g., killer,
197 weapon) and negative (e.g., tragedy, rejected) concepts instead. Taken together, these studies
198 suggest that angular shapes more strongly activate the amygdala and elicit negative
199 associations and emotions as compared to shapes that are rounder.

200 Neuroimaging research suggests that the amygdala is also activated when people
201 expect or experience pain and is interrelated with other cortical regions that process pain signals
202 (Larson et al., 2009; Simons et al., 2014). Importantly, Larson and colleagues reported that an
203 angular shape (i.e., a downward-pointing V-shape) activated pain-responsive regions such as
204 the posterior insular cortex and the anterior cingulate cortex. These findings suggest that
205 angular (vs. round) shapes may (explicitly and/or implicitly) induce a feeling of pain or, at the
206 very least, activate the concept of pain.

207

208 *2.3. Hypotheses*

209 Based on the above-mentioned arguments and findings, we first hypothesize that the
210 shape of the typeface for displaying a purchase amount will tend to influence the consumers'
211 awareness of spending in the context of mobile payment. Therefore,

212

213 H1: Angular (vs. round) price typeface will increase the awareness of spending.

214

215 As stated above, people tend to associate angular (vs. round) shapes/typefaces with
216 harshness, cruelty, and other feelings that are less pleasant (e.g., Bar & Neta, 2007;
217 Blazhenkova & Kumar, 2018; Henderson et al., 2004; Liu & Kennedy, 1997; Velasco &
218 Spence, 2019). Thus, it was predicted that an angular (vs. round) price typeface would increase
219 the perception of harshness (broadly defined to include negative associations and feelings). In
220 addition, neuroimaging research indicates that angular shapes activate those brain areas (e.g.,
221 amygdala, the anterior cingulate cortex) involved in the perception of fear, threat, and pain (e.g.,
222 Bar & Neta, 2007; Larson et al., 2009). Based on these findings, it is assumed that the perceived
223 harshness (induced by the angular typeface) will increase the pain that is associated with
224 payment. Further, research in payment methods suggests that the pain of payment increases the
225 awareness of spending (e.g., Prelec & Simester, 2001; Raghubir & Srivastava, 2008; Soman,
226 2003). Thus, we predict that the pain of payment will increase the awareness of spending. The
227 above-mentioned serial mediation predictions are formulated as follows.

228

229 H2: Angular (vs. round) price typeface will increase the awareness of spending through
230 perceived harshness and the pain of payment.

231

232 Studies regarding payment transparency suggest that the salience of spending money
233 induces a feeling of pain and thus negatively influences the willingness to spend and hence the
234 actual amount purchased (e.g., Runnemark et al., 2015; Soman, 2003; Thomas et al., 2011). As
235 an individual's behavioral system inhibits those behaviors that may lead to negative or painful
236 outcomes (e.g., Carver & White, 1994), it was predicted that an increase in the awareness of
237 spending would negatively influence the consumers' behavioral intention to pay via mobile
238 payment. This leads to:

239

240 H3: The awareness of spending will positively influence an increase in hesitation to press the
241 “pay” button.

242

243 The pain associated with payment and the awareness of spending depends on the amount to be
244 paid (Ceravolo et al., 2019; Soman, 2003). According to cue utilization theory, high (vs. low)
245 involvement consumers tend to adopt systematic processes and depend more on intrinsic rather
246 than extrinsic cues for their judgments (e.g., Celsi & Olson, 1988; Lee & Lou, 1995; Olson &
247 Jacoby, 1972). In addition, perceived risk is often viewed as a significant antecedent of
248 involvement (Mitchell, 1999). In the current research, the amount to be paid can be considered
249 as an internal cue and the typeface of displaying the amount as an external cue for the awareness
250 of spending. Since the perceived risk and involvement for payment is expected to increase in
251 proportion to the expenditure, the influence of the typeface (as an external cue) on the
252 awareness of spending may be attenuated or disappear entirely when the purchase amount is
253 relatively large (vs. small). Therefore:

254

255 H4: The purchase amount will negatively moderate the typeface effect on the awareness of
256 spending.

257 Studies based on evolutionary psychology suggest that the preference for curvature
258 appears to be universal and is unaffected by cultural differences (e.g., Bar & Neta, 2006; Fantz
259 & Miranda, 1975; Gómez-Puerto et al., 2018; Munar et al., 2015). For example, Gómez-Puerto
260 et al. have demonstrated that the preference for curved contours is also present in non-Western
261 cultures such as in Ghana. Meanwhile, Munar et al. report that non-human great apes also
262 prefer curved over sharp-angled contours. Contrary to the evolutionary psychological studies,
263 some social psychological and marketing studies have demonstrated that the preference for
264 shapes may differ as a function of culture (Chen et al., 2016; Henderson et al., 2003; Tzeng et

265 al., 1990; Velasco et al., 2018; Zhang et al., 2006). For example, Zhang et al. (2006)
266 demonstrated that individuals with independent (vs. interdependent) self-construals perceive
267 angular shapes as more attractive and rounded shapes as less attractive. This is because an
268 independent self-construal is associated with conflict confrontation, whereas an interdependent
269 self-construal is associated with conflict avoidance. Zhang and colleagues also found that
270 corporate logos from collectivist countries (i.e., Japan, Hong Kong, South Korea) were rounder
271 than those from individualistic countries (i.e., United States, United Kingdom, Canada, and
272 Germany). These studies suggest that it may be possible that culture affects the typeface effect
273 on the awareness of spending. Thus, we formulated the following research question (RQ).

274

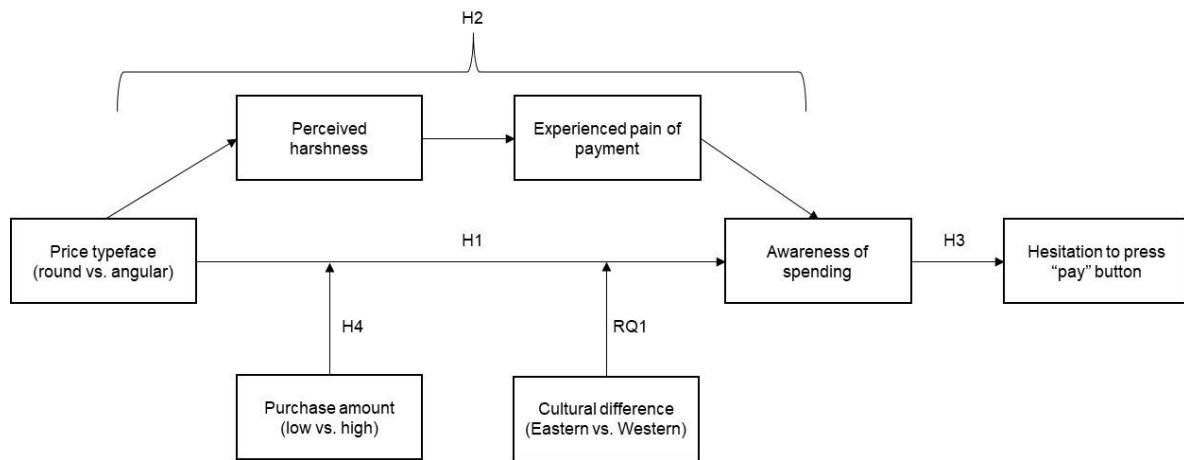
275 RQ1: Do cultural differences (i.e., Eastern vs. Western) affect the price typeface effect on the
276 awareness of spending?

277

278 **3. Overview of Studies**

279 The research model, which consists of four hypotheses and one RQ (see Fig 1), is
280 tested across a series of six studies. Study 1 examines the typeface (round vs. angular) effect
281 on the awareness of spending in the context of mobile payment (H1). Study 2 investigates the
282 underlying mechanisms of the typeface effect on the awareness of spending (H2) and the
283 downstream effect of the typeface used to display the payment amount on people's intention
284 to pay (i.e., hesitation to press the "pay" button) (H3). Study 3 examines whether the payment
285 amount (low vs. high) moderates the typeface effect on participants' awareness of spending
286 (H4). Contrary to Studies 1-3 conducted with Japanese participants, Studies 4 and 5 explore
287 the typeface effect on the awareness of spending with North American samples instead (RQ1).
288 Study 6 investigates the typeface effect on consumer responses to mobile payment for Japanese
289 participants using more realistic shopping experience stimuli (H1, H2, and H3) and another

290 downstream effect of price typeface, namely on the consumer’s willingness to spend on their
 291 next grocery shop.



292

293 Fig. 1. Research model of the current study.

294

295 **4. Study 1**

296 The purpose of the first study is to examine whether the typeface (i.e., round vs.
 297 angular) of amount display influences consumers’ awareness of spending in the context of
 298 mobile payment.

299

300 *4.1. Method*

301 *4.1.1. Participants*

302 One hundred and fifty-five participants (33 females, $M_{age} = 46.6$ years $SD = 9.67$) were
 303 recruited for Study 1. All of the participants passed an attention check. Across all studies, we
 304 recruited those participants who had used a mobile payment app. According to a priori power
 305 analyses for analysis of variance (ANOVA) using G*Power 3.1 (Faul, Erdfelder, Lang, &
 306 Buchner, 2007), the final sample size in all studies excepting Study 2 was sufficient to detect
 307 a medium effect ($f = 0.25$) with 80% power at an alpha level of 0.05. Although the final sample
 308 size in Study 2 ($N = 96$) was slightly smaller than the estimated one ($N = 128$), a post hoc
 309 power analysis (G*Power 3.1) revealed a sufficient power (85%) to detect a medium to large

310 effect ($f = 0.31$) for an ANOVA with two groups. The Japanese participants in Studies 1-3 and
311 6 were recruited online from Yahoo Crowd Sourcing service
312 (<https://crowdsourcing.yahoo.co.jp/>) in return for a small monetary compensation. The Yahoo
313 service constitutes one of the largest crowdsourcing platforms in Japan. A number of marketing
314 studies (e.g., Park et al., 2021; Sunaga et al., 2016; Youn et al., 2019) have used this platform
315 previously. The North American participants in Studies 4 and 5 were recruited via Amazon
316 Mturk (<https://www.mturk.com/>), again for a small monetary compensation. Survey Monkey
317 was used in all studies to collect participants' responses. All of the participants provided their
318 consent online prior to taking part in the studies.

319

320 4.1.2. Stimuli and pretest

321 We created two versions of the confirmation screen of a mobile payment app in which
322 a purchase amount (i.e., JPY3,300) was displayed with either round or angular typeface (see
323 Fig. 2). The purchase amount was decided based on the average range of expenditure (i.e., from
324 JPY3000 to JPY5000) on a grocery shopping trip provided by a survey of the Japanese Ministry
325 of Agriculture, Forestry, and Fisheries (JMAFF, 2018). "Simply rounded" and "Jersey sharp"
326 were used as a round and angular typeface to display the purchase amount, respectively.

327 A pretest ($N = 110$, 38 females, $M_{\text{age}} = 44.2$ years, $SD = 9.30$) was conducted to assess
328 whether the round and angular typefaces for the displayed amount were perceived differently
329 in terms of their shape (1 = round, 7 = angular) but perceived equivalently in terms of their
330 legibility (1 = bad, 7 = good) and size (1 = small, 7 = large). The results of the independent t -
331 tests indicated that, as expected, perceived roundness/angularity was significantly different
332 between the two typeface conditions ($M_{\text{round}} = 1.77$, $SD = 0.86$ vs. $M_{\text{angular}} = 6.10$, $SD = 1.03$;
333 $t(108) = 24.04$, $p < .001$, Cohen's $d = 4.61$). Meanwhile, the perceived legibility ($M_{\text{round}} = 3.56$,
334 $SD = 1.50$ vs. $M_{\text{angular}} = 3.10$, $SD = 1.61$; $t(108) = 1.53$, $p = .129$, Cohen's $d = 0.3$) and size

335 ($M_{\text{round}} = 5.08, SD = 1.11$ vs. $M_{\text{angular}} = 5.06, SD = 1.05; t(108) = 0.10, p = .921$, Cohen's $d =$
 336 0.02) did not differ between the two conditions.

337



338

339 Fig. 2. Stimuli used in Study 1. Note: The purchase amount displayed with the round typeface
 340 (Simply rounded) is on the left, and the angular typeface (Jersey sharp) is on the right.

341

342 *4.1.3. Procedure and measures*

343 At the start of the experiment, it was explained to the participants that the study
 344 concerned mobile payment. They were first asked to imagine a situation in which they bought
 345 some groceries from an online store and are about to pay the purchase amount by a mobile
 346 payment app. The participants were then randomly assigned to either the round or the angular
 347 typeface conditions (78 in the round condition and 77 in the angular condition) and asked to
 348 see the displayed amount on the confirmation screen. Subsequently, they rated their awareness
 349 of spending with two items partially adapted from Manshad and Brannon (2021) (“To what
 350 extent do you feel expensive for paying the displayed amount?”, “To what extent the payment
 351 for the displayed amount make you think about losing money?”; 1 = not at all, 7 = very much
 352 so; $\alpha = .86$). Afterward, as a manipulation check, they rated the perceived shape of the display
 353 typeface with a seven-point bipolar scale (1 = round, 7 = angular). Additionally, as an attention
 354 check, the participants were required to choose the displayed amount on the screen among four
 355 options (1 = JPY1,300, 2 = JPY3,300, 3 = JPY5,300, 4 = JPY10,300). At the end of the study,
 356 the participants reported their gender, age, and income.

357

358 4.2. Results

359 4.2.1. Manipulation check

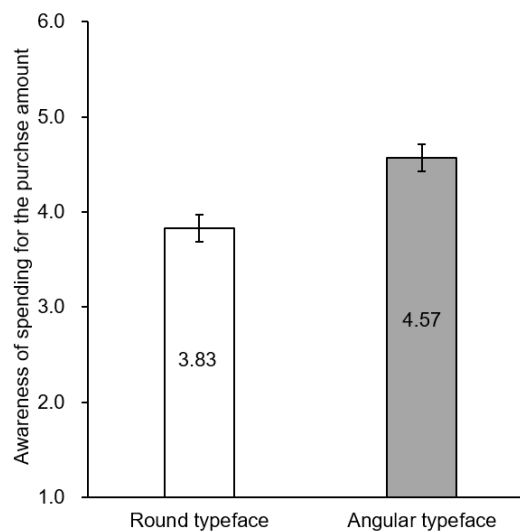
360 As expected, an independent *t*-test indicated that the participants in the angular
 361 condition perceived the price typeface to be more angular than those in the round condition
 362 ($M_{\text{round}} = 1.90, SD = 1.00$ vs. $M_{\text{angular}} = 5.75, SD = 1.19; t(153) = 21.80, p < .001, \text{Cohen's } d$
 363 $= 3.50$), thus confirming that the experimental manipulation was successful.

364

365 4.2.2. Main analysis

366 An ANOVA was performed with the type of price typeface (round vs. angular) as an
 367 independent variable and the awareness of spending for the purchased amount as a dependent
 368 variable. The results revealed, as expected, that the displayed amount indicated with the angular
 369 typeface induced higher awareness of spending than that with the round typeface ($M_{\text{round}} = 3.83,$
 370 $SD = 1.26$ vs. $M_{\text{angular}} = 4.57, SD = 1.22; F(1, 153) = 13.65, p < .001, \eta_p^2 = .08$; see Fig 3).
 371 Including participant gender, age, and income as covariates did not change the significance of
 372 the result. Thus, H1 was supported.

373



374

375 Fig. 3. The effect of the price typeface on the awareness of spending for the purchase amount
376 (i.e., JPY3,300). Note: Error bars indicate standard errors of mean.

377

378 4.3. Discussion

379 The results of Study 1 therefore provide initial evidence that the typeface for displaying
380 purchase amount influences the awareness of spending in the mobile payment context. More
381 specifically, the results show that, even though the purchase amount is identical, the amount
382 displayed with angular (vs. round) typeface can increase the subjective perception of spending.

383

384 5. Study 2

385 The purpose of Study 2 is two-fold. First, the study is designed to examine the
386 underlying mechanisms of the price typeface effect on the awareness of spending. Second, the
387 downstream consequences of the typeface effect on the intention to pay are also investigated.

388

389 5.1. Method

390 5.1.1. Participants and Stimuli

391 Ninety-eight participants (36 females) were recruited for Study 2. As one of the
392 participants failed an attention check item, and another one did not correctly report his age,
393 they were removed from the analysis. Thus, the final number of participants was 96 (36 females,
394 $M_{\text{age}} = 47.74$ years, $SD = 9.73$).

395 Two versions of the confirmation screen of a mobile app were created in which
396 JPY5,300 was displayed with either round or angular typeface (see Appendix A). This amount
397 was set by considering the following two aspects. First, as mentioned in Study 1, the average
398 range of expenditure per grocery shopping purchase in Japan ranges from approximately JPY
399 3,000 to 5,000 (JMAFF, 2018). Second, we wanted to use a different amount from that used in

400 Study 1 while minimizing the possible influence of number differences in an amount that might
401 induce different round/angular or price perceptions (e.g., round ending price vs. odd ending
402 price; Choi et al., 2014). Therefore, we only changed the first digit in the displayed amounts
403 from JPY3,300 used in Study 1 to JPY5,300.

404

405 *5.1.2. Procedure and measures*

406 The procedure was identical to that used in Study 1, except those additional
407 measurements were obtained. At the beginning of the experiment, the participants were
408 instructed to imagine a situation in which they bought some groceries online and were about to
409 pay the purchase amount using a mobile payment app. Participants were then randomly
410 assigned to either the round or angular typeface conditions (43 in the round condition and 53
411 in the angular condition) and asked to see the displayed purchase amount on the confirmation
412 screen. After that, they rated a series of measurement scales. They first rated the perceived
413 harshness of the price typeface with two seven-point bipolar items (“What do you think of the
414 typeface used for displaying the amount?”; 1 = gentle, 7 = harsh; 1 = comfortable, 7 = anxious;
415 $\alpha = .78$). The items were created based on the relevant literature stated above, suggesting that
416 people associate angular (vs. round) shapes more with concepts such as hardness, cruelty, and
417 harshness (e.g., Liu & Kennedy, 1997; Lundholm, 1921). Relatedly, angular (vs. round)
418 shapes are perceived to be more unpleasant and uneasy (e.g., Bar & Neta, 2007; Palumbo et
419 al., 2015). The participants rated the experienced pain associated with payment with a single
420 seven-point item (“To what extent do you feel pain for paying the displayed amount?”; 1 = not
421 at all, 7 = very much so) adapted from Borden et al. (2020) and the awareness of spending with
422 the two items used in Study 1 ($\alpha = .89$). Subsequently, the participants reported their hesitation
423 to press the “pay” button using a seven-point item (“To what extent do you feel hesitation to
424 press the “pay” button?”; 1 = not at all, 7 = very much so). Afterward, they answered the

425 manipulation and attention check items used in Study 1. At the end of the study, the participants
426 once again reported their gender, age, and income.

427

428 5.2. Results

429 5.2.1. Manipulation check

430 An independent t -test indicated that participants in the angular condition perceived the
431 displayed typeface to be more angular than those in the round condition ($M_{\text{round}} = 2.23$, $SD =$
432 1.23 vs. $M_{\text{angular}} = 6.36$, $SD = 0.88$; $t(94) = 19.13$, $p < .001$, Cohen's $d = 3.93$). Therefore, the
433 manipulation was satisfactory.

434

435 5.2.2. Main Analysis

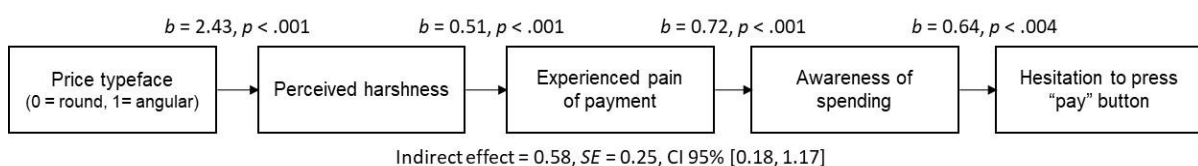
436 As with Study 1, we first conducted an ANOVA with the type of display typeface
437 (round vs. angular) as an independent variable and the awareness of spending as a dependent
438 variable. The result replicated the results of Study 1. The displayed amount indicated with the
439 angular (vs. round) typeface resulted in a higher awareness of spending ($M_{\text{round}} = 4.44$, $SD =$
440 0.95 vs. $M_{\text{angular}} = 5.06$, $SD = 1.10$; $F(1, 94) = 8.68$, $p = .004$, $\eta_p^2 = .09$). Once again, including
441 participant gender, age, and income as covariates did not change the significance of the result.
442 Thus, H1 (the price typeface effect on the awareness of spending) was again supported in Study
443 2 with the different purchase amount.

444 Next, we conducted a serial mediation analysis (Model 6 of the PROCESS SPSS
445 macro with 5000 bootstrap samples) to test the price typeface effect on the sense of spending
446 through the perceived harshness and the experienced pain of the payment (see Appendix B).
447 The results revealed that the amount displayed with angular (vs. round) typeface (dummy
448 coded as 0 = round, 1 = angular) increased the perceived harshness ($b = 2.43$, $SE = 0.18$, $t =$
449 12.87 , $p < .001$). Subsequently, the perceived harshness increased the experienced pain of

450 payment ($b = 0.51$, $SE = 0.13$, $t = 4.06$, $p < .001$). Finally, the experienced pain also positively
 451 influenced the awareness of spending ($b = 0.72$, $SE = 0.04$, $t = 16.62$, $p < .001$). Importantly,
 452 the indirect effect of the price typeface on the awareness of spending via the two mediators was
 453 also significant at the 95% confidence interval (indirect effect = 0.90, $SE = 0.29$, 95% CI [0.36,
 454 1.50]). Thus, H2 (price typeface \rightarrow perceived harshness \rightarrow experienced pain of payment \rightarrow
 455 awareness of spending) were supported. (See Appendix B for details). Participant gender, age,
 456 and income as covariates did not influence the results. As a further check, we conducted a
 457 reverse mediation analysis with the mediators in reverse order (i.e., experienced pain of
 458 payment first and perceived harshness second). The non-significant results of the reverse
 459 mediation (indirect effect = 0.20, $SE = 0.02$, 95% CI [-0.002, 0.06]) supported the veracity of
 460 the proposed underlying psychological process

461 We then ran another serial mediation analysis (Model 6 of the PROCESS SPSS macro
 462 with 5000 bootstrap samples; the perceived harshness, the experienced pain, and the awareness
 463 of spending as mediators) to examine the downstream effect of price font on hesitation to press
 464 the “pay” button (see Fig. 4). The results indicated that the awareness of spending increased
 465 the hesitation to press the “pay” button ($b = 0.64$, $SE = 0.22$, $t = 2.96$, $p < .004$). Thus, H3 was
 466 supported. Moreover, and importantly, the indirect effect of the price typeface on the hesitation
 467 to pay through the three mediators was also significant at the 95% confidence interval ($b = 0.58$,
 468 $SE = 0.25$, 95% CI [0.18, 1.17]). Total indirect effect ($b = 1.03$, $SE = 0.43$, 95% CI [0.13, 1.83])
 469 and total effect ($b = 0.86$, $SE = 0.30$, $t = 2.86$, $p = .005$, 95% CI [0.13, 1.83]) were also
 470 significant. Participant gender, age, and income as covariates did not influence the results.

471



473 Fig. 4. The results of the serial mediation analysis in Study 2.

474

475 Finally, we conducted independent *t*-tests to compare the mean scores of the
 476 measurements in both conditions. As shown in Table 1, all mean scores were significantly
 477 higher in the angular typeface condition than in the round typeface condition.

478

479 Table 1. The mean scores of the measurements in the round and angular display typeface
 480 conditions in Study 2.

	Round typeface	Angular typeface			
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
Perceived harshness	3.26 (0.90)	5.69 (0.94)	12.87	<.0001	2.63
Experienced pain of payment	4.14 (1.19)	4.94 (1.25)	3.21	.002	0.65
Awareness of spending	4.44 (0.95)	5.06 (1.10)	2.95	.004	0.60
Hesitation to press "pay" button	3.93 (1.35)	4.79 (1.56)	2.86	.005	0.59

481

482

483 *5.3. Discussion*

484 Study 2 replicated the findings of Study 1 with the different purchase amount (i.e.,
 485 JPY 5,300), indicating that the amount displayed with the angular (vs. round) typeface
 486 increased the participants' awareness of spending. In addition, and importantly, Study 2
 487 demonstrates the underlying mechanism of the display typeface effect on the awareness of
 488 spending. We found that the type of price typeface impacts the awareness of spending via the
 489 perceived harshness of the typeface and the experienced pain of payment. Furthermore, Study
 490 2 revealed that the awareness of spending induced by price typeface has a downstream effect
 491 on people's intention to pay. Namely, viewing the angular (vs. round) typeface increases
 492 people's hesitation when it comes to pressing the "pay" button through the perceived harshness,
 493 the pain of payment, and the awareness of spending.

494

495 **6. Study 3**

496 Studies 1 and 2 demonstrated that the typeface of a purchase amount influences the
497 awareness of spending. Study 3 extended the findings of Studies 1 and 2 by examining whether
498 the purchase amount (i.e., low vs. high) moderates the typeface effect on the awareness of
499 spending.

500

501 *6.1. Method*

502 *6.1.1. Participants and Stimuli*

503 Two hundred and thirty-five adults (66 females, $M_{\text{age}} = 45.02$ years, $SD = 10.19$)
504 participated in Study 3. Five participants failed an attention check, leaving 230 participants
505 available for analysis. Adding to the two versions of amount stimuli used in Study 2 (i.e.,
506 JPY5,300), we also created two more versions of the confirmation screen of a mobile app in
507 which JPY15,300 was displayed with either round or angular typeface (see Appendix A).
508 Similar to Study 2, in this study, we only added a ten-thousands digit to the base amount (i.e.,
509 JPY15,300) to create a high purchase amount condition while minimizing the possible
510 confounding effect of number differences in the amount.

511

512 *6.1.2. Procedure and measures*

513 The experiment involved a 2 (type of typeface: round vs. angular) \times 2 (purchase
514 amount: low vs. high) between-participants factorial design. The procedure was identical to
515 that used in Studies 1 and 2. The participants were first asked to imagine a situation in which
516 they bought some groceries online and were about to pay the amount using a mobile app. The
517 participants were then randomly assigned to one of four conditions (40 in the round/low-
518 amount condition, 59 in the round/high-amount condition, 71 in the angular/low-amount
519 condition, 60 in the angular/high-amount condition) and asked to view the purchase amount

520 displayed on the confirmation screen. After that, the participants rated the awareness of
521 spending with the two items ($\alpha = .86$) used in Studies 1 and 2. They then answered the
522 manipulation check item used in Studies 1 and 2 and were required to choose the purchase
523 amount displayed on the screen among four options (1 = JPY1,300, 2 = JPY3,300, 3 =
524 JPY5,300, 4 = JPY15,300). At the end of the study, the participants reported their gender, age,
525 and income.

526

527 6.2. Results

528 6.2.1. Manipulation check

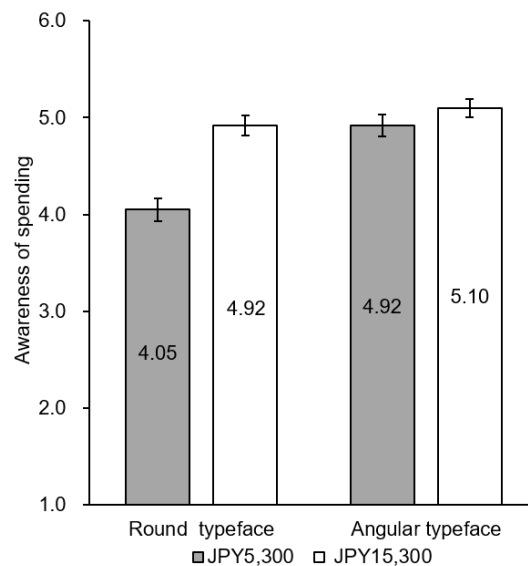
529 An independent *t*-test indicated that participants in the angular condition perceived the
530 price typeface as more angular than those in the round condition ($M_{\text{round}} = 1.87, SD = 1.14$ vs.
531 $M_{\text{angular}} = 6.21, SD = 0.99; t(228) = 30.96, p < .001, \text{Cohen's } d = 4.11$). In addition, all
532 participants in the low amount (i.e., JPY5,300) and high amount (i.e., JPY15,300) conditions
533 correctly remembered the displayed amount on the screen. Therefore, the manipulations for the
534 type of typeface and the purchase amount were successful.

535 In addition, a post *t*-test ($N = 157, 74$ females, $M_{\text{age}} = 44.94$ years, $SD = 9.06$) for a
536 perceived amount purchased per grocery shop with a 7-point item (“How do you feel if you
537 spend [indicated either JPY5,300 or JPY15,300] on grocery shopping?”; 1 = very low
538 expenditure, 7 = very high expenditure) was conducted. The results confirmed that the
539 perceived expenditure was significantly higher in the condition of JPY15,300 ($N = 82$) than in
540 that of JPY5,300 ($N = 75$) ($M_{\text{JPY15,300}} = 6.52, SD = 0.62$ vs. $M_{\text{JPY5,300}} = 5.74, SD = 1.02; t(136.10)$
541 $= 5.82, p < .001, \text{Cohen's } d = 0.91$).

542

543 6.2.2. Main analysis

544 An ANOVA was conducted for the awareness of spending (see Fig. 5). The results
 545 indicated the main effects of the type of typeface ($M_{\text{round}} = 4.57, SD = 1.32$ vs. $M_{\text{angular}} = 5.00,$
 546 $SD = 1.16; F(1, 226) = 10.49, p = .001, \eta_p^2 = .04$) and the purchase amount ($M_{\text{low}} = 4.60, SD =$
 547 1.25 vs. $M_{\text{high}} = 5.00, SD = 1.22; F(1, 226) = 10.48, p = .001, \eta_p^2 = .04$). However, as expected,
 548 these main effects were qualified by a significant interaction between the typeface factor and
 549 the purchase amount ($F(1, 226) = 4.41, p = .037, \eta_p^2 = .02$). Adding participant gender, age,
 550 and income as covariates did not impact the results. Simple contrasts revealed that in the low
 551 amount condition, the awareness of spending was significantly higher when the purchase
 552 amount was displayed with the angular typeface than with the round one ($M_{\text{round}} = 4.05, SD =$
 553 1.26 vs. $M_{\text{angular}} = 4.92, SD = 1.13; F(1, 226) = 13.25, p < .001, \eta_p^2 = .06$). Meanwhile, in the
 554 high amount condition, the type of price typeface did not influence the awareness of spending
 555 ($M_{\text{round}} = 4.92, SD = 1.25$ vs. $M_{\text{angular}} = 5.10, SD = 1.20; F(1, 226) = 0.70, p = .403, \eta_p^2 = .00$).
 556 Thus, H4 (the moderating role of purchase amount on the typeface effect) was supported.
 557



558 **Fig. 5.** Interaction between the type of price typeface and the purchase amount on the awareness
 559 of spending in Study 3. Note: Error bars indicate standard errors of mean.
 560

561

562 *6.3. Discussion*

563 Study 3 demonstrates that the display typeface effect on the awareness of spending
564 found in Studies 1 and 2 was moderated by the purchase amount. The study results indicated
565 that the angular (vs. round) display typeface significantly increased consumers' awareness of
566 spending when the purchase amount was low (i.e., JPY5,300). However, the typeface effect
567 was not found in the high purchase amount condition (i.e., JPY15,300).

568

569 **7. Study 4**

570 The price typeface effect found in Studies 1-3 was observed in Asian (i.e., Japanese)
571 participants. Study 4 aims to explore whether or not the typeface effect on the awareness of
572 spending could be generalized to consumers from other Western countries. To this end, we
573 conducted a study that is identical to Study 1 but with North American participants instead.

574

575 *7.1. Method*

576 *7.1.1. Participants and Stimuli*

577 One hundred and forty-four North American participants (44 females, $M_{\text{age}} = 34.79$
578 years, $SD = 8.93$) were recruited for a small monetary reward. Six participants (4%) failed an
579 attention check, leaving a final sample of 138 for analysis. We created two versions of the
580 confirmation screen on which USD47.00, approximately equivalent to JPY5,300, were
581 displayed with either the round or angular typeface (see Appendix A).

582

583 *7.1.2. Procedure and measures*

584 At the beginning of the experiment, the participants were asked to imagine a situation
585 in which they bought some groceries online and were about to pay the amount using a mobile
586 app. They were then randomly assigned to either condition (73 in the round condition and 65

587 in the angular condition) and asked to see the displayed amount on the confirmation screen.
588 Subsequently, the participants rated their awareness of spending with the two items ($\alpha = .87$)
589 and answered the manipulation check item used in Studies 1–3. As an attention check, they
590 were required to choose the displayed amount on the screen from amongst four options (1 =
591 USD7.00, 2 = USD17.00, 3 = USD47.00, 4 = USD107.00). At the end of the study, the
592 participants reported their gender, age, and income.

593

594 *7.2. Results and discussion*

595 *7.2.1. Manipulation check*

596 An independent *t*-test indicated that participants in the angular condition perceived the
597 price typeface as more angular than those in the round condition ($M_{\text{round}} = 4.44$, $SD = 1.91$ vs.
598 $M_{\text{angular}} = 5.65$, $SD = 1.53$; $t(134.68) = 4.12$, $p < .001$, Cohen's $d = 0.69$). Thus, the manipulation
599 was successful.

600

601 *7.2.2. Main analysis*

602 An ANOVA was conducted for the awareness of spending. The results indicated that
603 the type of price typeface did not influence the awareness of spending ($M_{\text{round}} = 4.17$, $SD = 1.71$
604 vs. $M_{\text{angular}} = 4.03$, $SD = 1.84$; $F(1, 136) = 0.22$, $p = .643$, $\eta_p^2 = .00$). Including participant
605 gender, age, and income as covariates did not change the pattern of results.

606

607 *7.2.3. Discussion*

608 Study 4 shows that the effect of price typeface on the awareness of spending found in
609 Japanese consumers in Studies 1-3 was not observed in consumers from the U.S.. This
610 difference implies that the consumers differ in terms of their cultural orientation (e.g., such as,

611 for example, independent vs. interdependent), and that this may moderate the typeface effect.
612 We will discuss this issue in the General Discussion.

613

614 **8. Study 5**

615 The purpose of Study 5 is two-fold. The first aim is to re-examine whether or not the
616 price typeface influences the awareness of spending in American participants using a different
617 purchase amount from Study 4. In so doing, we rule out possible boundary conditions set by
618 the prices that may influence the typeface effect, at least, when it comes to the shopping context
619 of interest. The second aim consists of more closely evaluating the relationship between the
620 price typeface and the awareness of spending in North American participants by looking at
621 similarities and differences of the typeface effect in Eastern and Western consumers.

622

623 *8.1. Method*

624 *8.1.1. Participants and Stimuli*

625 One hundred and forty-four American participants (47 females, $M_{\text{age}} = 34.92$ years, SD
626 $= 8.93$) were recruited for a small monetary reward. Twenty-two participants (15%) failed the
627 attention check, leaving a final sample of 122 for analysis. We created two versions of the
628 confirmation screen on which USD53.00 (identical to JPY5,300 in terms of the numbers that
629 consist of purchase amount) was displayed (see Appendix A).

630

631 *8.1.2. Procedure and measures*

632 The procedure was identical to that used in Study 2. The participants were first asked
633 to imagine an online grocery shopping situation where they were about to pay the purchase
634 amount using a mobile app. The participants were then randomly assigned to either typeface
635 condition (64 in the round condition and 58 in the angular condition) and asked to see the

636 displayed amount presented on the confirmation screen. After that, they rated a series of items
637 that were used in Study 2: the perceived harshness ($\alpha = .83$), the experienced pain of payment,
638 the awareness of spending ($\alpha = .82$), and the hesitation to press the “pay” button. They also
639 answered the manipulation question used in Studies 1–4 and, as an attention check, asked to
640 choose the displayed amount on the screen from amongst the following four options (1 =
641 USD13.00, 2 = USD33.00, 3 = USD53.00, 4 = USD103.00). At the end of the study, the
642 participants reported their gender, age, and income.

643

644 *8.2. Results and discussion*

645 *8.2.1. Manipulation check*

646 An independent *t*-test showed that the participants in the angular condition perceived
647 the price typeface as more angular than those in the round condition ($M_{\text{round}} = 4.27$, $SD = 2.03$
648 vs. $M_{\text{angular}} = 5.47$, $SD = 1.44$; $t(113.80) = 3.80$, $p < .001$, $d = 0.68$). Thus, the manipulation
649 was successful.

650

651 *8.2.2. Main analysis*

652 We first conducted an ANOVA for the awareness of spending. The results indicated
653 that, consistent with Study 4, the type of price typeface did not affect the perceived spending
654 ($M_{\text{round}} = 4.53$, $SD = 1.76$ vs. $M_{\text{angular}} = 4.32$, $SD = 1.76$; $F(1, 120) = 0.44$, $p = .507$, $\eta_p^2 = .00$).
655 Including participant gender, age, and income as covariates did not change the pattern of results.

656 To further examine the relationship between the price typeface and the awareness of
657 spending, we conducted a serial mediation analysis (Model 6 of the PROCESS SPSS macro
658 with 5000 bootstrap samples; see Appendix C). The indirect effect of the price typeface on the
659 awareness of spending through the perceived harshness and the experienced pain of the
660 payment was significant at the 95% confidence interval (indirect effect = 0.32, $SE = .15$, 95%

661 CI [0.06, 0.64]). However, the results indicated a negative direct effect of the typeface type on
 662 the awareness of spending (direct effect = -0.24 , $SE = .12$, 95% CI [-0.48 , -0.03]). We discuss
 663 a possible reason for the competitive mediation in the following section. Including participant
 664 gender, age, and income as covariates did not change the results.

665 The results of independent *t*-tests indicated that, as shown in Table 2, the mean score
 666 of the perceived harshness was higher in the angular condition than in round one. Meanwhile,
 667 the mean scores of the experienced pain, the awareness of spending, and the hesitation to press
 668 the “pay” button were not different in the two conditions.

669

670 Table 2. The mean scores of the measurements in the round and angular typeface conditions in
 671 Study 5.

	Round typeface	Angular typeface			
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
Perceived harshness	3.87 (1.80)	4.67 (1.73)	2.52	.013	0.45
Experienced pain of payment	4.34 (2.00)	4.31 (1.93)	0.09	.926	0.02
Awareness of spending	4.53 (1.76)	4.31 (1.76)	0.67	.507	0.12
Hesitation to press "pay" button	4.73 (2.18)	4.60 (1.96)	0.35	.730	0.06

672

673

674 *8.2.3. Discussion*

675 Studies 4 and 5 consistently showed that the price typeface effect on the awareness of
 676 spending, which was found for Japanese participants (Studies 1-3), did not hold for those from
 677 North America. Meanwhile, the mediation analysis with two mediators (perceived harshness
 678 and pain of payment) for North American participants indicated the competitive mediation (see
 679 Appendix C). That is, while the angular (vs. round) typeface indirectly increased the awareness
 680 of spending, the angular (vs. round) typeface directly decreased the awareness of spending.
 681 Although the indirect effect was significant, its effect size (standardized indirect effect = .18)
 682 was more than 4.6 times smaller than that obtained for the Japanese participants in Study 2

683 (standardized indirect effect = .84). The inconsistent mediation suggests that, for North
684 American consumers, the angular (vs. round) price typeface effect is not robust and there might
685 be a different mechanism underpinning the relationship between the shape of price typeface
686 and the awareness of spending.

687 In addition, although the mean score of the perceived harshness for typeface type was
688 higher in the angular (vs. round) condition, the effect size (Cohen's $d = 0.45$) was almost six
689 times smaller than that obtained from Study 2 with Japanese participants (Cohen's $d = 2.63$).
690 The mean differences of the experienced pain and the awareness of spending in both conditions
691 found in Study 2 were not observed in Study 5. Relatedly and importantly, the effect sizes of
692 the perceived shape differences between the two typefaces (i.e., how much did the participants
693 perceive the typefaces as round or angular) in the North American participants (Cohen's d in
694 Study 4 = 0.69, in Study 5 = 0.68) were approximately 5.6 times smaller than those in the
695 Japanese (Cohen's d in Study 1 = 3.50, in Study 2 = 3.93, in Study 3 = 4.11).

696 To summarize, the results of Studies 1-5 collectively suggest that a cultural difference
697 in Western and Eastern consumers may exist regarding their perception of angular and round
698 price typefaces. We think this difference may be closely related to the difference in the price
699 typeface effect on the awareness spending in both cultures.

700

701 9. Study 6

702 The purpose of Study 6 is threefold. The first aim is to test the typeface effect on
703 consumer responses to mobile payment in more realistic purchase settings. The second aim is
704 to test the generalizability of the angular (vs. round) typeface effect by using typefaces that are
705 different from those used in Studies 1-5 and are not slanted. The third aim is to examine the
706 downstream influence of the price typeface effect on the willingness to spend on the next
707 grocery shop.

708

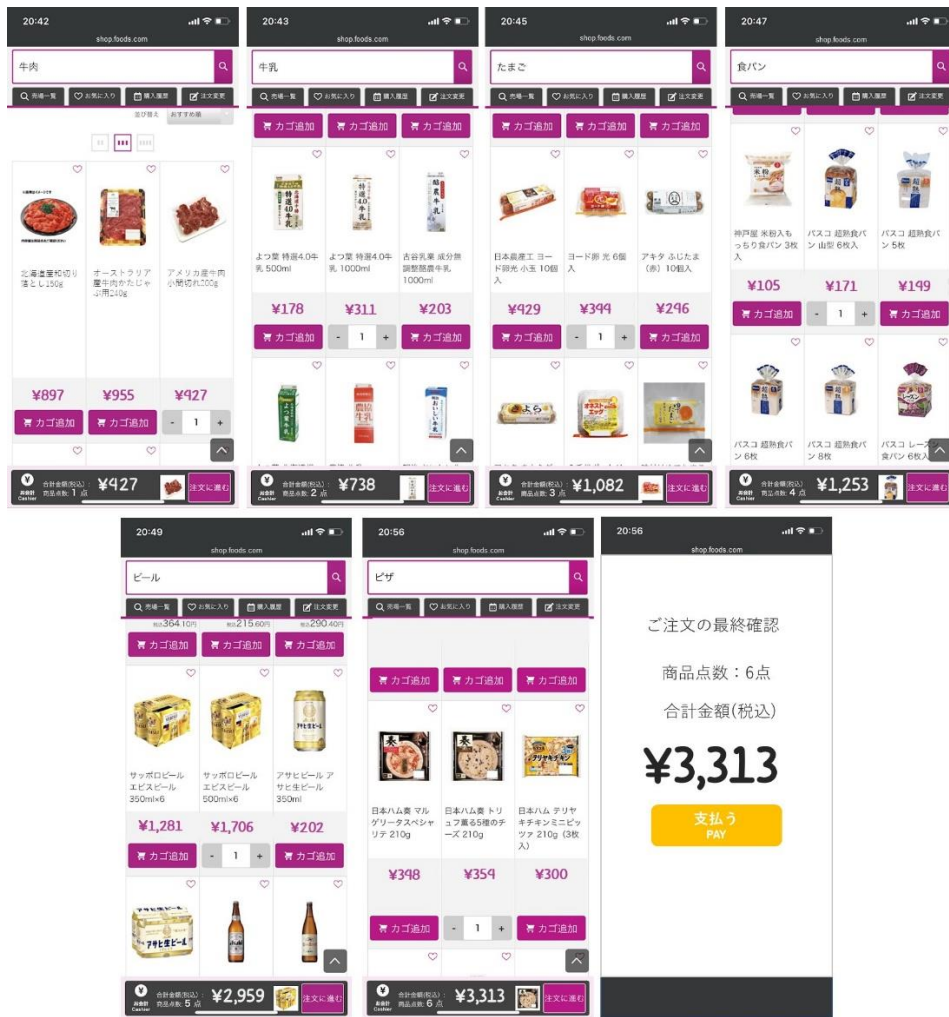
709 *9.1. Method*710 *9.1.1. Participants, pretest, and stimuli*

711 Two hundred and thirty-three Japanese participants (113 females, $M_{\text{age}} = 46.58$ years,
712 $SD = 10.25$) were recruited for Study 6. All participants passed an attention check.

713 In this study, we used “Strawberry Muffins Demo” and “Aldo the Apache” as a round
714 and angular typeface to display the product prices and total price (i.e., JPY3,313), respectively
715 (see Figures 6 and 7). A pretest ($N = 111$, 29 females, $M_{\text{age}} = 47.16$ years, $SD = 9.54$) (with the
716 items used for the pretest in Study 1) for the typeface of the total price with Japanese
717 participants indicated that the perceived roundness/angularity was significantly different
718 between the two typeface conditions ($M_{\text{round}} = 2.08$, $SD = 1.21$ vs. $M_{\text{angular}} = 5.69$, $SD = 1.17$;
719 $t(109) = 16.00$, $p < .001$, Cohen’s $d = 3.04$). Meanwhile, the perceived legibility ($M_{\text{round}} = 5.57$,
720 $SD = 1.50$ vs. $M_{\text{angular}} = 5.26$, $SD = 1.38$; $t(109) = 1.07$, $p = .288$, Cohen’s $d = 0.20$) and size
721 ($M_{\text{round}} = 4.77$, $SD = 1.01$ vs. $M_{\text{angular}} = 4.97$, $SD = 1.09$; $t(108.97) = 0.96$, $p = .990$, Cohen’s d
722 $= 0.18$) did not differ between the two conditions.

723 Using the two typefaces, the images of an actual online grocery shopping app, and
724 actual food products with real retail prices, we created two versions of mobile shopping
725 experience stimuli (see Figures 6 and 7). To avoid any influence of prior knowledge for the
726 app, we deleted all of the brand information from the app images and added fictitious brand
727 information to the stimuli (i.e., shop.foods.com). The shopping experience stimuli consisted of
728 six screenshots of item choices and one order confirmation screen. In the series of shots, six
729 food items (i.e., beef, milk, eggs, bread, beers, chilled pizza) were sequentially added to the
730 shopping cart. The order confirmation screen displayed the total price with either round or
731 angular typeface and a pay button.

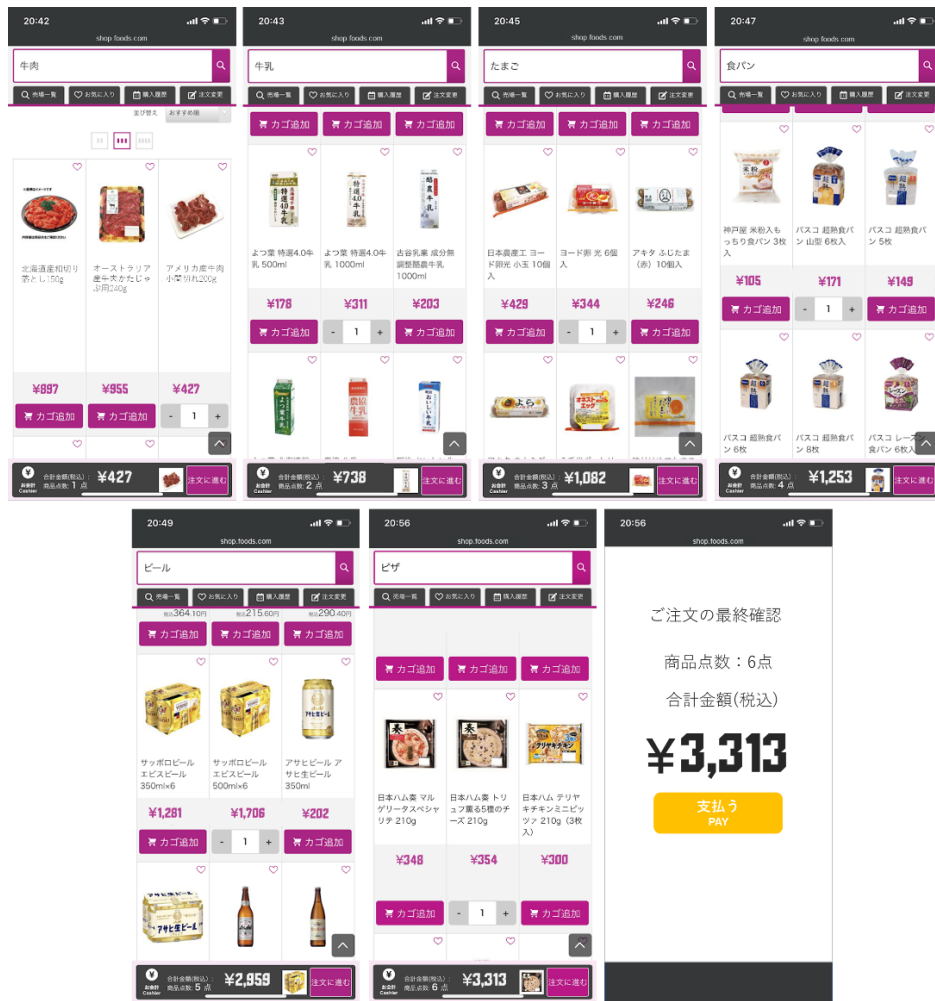
732



733

734

Fig. 6. The round version of the shopping experience stimuli used in Study 6.



735

736

Fig. 7. The angular version of the shopping experience stimuli in Study 6.

737

738 9.1.2. Procedure and measures

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740

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The procedure was similar to that of Studies 2 and 5. At the beginning of the experiment, the participants were instructed to imagine a situation in which they were about to buy some groceries online using a mobile shopping app. Participants were then randomly allocated to either the round (N = 93) or angular (N = 101) typeface condition. In each condition, the participants were asked to view the series of screenshots carefully and informed that they chose six items shown in the shots and added them to the shopping cart. Subsequently, they were asked to view the confirmation screen carefully and informed that the following order confirmation page was displayed when they pressed the “Proceed to Confirm” button. After

747 the instructions stated above, the participants were asked to rate a series of items that were used
748 in Studies 2 and 5: the perceived harshness ($\alpha = .74$), the experienced pain of payment, the
749 awareness of spending ($\alpha = .91$), and their hesitation when it came to pressing the “pay” button.
750 In addition, although we did not propose a hypothesis, we were interested in whether the
751 typeface in which the price was presented would influence the willingness to spend in the next
752 grocery shopping. To this end, referring to Manshad and Brannon (2021), we asked the
753 participants to indicate how much money they would be willing to spend (from JPY0 to
754 JPY10,000) on their next grocery shop using the same app. As the manipulation check, they
755 answered the perceived shape of typeface with an item used in Studies 1-5. As an attention
756 check, they were asked to choose the displayed amount on the screen among four options (1 =
757 JPY1,313, 2 = JPY3,313, 3 = JPY5,313, 4 = JPY7,313). At the end of the study, the participants
758 reported their gender, age, and income.

759

760 9.2. Results and discussion

761 9.2.1. Manipulation check

762 An independent *t*-test revealed that the participants in the angular condition perceived
763 the typeface in which the price was presented as more angular than those in the round condition
764 ($M_{\text{round}} = 1.84, SD = 0.97$ vs. $M_{\text{angular}} = 5.93, SD = 1.26$; $t(186.33) = 25.47, p < .001, d = 3.62$).
765 Thus, the manipulation of typeface shape was successful.

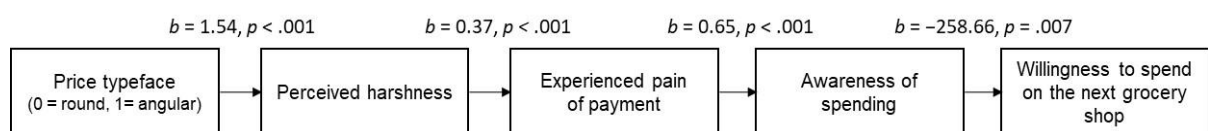
766 9.2.2. Main analysis

767 We first conducted an ANOVA for the awareness of spending. The results replicated
768 those of Studies 1-3 and revealed that the angular (vs. round) price typeface increased the
769 perceived spending ($M_{\text{round}} = 3.44, SD = 1.49$ vs. $M_{\text{angular}} = 4.00, SD = 1.35$; $F(1, 231) = 9.14$,
770 $p = .003, \eta_p^2 = .04$). Thus, H1 (price typeface \rightarrow awareness of spending) was again supported.
771 Including participant gender, age, and income as covariates did not change the results.

772 We then conducted a serial mediation analysis (Model 6 of the PROCESS SPSS macro
 773 with 5000 bootstrap samples) for the price typeface effect on the hesitation to press “pay”
 774 button with three mediators (i.e., perceived harshness, experienced pain of payment, awareness
 775 of spending). The results replicated the significant indirect effect found in Study 2 (indirect
 776 effect = 0.17, SE = 0.05, 95% CI [0.09, 0.27]). Thus, H2 (price typeface → perceived harshness
 777 → experienced pain of payment → awareness of spending) and H3 (awareness of spending →
 778 hesitation to press “pay” button) was again supported.

779 Subsequently, another serial mediation analysis (Model 6 of the PROCESS SPSS
 780 macro with 5000 bootstrap samples) was conducted for the price typeface effect on the
 781 willingness to spend on the next grocery shopping with three mediators (i.e., perceived
 782 harshness, experienced pain of payment, and awareness of spending). The results indicated a
 783 significant indirect effect and revealed that the angular (vs. round) typeface indeed decreased
 784 the willingness to spend on the next grocery shop through the perceived harshness, experienced
 785 pain of payment, and awareness of spending (see Figure 8). Including participant gender, age,
 786 and income as covariates did not change the results.

787



788

789 Fig. 8. The results of the serial mediation analysis in Study 6.

790

791 Finally, we conducted independent *t*-tests to compare the mean scores of the
 792 measurements in both conditions. The results indicated that all mean scores were significantly
 793 higher in the angular typeface condition than in the round typeface condition (see Table 3). As
 794 shown in Figure 9, the willingness to spend in the next grocery shopping was significantly
 795 lower in the angular (vs. round) price typeface condition.

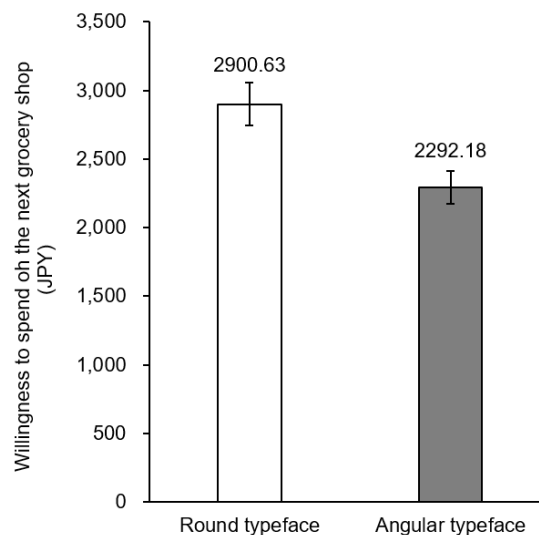
796

797 Table 3. The mean scores of the measurements in the round and angular display typeface
798 conditions in Study 6.

	Round typeface	Angular typeface	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)			
Perceived harshness	2.46 (1.07)	5.53 (1.10)	19.69	<.001	2.83
Experienced pain of payment	2.82 (1.44)	4.33 (1.35)	7.53	<.001	1.08
Awareness of spending	3.51 (1.46)	4.28 (1.22)	3.99	<.001	0.58
Hesitation to press "pay" button	3.28 (1.56)	4.20 (1.48)	4.21	<.001	0.61
Willingness to spend in the next grocery shopping	2900.63 (1480.06)	2292.18 (1185.66)	3.17	.002	0.46

799

800



801

802 Fig. 8. Willingness to spend on the next grocery shop using the same mobile app in the round
803 and angular typeface conditions (Study 6). Note: Error bars indicate standard errors of mean.

804

805 *9.2.3. Discussion*

806 By using round and angular typefaces that were different from those used in Studies
807 1-5 and stimuli that more closely matched a realistic shopping experience, Study 6 replicated
808 the price typeface effect on the awareness spending found in Studies 1-3. In addition, the results
809 also replicated the downstream effect of the awareness of spending induced by price typeface
810 on the hesitation to press the “pay” button found in Study 2. What is more, and importantly,

811 the results also revealed the downstream effect of the typeface in which the price was presented
 812 on the willingness to spend in the next grocery shop. The results of Study 6 therefore support
 813 the robustness of the price typeface effect on the awareness of mobile spending for Japanese
 814 consumers.

815 Table 4. Summary of the hypotheses and results of all the experiments.

Hypotheses and research question	Studies	Results
H1: Angular (vs. round) price typeface will increase the awareness of spending.	Studies 1–3, 5, and 6	Supported
H2: Angular (vs. round) price typeface will increase the awareness of spending through perceived harshness and the pain of payment.	Study 2 and 6	Supported
H3: The awareness of spending will positively influence an increase in hesitation to press the “pay” button.	Study 2 and 6	Supported
H4: The purchase amount will negatively moderate the typeface effect on the awareness of spending.	Study 3	Supported
RQ1: Do cultural differences (i.e., Eastern vs. Western) affect the price typeface effect on the awareness of spending?	Studies 1–6	The typeface effect was stronger and more robust for Japanese participants than North American participants.

816

817

818 **10. General discussion**

819 Across six studies, the present research finds evidence that the purchase amount
 820 displayed with an angular (vs. round) typeface can increase the awareness of spending in the
 821 context of mobile payment via the perceived harshness of the typeface in which the price is
 822 presented and the experienced pain associated with payment (Studies 1-3, 5, and 6). We also
 823 show that the angular (vs. round) price typeface has a downstream effect on the intention to
 824 pay, indicating the amount displayed in the angular (vs. round) typeface increases the hesitation
 825 to press the “pay” button (Studies 2 and 6). The research outlined here also demonstrates that
 826 the price typeface effect on the awareness of spending is moderated by the purchase amount,
 827 showing that the typeface effect is found when the purchase amount is relatively low but not
 828 when it is considered high (Study 3). We further show that the robust typeface effect found in
 829 Studies 1-3 with Japanese consumers is not observed for North American consumers (Studies
 830 4 and 5). Finally, we replicate the price typeface effect on awareness of spending found in

831 Studies 1-3 with different typefaces in a more close-to real mobile shopping context and
832 demonstrate the price typeface indeed impacts the willingness to spend on the next grocery
833 shop (Study 6).

834

835 *9.1. Theoretical implications*

836 The present research makes three distinct theoretical contributions to the literature.
837 First, our research contributes to the scarce literature on addressing the profligacy issues
838 associated with mobile payment and broadly cashless payments. A number of studies have
839 identified that consumers tend to spend more when they pay with cashless methods than with
840 cash since cashless payments are less transparent and thus entail less pain of payment and less
841 awareness of spending (e.g., Raghubir & Srivastava, 2008; Soman, 2003). Relatedly, and
842 importantly, a growing body of research points out the negative consequences of cashless
843 payments such as encouraging lavish spending (e.g., Erasmus & Lebani, 2008), unhealthy
844 consumption (e.g., Park et al., 2021), and even resulting in personal bankruptcy for some
845 individuals (e.g., Awanis & Cui, 2014). Regardless of these findings, little effort has been
846 devoted to the question of how to deal with and mitigate the profligacy issues around cashless
847 payments.

848 As far as the authors are aware, the only study to have explored the profligacy issue
849 was reported by Manshad and Brannon (2021). Their results suggest that low-intensity (vs. no)
850 vibration feedback can increase the awareness of spending and therefore reduce the willingness
851 to spend in the context of mobile payment. However, the latter researchers did not provide
852 evidence of why the haptic input could affect the awareness of spending. While Manshad and
853 Brannon (2021) focus on the haptic input, the present study highlights the importance of visual
854 design and demonstrates that angular (vs. round) price typeface can contribute to intensifying
855 the awareness of spending and subsequently decrease the intention to pay (i.e., press “pay”

856 button). Our research also demonstrates the underlying mechanism of the typeface effect that
857 an angular (vs. round) price typeface increases the awareness of spending via an increase in
858 perceived harshness for the typeface and the experienced pain of payment. We further elucidate
859 the boundary condition of the typeface effect, indicating that its impact on the awareness of
860 spending works when the purchase amount is relatively small (vs. high). These findings
861 therefore provide valuable insight concerning how to deal with the possible profligacy issues
862 in mobile spending and cashless payments by providing a unique visual approach to manage
863 the issue.

864 Second, the present research adds to our understanding of consumer shape perception
865 and preference. Psychological studies have consistently shown that people prefer curvature
866 shapes to angular shapes (e.g., Bar & Neta, 2006; Blazhenkova & Kumar, 2018; Liu &
867 Kennedy, 1997). The preference for curvature is also found in the consumer evaluation of
868 product design (e.g., Leder & Carbon, 2005), packaging design (e.g., Westerman et al., 2012),
869 and typeface design (e.g., Wang et al., 2020). While a series of studies suggest that the
870 curvature preference seems universal across different cultures (e.g., Fantz & Miranda, 1975;
871 Gómez-Puerto et al., 2018), another series of studies has shown that shape preference can also
872 be influenced by culture (e.g., Tzeng et al., 1990; Zhang et al., 2006). According to Zhang et
873 al. (2006), individuals in individualistic countries (e.g., United States, United Kingdom)
874 perceive angular shapes as somewhat more attractive and rounded shapes as less attractive, and
875 vice versa for those living in collectivistic countries (e.g., Japan, South Korea). The results of
876 our study support the latter view. Although the participants in both countries perceived the
877 angular (vs. round) typeface as harsher than the round one, the effect size of harshness
878 perception for the angular (vs. round) typeface was almost six times greater in the Japanese
879 participants (Study 2) than in the American participants (Study 5). In addition, and interestingly,
880 while both groups of participants in our studies perceived the angular (vs. round) typeface as

881 more angular, the effect size of perceived angularity for the angular type was about 5.6 times
882 greater amongst the Japanese participants (Studies 1-3) than in the North American participants
883 (Studies 4-5). These results indicate that the Japanese participants perceived the angular (vs.
884 round) typeface as sharper and harsher than did the North Americans who took part in our
885 studies. These findings may provide additional support for the cultural difference in shape
886 perception and emphasize the need for further research examining the cultural influence on the
887 effect of shape design over consumers' product/brand evaluations.

888 Third, our findings also contribute to the scarce literature on the effect of sensory
889 elements of price format on price perception. Although some studies have revealed that visual
890 features such as price color (e.g., Puccinelli et al., 2013; Ye et al., 2020), price font size (e.g.,
891 Coulter & Coulter, 2005), and price font clarity (Mead & Hardesty, 2018) may affect the
892 consumer's response to price, the literature in this field is still largely limited. Our study
893 provides new insight into the literature on pricing and price format by demonstrating that price
894 typeface has a significant effect on consumers' price perception.

895

896 *9.2. Practical implications*

897 The findings of our research offer clear implications for mobile spending and broadly
898 for online spending. Our study demonstrates that angular (vs. round) price typeface elicits a
899 stronger awareness of spending and thus may contribute to regulating people's mobile spending
900 behavior. Mobile shopping apps and other online shopping platforms for computers and tablets
901 have very similar systems and procedures for payment. For example, purchased items and their
902 prices are displayed on the screen, and users are required to confirm and pay for the total
903 purchase amount on the screen. Therefore, we believe that the price typeface strategy ought to
904 be broadly applicable to various online shopping systems. For example, retailers or mobile
905 service providers may provide their customers with a payment application or system that is

906 equipped with price typeface display options (e.g., default or angular). By so doing, customers
907 who hope to regulate their spending can choose “angular typeface mode” in mobile or other
908 online payment, and this may help and encourage sound spending amongst consumers.
909 Meanwhile, our research results also suggest that the typeface effect on the awareness of
910 spending may be more prominent in collectivist countries than individualistic countries.
911 Therefore, our research offers valuable insights for retailers and mobile/online service
912 providers interested in implementing the typeface function in their payment systems by
913 highlighting the possible cultural influence on the typeface effect on consumer awareness of
914 spending. According to our findings, retailers and online service providers who operate in
915 Eastern rather than Western countries should expect to see more prominent price typeface
916 effects amongst their customers.

917

918 *9.3. Limitations and future research*

919 Our study has some limitations that we hope to address in future research. The first
920 limitation is about the ecological validity of our findings. Our research found a robust effect of
921 price typeface on the awareness of mobile spending. However, the research findings were
922 obtained from hypothetical scenario experiments. Therefore, future studies should examine
923 whether the price typeface effect on the awareness of spending occurs in the actual mobile
924 payment context. A purchase experiment in a more natural setting will be an option to test those
925 effects. For example, future research could conduct a shopping experiment whereby the
926 participants purchase a certain number of target products using either a round or angular
927 typeface version of a mobile payment app.

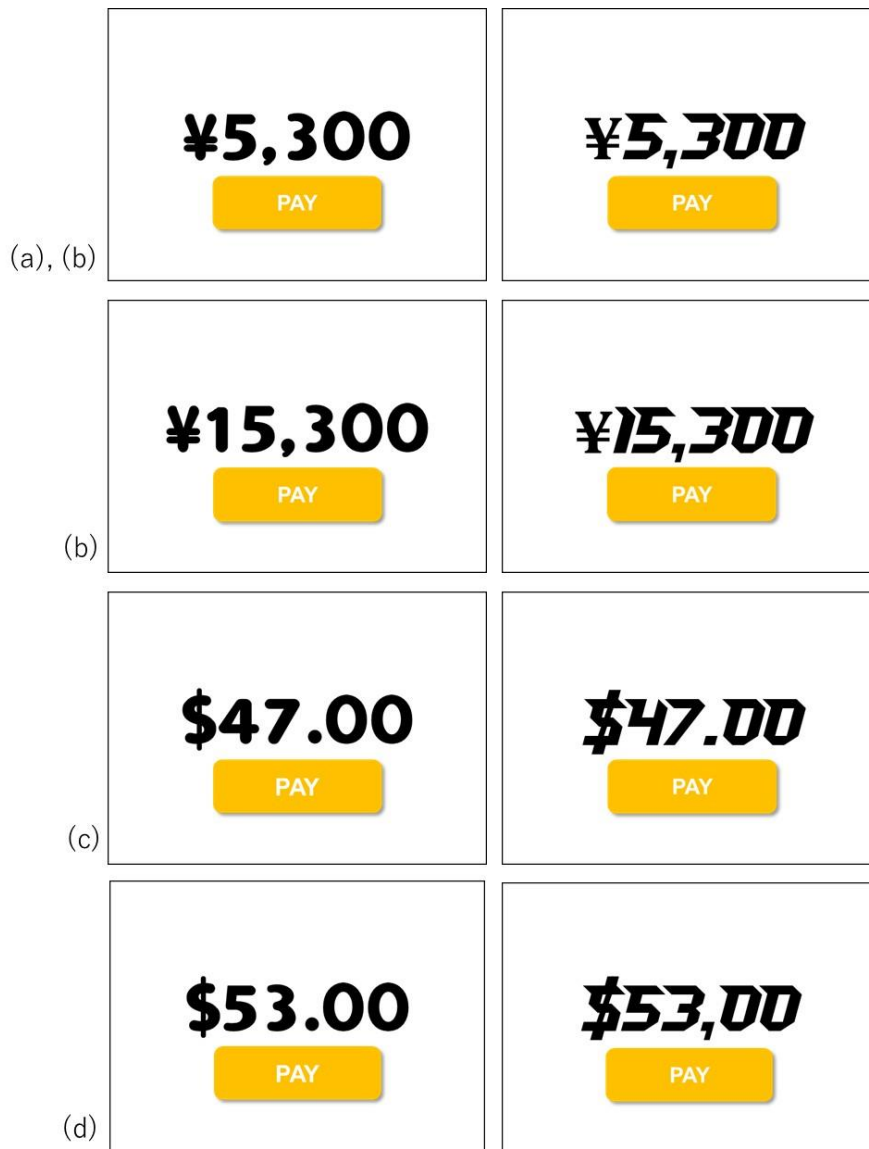
928 Second, although we demonstrate that culture may moderate the typeface effect on the
929 awareness of spending, we did not directly test what cultural factor and mechanism might
930 explain the difference in the typeface effect between Japanese and North American participants.

931 Our expectation is that the angular typeface effect on the awareness of spending will be less
932 prominent for Western consumers than for Eastern consumers. At this point, we speculate that
933 this difference might occur because of cultural differences in consumer's self-construal or/and
934 processing style. From the point of view of self-construal, the angular typeface effect in
935 Western (vs. Eastern) consumers is expected to be weaker since independent (interdependent)
936 self-construal is associated with conflict confrontation (avoidance) and therefore individuals
937 with independent (vs. interdependent) self-construal perceive angular shapes as more attractive
938 and less harsh (Zhang et al., 2006). Meanwhile, from the perspective of processing style, the
939 typeface effect itself may be weaker for Western (vs. Eastern) consumers. This might be
940 because, while Eastern individuals tend to process information holistically, Western
941 individuals tend to pay more attention to focal information, less attention to contextual
942 information, and process information analytically (e.g., Masuda & Nisbett, 2001). In this
943 respect, Western (vs. Eastern) consumers may be more susceptible to the purchase amount
944 itself and less susceptible to price typeface when they are aware of how much is spent in the
945 situation of mobile payment. Cultural priming methods (e.g., Torelli, 2006; Zhang et al., 2006)
946 would be useful for further investigating these possible cultural influences on the typeface
947 effect. For instance, if priming North American (Japanese) participants' self-concept as
948 interdependent (independent) or holistic (analytic) results in a significant (null) typeface effect
949 on awareness of spending, we can assure that culture moderates the price typeface effect.
950 Meanwhile, although we expect that culture is a significant moderator for the typeface effect
951 in both countries, this does not rule out other possible moderators (e.g., differences in the usage
952 rate and familiarity of mobile payment in both countries). Thus, future research could examine
953 those unexamined factors to understand more nuanced aspects of typeface effect on consumer
954 awareness of mobile spending.

955 Third, while our study focuses on the effect of typeface shape (i.e., round vs. angular)
956 on the awareness of spending, it would be intriguing and important to explore possible
957 interactions with other visual elements (e.g., color and size) and other sensory inputs (e.g.,
958 sounds). For example, given findings that colors of prices (e.g., Puccinelli et al., 2013; Ye et
959 al., 2020) and the size of the font in which the price is presented (e.g., Coulter & Coulter, 2005)
960 affect consumer's price perception, price typefaces may interact with price colors (e.g., red vs.
961 black) or the size of price fonts (i.e., small vs. large) on consumers' awareness of spending. In
962 addition, given that angular typeface matches with high pitched sound on inducing harshness
963 perception (e.g., Velasco et al., 2014), an angular price typeface combined with high-pitched
964 beep sound may induce a strong awareness of spending in mobile payment. We hope that our
965 research stimulates future work on this topic.
966

967 Appendix A. The stimuli of payment confirmation screen used in Studies 2-5.

968 Note: (a): Study 2, (b): Study 3, (c): Study 4, (d): Study 5.

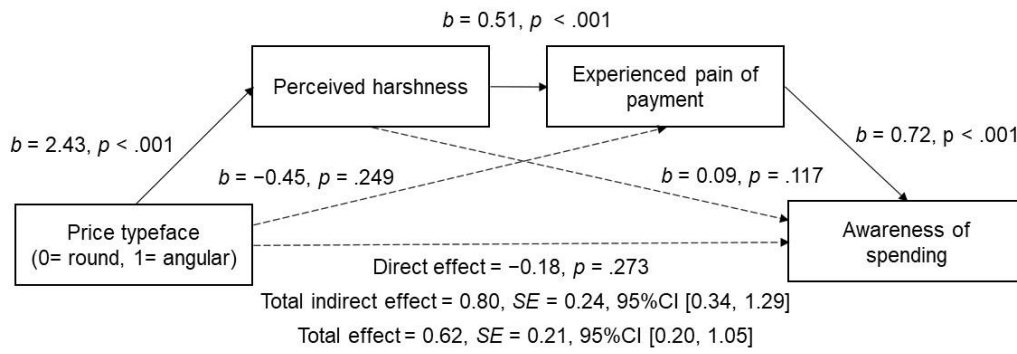


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970

971 Appendix B. The results of the serial mediation analysis (two mediators) for Japanese

972 participants in Study 2.

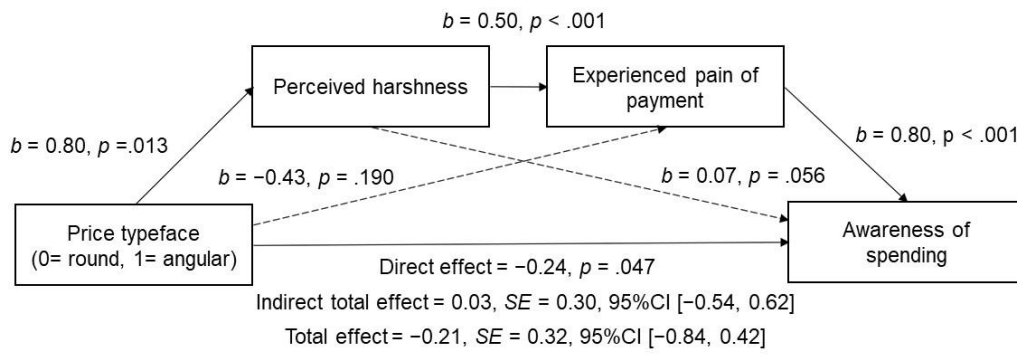


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974

975 Appendix C. The results of the serial mediation analysis (two mediators) for the North

976 American participants in Study 5.



977

978

979

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