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The Perception of Qualities in Typefaces: *A Data Review*

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Abstract

The selection of an appropriate typeface is fundamental in numerous contexts. For example, a typeface that communicates the correct qualities increases the probability of buying a product, perceiving a brand as trustworthy, increasing the time spent exploring a website, and communicating a message effectively (Huang & Liu, 2020; Johnson-Sheehan, 2014; Velasco, 2019). However, professionals report struggling to find the most appropriate typeface for their project and, as a result, spending a considerable amount of time on the search (Wu et al., 2019). This is in part due to the lack of information regarding which qualities each typeface communicates (Wu et al., 2019). In fact, the data that exist on the subject are scattered across several research articles. Consequently, professionals have few tools to help them choose the appropriate typeface based on scientific data, and instead must often rely on personal experience (O'Donovan et al., 2014). The current review aims to provide professionals with scientific support for choosing an appropriate typeface by collecting these scattered data in a single place. We describe the findings of 34 studies that asked participants to rate the perception of 229 qualities in 635 typefaces, and we created a unified dataset where data are easily comparable across multiple studies. We believe this work will make the messages created by professionals in the design, marketing and communication industries more effective.

Keywords

Typefaces
Perception
Communication
Semantic qualities
Affective review

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The Communication of Qualities

Professionals in multiple sectors are required to convey qualities to the user in indirect ways. For example, when choosing a product among multiple options, customers are highly influenced by visual identity and packaging (Favier et al., 2019; Steenis et al., 2017; Velasco, 2019). The final choice is more likely to fall on the product that shows the qualities that the customer is looking for (Barajas & Agard, 2011). It is therefore no surprise that designers strive to enhance the perception of key qualities during product design to gain a competitive edge.

Similarly, companies strive to create a unique and distinctive brand image that resonates with its target customers (Kohli & Suri, 2002; Melewar & Saunders, 1998). Anything related to a brand, from the logo to the staff uniform, should communicate the values and qualities promoted by the company (Bettels & Wiedmann, 2019; Henderson & Cote, 1998; Klink, 2001). As a result, customers have a clear impression of the company, which increases brand loyalty and the disposition to pay more for the product (Bairrada et al., 2018; Nandan, 2005).

Conveying values and qualities is also important for technical communicators, who create informative documents that describe ideas and concepts in an accessible format (Johnson-Sheehan, 2014). For these professionals, clarity is paramount, as evidenced by frequent use of infographics to improve the document's understanding (Bursi-Amba et al., 2016). However, technical communicators may also want to convey qualities such as urgency, particularly when writing documents aimed to persuade the reader of a proposal (Johnson-Sheehan, 2014). Furthermore, they may want to communicate qualities that are appreciated by the target reader; for example, in the 1890s, leaflets about bicycles and how to use them were created specifically for women because they developed an unexpected interest in bicycles (Hallenbeck, 2012).

In modern times, web designers are also expected to create websites that convey key qualities upon first glance (Akrimi & Khemakhem, 2014; Lal & Katole, 2021; Leech, 2016). Most websites need to communicate a sense of credibility in order to prevent users to look for another website with similar content that appears more reliable (Koiso-Kanttila, 2005). This is particularly true for online stores, where the user needs reassurance that the website is authentic and the purchased product will be delivered (Ha & Lennon, 2011). Furthermore, the website created by the graphic designer should communicate the company's personality (Poddar et al., 2009). These are only a few examples of professionals who need to communicate qualities; many more exist.

Considering that most visual identities, packaging, products, logotypes, informative documents, and websites include text, the selection or design of an appropriate typeface is one important aspect to consider when communicating a quality (McCarthy & Mothersbaugh, 2002; Velasco, 2019). In fact, typefaces themselves have qualities (Strizver, 2013), and should be in line with the qualities that the professional wants to communicate.

Semantic Qualities in Typefaces

Bartram (1982) divided typeface qualities into two categories: functional and semantic. Functional qualities are those that directly affect the text legibility, such as size and boldness. Numerous studies have been conducted to test the effect of the real or perceived size of the typeface on legibility (see Perondi, 2021; Tarasov et al., 2015 for review). Most importantly for this paper, semantic qualities are those that elicit associations to past knowledge, as well as emotional responses from the viewer. For example, viewers can perceive typefaces being masculine (e.g., Impact; Shaikh, 2007), cheap (e.g., Courier New; Shaikh, 2007) or fearful (e.g., Playbill; Li & Suen, 2010).

In the current manuscript, we use "semantic qualities" as an umbrella term that includes the numerous terms used in previous research that investigated nonphysical qualities of typefaces, such as tones (Evans et al., 2004), personas (Puškarević et al., 2013), emotions (Ho, 2013), and personalities (MacKiewicz, 2004). In fact, although these terms indicate different concepts, they all refer to the associative and emotional responses of the viewer to the typeface, the very definition of Bartram's "semantic qualities". With "semantic qualities", we therefore refer to anything that typefaces can communicate, from "elegance", to "happiness", to "distinctness".

It is important to specify that, as a consequence, the term "semantic" is here used differently as compared to previous articles, where "semantic" referred to associations with the individual's past experience (Sinico, 2015, 2019). From Bartram (1982), the current manuscript also adopts the term "perception" to indicate participants' ability to notice impressions, feelings, moods, and personalities (i.e., semantic qualities) communicated by typefaces. This is also in line with previous literature on the topic (e.g., Brumberger, 2003a, 2003b; Doyle & Bottomley, 2006, 2010; Gump, 2001; Li & Suen, 2010; Louch, 2011).

Numerous authors have stated that typefaces have an impact on the reader that goes beyond legibility and readability (Garfield, 2010; Strizver, 2013). Warde (1956) provided a vivid description of the phenomenon, and stated that reading the same text written with three typefaces is like *"hear[ing] three different people delivering the same discourse – [...] each through the medium of a different personality"* (p. 138; see also Bringhurst, 1996; Craig & Bevington, 1999; Earls, 2002).

Critically, evidence exists to argue that the

semantic qualities of the typeface should be congruent with those of the associated product in order to have the best impact on the customer (Bringhurst, 1996; Garfield, 2010; Velasco, 2019). A rugged typeface, such as Impact, may be considered appropriate for the packaging of a box of screws, but inappropriate for a ball of silk. By contrast, the appropriateness of Ballet may be reversed. Selecting the proper typeface increases the perception of the product's quality (Childers & Jass, 2002) and likelihood of purchase (Doyle & Bottomley, 2004, 2006). It is therefore in the designers' best interest to select the right typeface for the right product and its packaging.

In reading contexts, selecting an appropriate typeface increases the readers' processing speed, as well as their positive emotional response. This has been demonstrated in studies showing that people judge words faster when the qualities communicated by the typeface are in line with the words' meaning (Hazlett et al., 2013). An appropriate typeface also reduces the activation of the corrugator muscle during reading (Larson et al., 2007), which is indicative of a positive emotional response (Cacioppo et al., 1992). Furthermore, there is also evidence that an appropriate typeface has a lasting effect on the viewer, as demonstrated by improved performance on a creative cognitive task after exposure to the typeface (Larson et al., 2007). Therefore, to generate a fluid and positive experience for the reader, professionals working with a significant amount of content (e.g., technical communicators and web designers) should make a conscientious and informed decision about typeface.

Although there is general agreement about the importance of the typeface choice, limited scientific research exists that investigates which typefaces are most suited to communicate specific qualities. Furthermore, professionals who might be interested in using this evidence but do not have a research background may have difficulty extrapolating the information they are looking for due to the technical language and complex analysis used in previous research. Finally, although there are PhD theses summarizing the overall findings of previous research, the *data* obtained by different researchers are still scattered in multiple articles, adding to the difficulty of gaining a clear overall picture.

Altogether, these issues lead (at least) some professionals to select a typeface based on their feelings, beliefs, and personal experience rather than on scientific evidence (Wu et al., 2019), which is unlikely to result in the best possible choice considering the number of typefaces available for free or for a small fee. By contrast, selecting a typeface based on scientific evidence would increase the accuracy of the typeface selection because it would be based on judgments made by multiple people, who are likely to represent the final users, instead of a single or few professionals. Scientific evidence would help professionals, particularly when they need to communicate qualities that they have never communicated before, by minimizing the risk of being influenced by personal biases. Furthermore, scientific data would provide independent support that professionals could use to justify their typeface choice to the client.

The Current Review

The aim of the current paper is to address these issues and help professionals by reviewing the studies conducted to date that tested the perception of semantic qualities in typefaces using a subject sample. The review was linked to an Open Science Framework project, where we included the following: 1) The details of the studies that investigated the perception of qualities of typefaces (see the "Studies Selection" section for inclusion criteria); 2) the list of all semantic qualities and typefaces investigated to date with reference to the original article; 3) the original ratings of participants; and 4) a unified dataset where participants' ratings were included in a comparable format (see the "Unified Dataset" section).

Studies Selection

We sought journal articles, PhD theses, and books reporting studies where participants were asked to explicitly judge their perceptions of atmospheres, tones, qualities, personalities, personas, impressions, emotions, etc. in typefaces using the Latin alphabet. Manuscripts from all disciplines (e.g., vision science, psychology, etc.) were included in the search because the aim of the review was to be as comprehensive as possible, and to compare and discuss the *data* of the original articles rather than their *outcomes*, which were framed within the discipline of the original manuscript. In fact, the data could be transferred from one discipline to others – which could not be done with the outcomes. Focus on the data therefore allowed the present review to be useful to professionals from multiple sectors, such as marketing, communication, design, and more.

We excluded studies that exclusively asked participants how appropriate a group of typefaces was for text related to professions (e.g., bakers; Brinton, 1961) because the data cannot be generalized as much as the semantic qualities, which can be used in a variety of contexts. We also excluded studies where the typeface was one of multiple features investigated in the product (e.g., shape, color, etc) because it was impossible to extrapolate the judgments related only to the typefaces. For example, Orth and Malkewitz (2008) presented wine bottles with different shapes, labels, logos, colors and typefaces, and it was not possible to retrieve the mean ratings based on typefaces only. Finally, those typefaces that

were developed specifically for a study (e.g., modified Bodoni Poster Italic in Velasco et al., 2018) were not included in the review and the unified dataset, because such typefaces are not relevant to professionals who do not have access to them.

In total, we found 34 studies in 30 manuscripts that met the criteria. If data were not included in the original manuscript, we contacted the author(s) and asked them to share the data with us for the present review. A list of the studies and their details appears in Table 1, which reports the country of testing, the method, the sample size, age and sex, and the number of typefaces and qualities. An index code created with the authors' initials was assigned to each study for easy reference in other tables. Table 1 also indicates whether participants' ratings were reported in the original article, provided by the authors after request (see Acknowledgments), or impossible to retrieve. Finally, Table 1 shows whether the data was included in the unified dataset. The OSF project includes an expanded version of Table 1 with the list of typefaces and semantic qualities investigated in each study.

Studies Details

Most of the studies listed in Table 1 presented the full alphabet in uppercase and lowercase, sometimes together with numbers and symbols (e.g., Nedeljković et al., 2017; Rowe, 1982; Shaikh et al., 2006). However, a group of authors preferred to present meaningful text to participants – such as "The quick brown fox jumps over the lazy dog," a sentence that includes every letter in the alphabet (e.g., Brumberger, 2003b; Choi et al., 2016; Gump, 2001), emails (Louch, 2011), and text passages (Brumberger, 2003a). Finally, some researchers presented text with real words but no meaning, such as "over there. Again we might have expected zero. Just in" (Amare & Manning, 2012), or text with non-words, e.g., "NRESTA" (Tantillo et al., 1995).

Almost all the studies asked participants to evaluate the perception of semantic qualities communicated by the typeface itself. A few studies, however, asked participants to evaluate the stimulus associated with the typeface. For example, Velasco et al. (2018) conducted a series of studies asking participants to rate the sweetness and sourness of a jelly bean while they viewed "Eat me" written in different typefaces.

The studies also used a variety of methods to record participants' judgment. As indicated in Table 1, most studies presented one typeface at the time to participants, who were asked to rate how much they perceived each semantic quality in the typeface using a Likert scale. However, other studies asked participants to select the single (Choi et al., 2016; Davis & Smith, 1933) or the three (Amare & Manning, 2012)

semantic qualities that best fit with each typeface. Meanwhile, Poffenberger and Franken (1923) and Schiller (1935) asked participants to order the typefaces from most to least appropriate related to how well they conveyed each quality.

Furthermore, among those studies that used a Likert scale, most presented a single term to participants to indicate the semantic quality they had to judge (e.g., delicate; Davis & Smith, 1933). However, some studies preferred to use pairs of opposite terms, adopting Osgood and colleagues' (1957) semantic differential scales, to provide participants with a clearer reference to the concept expressed by the quality of interest (e.g., bold – delicate; Bartram, 1982). To be even clearer, a few studies provided participants with multiple words to indicate the semantic quality (e.g., soft, delicate, tender, weak, gentle – strong, hard, rugged, potent, tough; Doyle & Bottomley, 2006, 2010). Authors justified this decision by claiming that those terms were highly related in previous studies. The downside of presenting multiple terms, however, is that it is unlikely that other studies would use the exact same terms, making the findings of the study not comparable to those of others.

The use of single or multiple descriptors is a complex issue when using the Likert scale (Shaikh, 2007). A single word may be vague and each person may associate it with a different concept, which may not be the researchers' concept of interest. The use of bipolar terms, however, creates other issues because those terms may not be opposite qualities necessarily. For example, "feminine" and "masculine" have been often placed at the extremities of the scale, but a typeface can be viewed as both masculine and feminine. Nevertheless, participants cannot indicate that the typeface can communicate both qualities and they are forced to choose one.

The Unified Dataset

To make the results of previous studies as comparable as possible, we collected the data in a unified dataset, where participants' mean ratings of typeface according to each semantic quality were reported. Eleven studies did not report participants› ratings and it was not possible to contact the authors, or the data were lost at the time of this publication. Therefore, data from these studies could not be included in the unified dataset. Data from 11 more studies were also excluded because it was not comparable to other studies. In fact, it was not possible to include studies that asked participants to order the typefaces based on a quality, as the order produced could not be compared to other findings. We also excluded studies that asked participants to rate the semantic quality of stimuli associated with typefaces

Table 1.

List of studies included in the review with details.

Index	*Article (study)*	*Country*	*Sample size*	*Age*	*Males / Females*	*Text presented (format)*	*Object of evaluation*	*Method*	*N. of typefaces*	*N. of qualities*	*Data*	*Included in unified dataset*
AM	Amare & Manning, 2012	USA (online)	102	Range: 19-55	Not indicated	Brief text (digital)	Typeface	Choose the 3 qualities that best describe each typeface	36	12	Provided by the authors	No
Ba	Bartram, 1982	UK	90	Range: 18-20	46/45	Alphabet (paper)	Typeface	Likert scale 1 - 7	12	18 pairs	Irretrievable	No
Bra	Brumberger, 2003a (study 2)	USA	72	Not indicated	36/36	Text passages (paper)	Text content	Likert scale 1 - 7	3	20	Irretrievable	No
Brb	Brumberger, 2003b (study 1)	USA	80	Not indicated	40/40	Alphabet + brief text (paper)	Typeface	Likert scale 1 - 7	15	20	Irretrievable	No
CYA	Choi, Yamasaki, & Aizawa, 2016	USA (online)	72	Not indicated	Not indicated	Brief text (digital)	Typeface	Likert scale 1-9 for two qualities; Choose the quality that fits with the typeface	100	2 pairs + 6	Provided by the authors	Yes (2 pairs)
DSr	Davis & Smith, 1933 (Red method)	USA	90	Range: 16-38	Not indicated	Brief text (paper)	Typeface	Choose the typeface that fits with the quality	13	24	In article	No
DSb	Davis & Smith, 1933 (Blue method)	USA	90	Range: 16-38	Not indicated	Brief text (paper)	Typeface	Choose the quality that fits with the typeface	13	24	In article	No
DB06	Doyle & Bottomley, 2006 (pretest 1)	UK	142	Not indicated	Not indicated	Alphabet (digital)	Typeface	Likert scale -5 - 5	132	3 multi	Irretrievable	No
DB10	Doyle & Bottomley, 2010	UK	38	Not indicated	Not indicated	Alphabet (digital)	Typeface	Likert scale -5 - 5	102	3 multi	In article	Yes
GGP1	Grohmann, Giese & Parkman, 2013 (study 1)	USA	1216	Median: 36	552/664	Brand names (digital)	Brand names	Likert scale 1 - 5	35	5 FA	Provided by the authors	No

Index	*Article (study)*	*Country*	*Sample size*	*Age*	*Males / Females*	*Text presented (format)*
GGP2	Grohmann, Giese & Parkman, 2013 (study 2)	USA	123	Not indicated	Not indicated	Brand names (digital)
Gu	Gump, 2001	USA	84	Not indicated	40/44	Brief text (paper)
HLSC2	Hazlett, Larson, Shaikh, & Chaparro, 2013 (study 2)	USA	22	Not indicated	Not indicated	Text page (digital)
HGC	Henderson, Giese, & Cote, 2004	USA	336	Not indicated	Not indicated	Alphabet (digital)
KC	Kastl & Child, 1968	USA	40	Not indicated	31/9	Alphabet (slide projected)
Ko	Koch, 2012	USA	42	Not indicated	18/23	Alphabet (digital)
LS	Li & Suen, 2010	Canada	75	Range: 20-29	38/37	Alphabet + brief text (digital)
Lo	Louch, 2011	USA (online)	52	Range: 18-48	30/22	e-mails (digital)
MM	Mackiewicz & Moeller, 2004	USA	63	Not indicated	Not indicated	Brief text (digital)
Ma	Mackiewicz, 2005	USA	63	Not indicated	Not indicated	Brief text (digital)
NNP	Nedeljković, Novaković & Pinćjer, 2017	Serbia	40	Range: 20-30	20/20	Alphabet (digital)
Ov	Ovink, 1938	Holland	68	Not indicated	Not indicated	Alphabet (paper)
PF	Poffenberger & Franken, 1923	USA	40-50	Not indicated	Not indicated	Brief text (paper)

Object of evaluation	*Method*	*N. of typefaces*	*N. of qualities*	*Data*	*Included in unified dataset*
Brand names	Likert scale 1 - 5	4	5 FA	Irretrievable	No
Typeface	Choose the quality that fits with the typeface	10	4	In article	No
Page	Likert scale 1 - 4	2	6	In article	No
Typeface	Likert scale 1 - 7	209	4 FA	Provided by the authors	No
Typeface	Likert scale 0 - 5	32	8 multi	Irretrievable	No
Typeface	Likert scale 0 - 4	6	12	Provided by the authors	Yes
Typeface	Likert scale 1 - 5	24	10	Provided by the authors	Yes
Typeface	Likert scale 1-4	3	9 pairs	Provided by the authors	Yes
Typeface	Likert scale 1 - 7	15	10	In article (partially)	Yes
Typeface	Likert scale 1 - 7	15	2	In article	Yes
Typeface	Likert scale 1 - 7	8	20	In article	Yes
Typeface	Likert scale 1 - 5	30	8 multi	In article	Yes
Typeface	Put typefaces in order	29	5	In article	No

Index	*Article (study)*	*Country*	*Sample size*	*Age*	*Males / Females*	*Text presented (format)*
Ro	Rowe, 1982	USA	24	Not indicated	Not indicated	Alphabet (paper)
Sc	Schiller, 1935	USA	20	Not indicated	0/20	Brief text (paper)
SCF	Shaikh, Chaparro, & Fox, 2006 (Part A)	USA	561	Range: 20-39	157/404	Alphabet (digital)
Sh1	Shaikh, 2007 (study 1)	USA (online)	379	Range: 15-76	153/226	Brief text with no-words (digital)
TJN	Tannenbaum, Jacobson, & Norris, 1964	USA	75	Not indicated	Not indicated	Alphabet (paper)
TLM	Tantillo, Lorenzo-Aiss & Mathisen, 1995	USA	250	Mean: 24.4	110/140	Alphabet (paper)
VHS1	Velasco, Hyndman & Spence, 2018 (study 1)	UK	80	Not indicated	Not indicated	“eat me” (slide projected)
VHS2	Velasco, Hyndman & Spence, 2018 (study 2)	UK	166	Not indicated	Not indicated	“Eat Me” (paper)
VHS3	Velasco, Hyndman & Spence, 2018 (study 3)	UK	188	Range: 20-60	78/110	“tastes like” (paper)
VWHS1	Velasco, Woods, Hyndman & Spence, 2015 (study 1)	UK	101	Range: 20-69	59/42	“eat me” (digital)

Object of evaluation	*Method*	*N. of typefaces*	*N. of qualities*	*Data*	*Included in unified dataset*
Typeface	Likert scale 1 - 7	10	26 pairs	Irretrievable	No
Typeface	Put typefaces in order	15	5	In article	No
Typeface	Likert scale 1 - 4	20	15 pairs	Irretrievable	No
Typeface	Likert scale -3 - 3	40	16 pairs	In article	Yes
Typeface	Likert scale Not indicated	4	13 pairs	Irretrievable	No
Typeface	Likert scale 1 - 7	6	28 pairs	In article	Yes
Jellybean	Likert scale 0 - 10	1	2	In article	No
Jellybean	Likert scale 1 - 10	6	2	In article	No
Jellybean	Likert scale 0 - 10	1	2	In article	No
Typeface	Continuous scale 0 - 100	2	4	Irretrievable	No

Index	*Article (study)*	*Country*	*Sample size*	*Age*	*Males / Females*	*Text presented (format)*
WSL	Walker, Smith, & Livingston, 1986	UK	66	Not indicated	Not indicated	Alphabet (paper)
We	Wendt, 1968	Germany	10	Not indicated	Not indicated	Alphabet (paper)

Object of evaluation	*Method*	*N. of typefaces*	*N. of qualities*	*Data*	*Included in unified dataset*
Typeface	Likert scale 1 - 7	14	13 pairs	In article (partially)	Yes
Typeface	Likert scale 1 - 7	35	25 pairs	Irretrievable	No

Note. ‘pairs’ indicates that opposite terms were given to participants to identify the semantic quality. ‘multi’ indicates that two or more similar terms were given. ‘FA’ indicates that participants indicated ratings on multiple qualities that were later aggregated by the authors following a factorial analysis.

(e.g., jelly beans), because the ratings were largely affected by the stimulus itself and were therefore not comparable with ratings from other studies. We therefore only included the data from the 12 studies that asked participants to rate the perception of semantic qualities in typefaces, presented as alphabet or text, using a rating scale.

Given that previous studies used different rating scales (i.e., 1–5, 0–9, etc.), mean ratings originally reported were converted to a 0–10 rating scale to make data comparable. Data were transformed as follows: from the original mean rating, the lowest possible score of the scale was subtracted and the result divided by the number of points in the scale minus 1. Finally, the result was multiplied by 10. For example, if participants gave a mean rating of 5 on a 1–6 scale, the transformed value was 8 (= [(5-1)/(6-1)]*10). As another example, if participants gave a mean rating of 4 in a 0–5 scale, the transformed value was 8 (= [(4-0)/(6-1)]*10). The higher the score, the stronger the perception of the semantic quality in the typeface. In case of pair qualities presented at the extremities of the scale (e.g., beautiful – ugly), a low score (<5) indicates that the typeface is more representative of the first quality (beautiful); meanwhile, a high score (>5) indicates that the typeface is more representative of the second quality (ugly).

The unified dataset reported on OSF includes 108 semantic qualities and 315 typefaces. Anyone interested in a particular quality can arrange the dataset to see which typefaces had the highest ratings and which had the lowest. Similarly, anyone interested in a particular typeface can arrange the dataset to see which semantic qualities the typeface is most able to communicate. The next two sections show a few examples of the information that can be extracted from the unified dataset.

The Most Researched Qualities

Happiness and Sadness

Happiness and sadness were rated in 51 typefaces across 3 studies. As shown in Table 2, Curlz MT was rated as the happiest, followed by Gigi and Kristen ITC (Shaikh, 2007). All handwriting typefaces were perceived as happy. In general, results seemed to indicate that the feeling of happiness was communicated by curves and irregular lines.

In contrast, Helvetica Medium Condensed (Walker et al., 1986) was rated as the saddest, followed by Impact (Shaikh, 2007) and Evans (Walker et al., 1986). Overall, few typefaces were perceived as sad (i.e., had a score higher than 5). Nevertheless, it seems that the feeling of sadness was communicated mainly by typefaces that were condensed or intrinsically narrow. Finally, the thickness of the line seemed to be largely irrelevant for the communication of happiness or sadness.

Table 2.

Extract from the unified dataset. List of the typefaces that have been rated on how much they were perceived happy – sad.

happy–sad

Typeface	*Rating*	*Typeface*	*Rating*	*Typeface*	*Rating*
Curlz MT	1.88	Century Gothic	4.03	Verdana	4.77
Gigi	2.63	Perpetua	4.23	**Bauhaus 93**	4.78
Kristen ITC	2.70	Trebuchet MS	4.23	Arial	4.87
Hudson	2.72	Centaur	4.25	Lucida Bright	4.90
French Script MT	3.17	**Berlin Sans FB**	4.30	Avant Garde Gothic	4.93
Lucida Handwriting	3.25	Poor Richard	4.32	*Informal Roman*	4.95
Clarion Shaded[1]	3.27	Papyrus	4.40	Consolas	5.30
Bradley Hand	3.28	Incised901 Lt BT	4.42	Univers	5.38
Goudy Old Style	3.58	Corbel	4.45	Helvetica	5.43
Cooper Black	3.63	Georgia	4.48	Courier New	5.45
Tempus Sans ITC	3.65	High Tower Text	4.48	Agency FB	5.57
Monotype Corsiva	3.68	Calibri	4.53	Chiller	5.58
Vivaldi	3.78	Calisto	4.62	Lucida Console	5.62
Century Schoolbook	3.80	Juice ITC	4.65	**Playbill**	5.65
Times New Roman	3.88	Viner Hand ITC	4.65	Evans	5.70
Bauhaus Demi	3.88	**Broadway**	4.68	**Impact**	5.97
Brush Script	3.98	Cambria	4.75	Helvetica Medium Condensed	6.15

Hardness and Softness

Hardness and softness were rated in 49 typefaces across 2 studies. As shown in Table 3, Impact was rated as the hardest, followed by Playbill and Broadway (Shaikh, 2007). All typefaces with thick lines were perceived as hard, with the exception of Cooper Black. Typefaces with thin lines, monospaced typefaces, and typefaces with geometric and squared lines were perceived as hard.

By contrast, Bradley Hand was rated as the softest, followed by Vivaldi and French Script MT (Shaikh, 2007). Almost all handwriting typefaces were perceived as soft. Generally, an irregular line with high contrast appeared to drive the feeling of the typeface being perceived as soft. Finally, text typefaces with serifs were rated neither hard nor soft, with their score being around 5.

Loudness and Quietness

Loudness and quietness were rated in 48 typefaces across 2 studies. As shown in Table 4, Broadway was rated as the loudest (Shaikh, 2007), followed by Bauhaus 93 (Shaikh, 2007) and Braggadocio (Walker et al., 1986). It appeared that a thick line was the main feature driving the perception of loudness. However, it should be noted that the curvature of the line enhanced the effect of its thickness on the perception of loudness.

By contrast, Bradley Hand was rated as the quietest (Shaikh, 2007), followed by Vivaldi (Shaikh, 2007) and Avant Garde Gothic Book (Walker et al., 1986). It was unclear which typeface feature drives quietness. A thin line seemed to be essential, but not sufficient, as some typefaces with thin lines had scores around 5. Finally, most handwriting and text typefaces that contained serifs, were rated neither loud nor quiet as their scores were around 5.

Masculinity and Femininity

Masculinity and femininity were rated in 48 typefaces across 2 studies. As shown in Table 5, Impact (Shaikh, 2007) was rated as the most masculine, followed by Playbill (Shaikh, 2007) and Braggadocio (Walker et al., 1986). It is clear that a thick line and monospace were the main features driving the perception of masculinity. Furthermore, it seems that masculinity was communicated more by the typefaces that had regular and geometric lines.

By contrast, Virtuoso bold was rated as the most feminine typeface (Walker et al., 1986), followed by Vivaldi (Shaikh, 2007) and Curlz MT (Shaikh, 2007). All handwriting typefaces were rated as feminine. Generally, feminine typefaces had curved lines with additional flourish elements. Finally, text typefaces with serifs were rated neither feminine nor masculine, with their score being around 5.

Warmth and Coolness

Warmth and coolness were rated in 46 typefaces across 2 studies. As shown in Table 6, French Script MT was rated as the

Table 3.

Extract from the unified dataset. List of the typefaces that have been rated on how much they were perceived hard – soft.

hard–soft

Typeface	*Rating*	*Typeface*	*Rating*	*Typeface*	*Rating*
Impact	1.53	Cambria	4.05	Juice ITC	5.70
Playbill	2.20	Times New Roman	4.10	Papyrus	5.97
Broadway	2.43	Lucida Bright	4.15	Clarion Shaded[1]	6.00
Lucida Console	2.43	Verdana	4.18	**Cooper Black**	6.10
Braggadocio	2.47	Calibri	4.20	Kristen ITC	6.37
Agency FB	2.73	Corbel	4.53	*Brush Script*	6.38
Serpentine	2.77	Calisto	4.53	Tempus Sans ITC	6.43
Helvetica Medium Condensed	3.07	*Informal Roman*	4.53	**Hudson**	6.50
Consolas	3.15	Chiller	4.68	*Lucida Handwriting*	6.62
Evans	3.17	*Viner Hand ITC*	4.72	Gigi	6.82
Bauhaus 93	3.27	Perpetua	4.88	*Monotype Corsiva*	6.87
Dynamo	3.43	High Tower Text	4.90	Virtuoso bold	6.87
Arial	3.67	Poor Richard	5.00	Curlz MT	6.90
Courier New	3.73	Centaur	5.07	French Script MT	7.12
Berlin Sans FB	3.77	Century Gothic	5.53	*Vivaldi*	7.33
Georgia	3.87	Incised901 Lt BT	5.60	Bradley Hand	7.48
Trebuchet MS	4.02				

Table 4.

Extract from the unified dataset. List of the typefaces that have been rated on how much they were perceived loud – quiet.

loud–quiet

Typeface	*Rating*	*Typeface*	*Rating*	*Typeface*	*Rating*
Broadway	1.53	Poor Richard	4.20	Corbel	5.18
Bauhaus 93	2.05	Georgia	4.25	Lucida Handwriting	5.18
Braggadocio	2.17	Agency FB	4.32	Brush Script	5.20
Impact	2.18	Verdana	4.38	French Script MT	5.27
Dynamo	2.32	Informal Roman	4.40	Century Gothic	5.32
Playbill	2.67	Chiller	4.52	Centaur	5.38
Serpentine	3.17	Viner Hand ITC	4.55	Papyrus	5.55
Berlin Sans FB	3.28	Kristen ITC	4.55	Juice ITC	5.63
Helvetica Medium Condensed	3.33	Calibri	4.58	Monotype Corsiva	5.78
Evans[1]	3.48	Cambria	4.60	Eusebius Open	5.80
Gigi	3.85	Times New Roman	4.63	Palatino Italic	5.90
Trebuchet MS	3.92	High Tower Text	4.68	Tempus Sans ITC	6.00
Lucida Console	3.93	Calisto	4.82	Incised901 Lt BT	6.10
Curlz MT	3.95	Lucida Bright	4.90	Avant Garde Gothic Book	6.15
Arial	4.17	Courier New	5.00	Vivaldi	6.20
Consolas	4.18	Perpetua	5.15	Bradley Hand	6.80

Table 5.

Extract from the unified dataset. List of the typefaces that have been rated on how much they were perceived masculine – femenine.

masculine–feminine

Typeface	*Rating*	*Typeface*	*Rating*	*Typeface*	*Rating*
Impact	2.20	Berlin Sans FB	4.27	Poor Richard	5.73
Playbill	2.37	Cambria	4.33	Papyrus	5.97
Braggadocio	2.67	Times New Roman	4.37	Juice ITC	6.18
Helvetica Medium Condensed	2.97	Lucida Bright	4.38	Kristen ITC	6.32
Lucida Console	3.03	Trebuchet MS	4.38	Tempus Sans ITC	6.45
Dynamo	3.17	Calibri	4.50	Palatino Italic	6.60
Evans[1]	3.17	Calisto	4.60	Hudson	6.72
Serpentine	3.22	Corbel	4.65	Brush Script	6.87
Agency FB	3.30	Chiller	4.68	Monotype Corsiva	7.32
Consolas	3.43	Viner Hand ITC	4.97	Bradley Hand	7.38
Broadway	3.55	Perpetua	5.03	Lucida Handwriting	7.43
Courier New	3.77	Informal Roman	5.04	French Script MT	7.90
Arial	3.98	High Tower Text	5.10	Gigi	7.95
Bauhaus 93	4.12	Centaur	5.25	Curlz MT	8.03
Verdana	4.15	Incised901 Lt BT	5.40	Vivaldi	8.22
Georgia	4.15	Century Gothic	5.68	Virtuoso bold	8.50

Table 6.

Extract from the unified dataset. List of the typefaces that have been rated on how much they were perceived warm – cool.

warm–cool

Typeface	Rating	Typeface	Rating	Typeface	Rating
French Script MT	3.45	Berlin Sans FB	4.63	Arial	5.48
Monotype Corsiva	3.48	Georgia	4.67	Chiller	5.55
Lucida Handwriting	3.52	Cambria	4.77	Incised901 Lt BT	5.57
Vivaldi	3.60	Calisto	4.83	Calibri	5.62
Curlz MT	3.67	Viner Hand ITC	4.85	Playbill	5.63
Hudson	3.70	Centaur	4.85	Broadway	5.63
Kristen ITC	3.80	Perpetua	4.90	Bauhaus 93	5.93
Brush Script	3.87	Trebuchet MS	4.95	Courier New	6.20
Bradley Hand	3.95	Times New Roman	5.07	Evans	6.37
Cooper Black	4.00	Century Gothic	5.13	Impact	6.52
Gigi	4.02	Lucida Bright	5.18	Helvetica Medium Condensed	6.57
Tempus Sans ITC	4.07	Juice ITC	5.22	Consolas	6.63
Clarion Shaded[1]	4.10	Informal Roman	5.32	Lucida Console	6.73
High Tower Text	4.37	Corbel	5.35	Serpentine	6.78
Papyrus	4.45	Verdana	5.43	Agency FB	6.97
Poor Richard	4.50				

Table 7.

Extract from the unified dataset. List of the typefaces that have been rated on how much they were perceived weak – strong.

weak–strong

Typeface	Rating	Typeface	Rating	Typeface	Rating
Bradley Hand	3.23	Viner Hand ITC	5.38	Lucida Console	6.58
Juice ITC	3.28	Monotype Corsiva	5.40	Arial	6.65
Curlz MT	3.62	Century Gothic	5.47	Playbill	6.65
Gigi	3.73	Centaur	5.97	Cambria	6.72
Virtuoso bold[1]	3.85	Lucida Bright	6.02	Trebuchet MS	6.72
Chiller	3.95	Agency FB	6.05	Georgia	6.80
Vivaldi	4.28	Corbel	6.08	Bauhaus 93	6.85
Kristen ITC	4.37	Calisto	6.18	Clarion Shaded	6.98
Informal Roman	4.45	Perpetua	6.18	Berlin Sans FB	7.27
Lucida Handwriting	4.60	Poor Richard	6.22	Impact	7.48
Tempus Sans ITC	4.62	Consolas	6.23	Helvetica Medium Condensed	7.48
Papyrus	4.78	High Tower Text	6.30	Serpentine	7.48
French Script MT	4.92	Calibri	6.33	Broadway	7.80
Incised901 Lt BT	4.93	Times New Roman	6.47	Dynamo	7.83
Brush Script	5.27	Verdana	6.57	Braggadocio	7.98
Courier New	5.27				

warmest, followed by Monotype Corsiva and Lucida Handwriting (Shaikh, 2007). In fact, (almost) all handwriting typefaces were perceived warm. Generally, warm typefaces had curved lines.

By contrast, Agency FB was rated as the coolest typeface (Shaikh, 2007), followed by Serpentien (Walker et al., 1986) and Lucida Console (Shaikh, 2007). It appears that all monospaced typefaces were perceived as cool. Generally, cool typefaces were sans serifs with straight lines and low contrast. Finally, text typeface with serifs were rated neither cool nor warm, with their score being around 5.

Weakness and Strength

Weakness and strength were rated in 46 typefaces across 2 studies. As shown in Table 7, Bradley Hand was rated as the weakest, followed by Juice ITC and Curlz MT (Shaikh, 2007). Furthermore, most handwriting typefaces were perceived to be weak. Generally, weakness was communicated by typefaces with irregular lines and high contrast.

By contrast, Braggadocio was rated as the strongest typeface (Walker et al., 1986), followed by Dynamo (Walker et al., 1986) and Broadway (Shaikh, 2007). Similar to masculinity, it was clear that a thick line was the main feature driving the perception of strength. Furthermore, it seemed that strength was communicated more by those typefaces that had regular and geometric lines.

Finally, it should be noted that although a thick line communicated a feeling of strength, the opposite was not true; not all typefaces with thin lines were perceived as weak.

The Most Researched Typefaces

Times New Roman was rated on 68 qualities across 8 studies. As shown in Table 8, it was consistently rated high for legibility (Li & Suen, 2010; Shaikh, 2007; Tantillo et al., 1995) and readability (Tantillo et al., 1995). Furthermore, Times New Roman received low ratings for sloppiness and fearfulness (Li & Suen, 2010), and was found highly reassuring (Henderson et al., 2004), polite (Louch, 2011), confident (Li & Suen, 2010), professional and formal (MacKiewicz, 2005; Mackiewicz & Moeller, 2004). By contrast, participants rated Times New Roman low for cheerfulness and creativity (Li & Suen, 2010). Overall, this would suggest that Times New Roman is a typeface most appropriate in work-related contexts, where professionalism and formality are paramount.

Helvetica

Helvetica was rated on 42 qualities across 4 studies. As shown in Table 9, it was rated highly for legibility (Li & Suen, 2010; Tantillo et al., 1995) and readability (Tantillo et al., 1995). Furthermore,

Table 8.

Extract from the unified dataset. List of the typefaces that have been rated on Times New Roman.

Times New Roman

Quality	*Rating*	*Quality*	*Rating*	*Quality*	*Rating*
Fearful	1.13	Happy – Sad	3.88	Warm – Cool	5.07
Legible – Illegible	1.33	Good – Bad	3.93	Friendly	5.23
Sloppy	1.43	Honest – Dishonest	3.95	Cheap – Expensive	5.32
Polite - Rude	1.57	Supportive – Unsupportive	3.99	Rough – Gentle	5.33
Legible – Not Legible	2.22	Freshness – Stale	4.00	Ordinary – Extraordinary	5.37
Readable – Not Readable	2.37	Vitality – No Vitality	4.00	Passive – Active	5.38
Consistent – Inconsistent	2.75	Charming – Not Charming	4.03	Delicate – Rugged	5.43
Creative	2.97	Valuable – Worthless	4.08	Formal – Casual	5.62
Cheerful	3.13	Hard – Soft	4.10	Relaxed – Stiff	5.73
Distinct – Not Distinct	3.33	Calm – Exciting	4.18	Old – Young	5.75
High Quality – Low Quality	3.33	Emotional – Not Emotional	4.23	Pleasing CFA	5.87
Engaging CFA	3.45	Youthful – Mature	4.30	Old – New	5.90
Rich – Poor	3.52	Professional – Unprofessional	4.33	Lower Class – Upper Class	5.93
Interesting – Boring	3.57	Masculine – Feminine	4.37	Assertive – Passive	6.13
Smart – Not Smart	3.62	Attractive – Unattractive	4.42	Power CFA	6.31
Loud – Soft	3.67	Attractive	4.50	Weak – Strong	6.47
Personality – No Personality	3.67	Loud – Quiet	4.63	Formal	6.63
Powerful – Powerless	3.70	Calm – Agitated	4.67	Confident	6.80

Table 9.

Extract from the unified dataset. List of the typefaces that have been rated on Helvetica.

Helvetica

Quality	*Rating*	*Quality*	*Rating*	*Quality*	*Rating*
Fearful	0.90	Manly – Unmanly	3.85	Vitality – No Vitality	5.20
Sloppy	1.33	Rough – Gentle	4.03	Calm – Agitated	5.30
Legible – Not Legible	1.47	Honest – Dishonest	4.10	Happy – Sad	5.43
Artistic	1.53	Powerful – Powerless	4.27	Personality – No Personality	5.98
Readable – Not Readable	1.55	Attractive	4.30	Beautiful – Ugly	6.07
Dramatic	2.25	Old – New	4.42	Freshness – Stale	6.22
Individual	2.58	Distinct – Not Distinct	4.45	Charming – Not Charming	6.37
Creative	2.63	Lower Class – Upper Class	4.60	Interesting – Boring	6.45
Cheerful	2.93	Old – Young	4.68	Emotional – Not Emotional	6.45
Ordinary – Extraordinary	3.02	Friendly	4.83	Elegant – Not Elegant	6.85
Loud - Soft	3.22	Smart – Not Smart	4.85	Professional	6.95
Sturdy – Not Sturdy	3.37	High Quality – Low Quality	4.93	Confident	7.07
Traditional – Not Traditional	3.68	Valuable – Worthless	4.97	Formal	7.13
Relaxed	3.73	Rich – Poor	5.18	Legible	7.87

Table 10.

Extract from the unified dataset. List of the typefaces that have been rated on Century Schoolbook.

Century Schoolbook

Quality	*Rating*	*Quality*	*Rating*	*Quality*	*Rating*
Legible – Not Legible	2.03	Smart – Not Smart	3.60	Manly – Unmanly	5.03
Readable – Not Readable	2.18	Personality – No Personality	3.65	Rough – Gentle	5.12
Engaging CFA	2.60	Valuable – Worthless	3.80	Friendly	5.18
High Quality – Low Quality	3.12	Happy – Sad	3.80	Ordinary – Extraordinary	5.32
Distinct – Not Distinct	3.17	Charming – Not Charming	3.83	Pleasing CFA	5.57
Rich – Poor	3.20	Vitality – No Vitality	3.90	Old – Young	5.63
Beautiful – Ugly	3.40	Honest – Dishonest	4.08	Old – New	5.78
Sturdy – Not Sturdy	3.42	Emotional – Not Emotional	4.17	Lower Class – Upper Class	6.32
Powerful – Powerless	3.45	Freshness – Stale	4.18	Power CFA	6.41
Loud – Soft	3.47	Traditional – Not Traditional	4.48	Professional	6.85
Interesting – Boring	3.50	Calm – Agitated	4.73	Reassuring CFA	7.65
Elegant – Not Elegant	3.58				

Note. CFA indicates that participants indicated ratings on multiple qualities that were later aggregated by authors following a Factorial Analysis.

Table 11.

Extract from the unified dataset. List of the typefaces that have been rated on Impact.

Impact

Quality	*Rating*	*Quality*	*Rating*	*Quality*	*Rating*
Hard – Soft	1.53	Consistent – Inconsistent	3.79	Confident	6.10
Assertive – Passive	2.12	Pleasing CFA	4.24	Passive – Active	6.10
Sloppy	2.13	Old – Young	4.37	Professional – Unprofessional	6.21
Cheerful	2.17	Youthful – Mature	4.44	Power CFA	6.43
Relaxed	2.17	Formal	4.93	Warm – Cool	6.52
Loud – Quiet	2.18	Polite – Rude	5.16	Attractive – Unattractive	6.60
Masculine – Feminine	2.20	Slow – Fast	5.33	Reassuring CFA	6.71
Fearful	2.47	Supportive – Unsupportive	5.36	Good – Bad	7.05
Creative	2.53	Legible	5.63	Beautiful – Ugly	7.23
Engaging CFA	2.65	Legible – Illegible	5.75	Weak – Strong	7.48
Friendly	2.77	Calm – Exciting	5.77	Delicate – Rugged	7.78
Cheap – Expensive	3.35	Formal – Casual	5.83	Relaxed – Stiff	8.08
Attractive	3.50	Happy - Sad	5.97		

Note. CFA indicates that participants indicated ratings on multiple qualities that were later aggregated by authors following a Factorial Analysis.

Table 12.

Extract from the unified dataset. List of the typefaces that have been rated on Goudy Old Style.

Goudy Old Style

Quality	*Rating*	*Quality*	*Rating*	*Quality*	*Rating*
Readable – Not Readable	2.03	Personality – No Personality	3.58	Power CFA	5.24
Legible – Not Legible	2.05	Freshness – Stale	3.60	Loud – Soft	5.37
Distinct – Not Distinct	3.02	Calm – Agitated	3.63	Manly – Unmanly	5.50
Elegant – Not Elegant	3.20	Honest – Dishonest	3.73	Old – Young	5.68
Beautiful – Ugly	3.23	Valuable – Worthless	3.78	Ordinary – Extraordinary	5.70
High Quality – Low Quality	3.23	Engaging CFA	3.86	Old – New	5.98
Rich – Poor	3.25	Vitality – No Vitality	4.20	Pleasing CFA	6.37
Charming – Not Charming	3.42	Emotional – Not Emotional	4.27	Rough – Gentle	6.37
Smart – Not Smart	3.43	Powerful – Powerless	4.30	Lower Class – Upper Class	6.38
Interesting – Boring	3.53	Sturdy – Not Sturdy	4.47	Reassuring CFA	7.58
Happy – Sad	3.58	Traditional – Not Traditional	4.72		

Note. CFA indicates that participants indicated ratings on multiple qualities that were later aggregated by authors following a Factorial Analysis.

similar to Times New Roman, Helvetica received low ratings for sloppiness and fearfulness (Li & Suen, 2010) and was found highly confident (Li & Suen, 2010), professional, and formal (MacKiewicz, 2005). By contrast, Helvetica was not considered artistic (Mackiewicz & Moeller, 2004), creative (Li & Suen, 2010), or dramatic (Mackiewicz & Moeller, 2004).

The main differences between Helvetica and Times New Roman were in terms of novelty and aesthetics. While Times New Roman was perceived as more extraordinary, interesting, elegant, and beautiful, Helvetica was considered more ordinary, boring, not elegant, and ugly (Tantillo et al., 1995).

Century Schoolbook

Century Schoolbook was rated on 34 qualities across 3 studies. As shown in Table 10, it was rated highly for legibility and readability (Tantillo et al., 1995). Furthermore, it was perceived as professional, reassuring, rich, distinct, and high quality (Henderson et al., 2004; MacKiewicz, 2005; Tantillo et al., 1995). By contrast, Century Schoolbook was considered neither manly nor unmanly, rough nor gentle, and ordinary nor extraordinary (Tantillo et al., 1995). Overall, this suggests that Century Schoolbook could be a more distinct typeface compared to Times New Roman and Helvetica.

Impact

Impact was rated on 38 qualities across 4 studies. As shown in Table 11, it was rated highly for hardness, assertiveness, stiffness, ruggedness, loudness, and strength (Louch, 2011; Shaikh, 2007). It also received high ratings for badness and ugliness (Shaikh, 2007), which were in line with low ratings in attractiveness (Li & Suen, 2010). This, however, did not mean that Impact was perceived as sloppy or fearful, as it received low ratings on both qualities (Li & Suen, 2010). Furthermore, Impact received low ratings for creativity and cheerfulness (Li & Suen, 2010). Overall, Impact was a low creative typeface that communicated a sense of strength without being sloppy or fearful.

Goudy Old Style

Goudy Old Style was rated on 32 qualities across 2 studies. As shown in Table 12, it was rated highly for legibility and readability (Tantillo et al., 1995). Furthermore, similarly to Century Schoolbook, it was perceived as reassuring, rich, distinct and high quality (Henderson et al., 2004; Tantillo et al., 1995). Goudy Old Style was also considered neither manly nor unmanly, traditional nor untraditional, and loud nor soft (Tantillo et al., 1995). Contrary to Century Schoolbook, however, it was perceived as highly gentle (Tantillo et al., 1995). Overall, Goudy Old Style was perceived as a gentler alternative to Century Schoolbook that can be used for situations that call for a distinct typeface.

General Discussion

This article provided an overview of previous studies that asked participants to indicate their perception of semantic qualities in typefaces. Whenever possible, participants' judgments have been collected in a single place and were made comparable in the unified dataset. Due to the high number of qualities and typefaces, the tables in the previous two sections only included data regarding the most researched qualities and typefaces.

Specifically, the tables throughout the previous section provided scientific evidence regarding which typefaces are the most effective to communicate happiness/sadness, hardness/softness, loudness/quietness, masculinity/femininity, warmth/coolness, and weakness/strength. These tables can therefore help professionals identify those typefaces that are most appropriate for their project if they want to communicate these semantic qualities. In summary, the tables indicate that Curlz MT, Gigi, and Kristen ITC were perceived as the happiest; Helvetica Medium Condensed, Impact, and Evans as the saddest; Impact, Playbill, and Broadway as the hardest; Bradley Hand, Vivaldi, and French Script MT as the softest; Broadway, Bauhaus 93, and Braggadocio as the loudest; Bradley Hand, Vivaldi, and Avant Garde Gothic Book as the quietest; Impact, Playbill, and Braggadocio as the most masculine; Virtuoso bold, Vivaldi, and Curlz MT as the most feminine; French Script MT, Monotype Corsiva, and Lucida Handwriting as the warmest; and Agency FB, , and Lucida Console as the coolest.

These tables also indicated which physical features of the typefaces may drive the communication of the qualities. Some indications were expected; for example, that a thick line is the most important feature to communicate a sense of loudness and that curved lines enhance this feeling further. Others were more unexpected; for example, sadness was mainly communicated by narrow typefaces. These findings can therefore help professionals who are creating new typefaces by drawing correlations between typeface features and intended outcomes

The tables also provided scientific evidence regarding which semantic qualities each typeface did or did not communicate. These tables gave a comprehensive view of the feelings that each typeface can transfer to the viewer. In summary, Times New Roman was perceived as a typeface that communicated a high sense of professionalism, confidence, reassurance, and politeness, and a low sense of cheerfulness and creativity. Helvetica was perceived as a typeface that communicated a high sense of formality, professionalism, and confidence, and a low sense of creativity, sloppiness, and fearfulness. Century Schoolbook was perceived as a typeface that communicated a high sense of distinctness, high quality, and professionalism, and a low sense of both roughness and gentleness. Impact was perceived as a typeface that communicated a high sense of strength,

stiffness, and assertiveness, and a low sense of creativity, sloppiness, and fearfulness. Finally, Goudy Old Style was perceived as a typeface that communicated a high sense of distinctiveness, high quality, and gentleness, and a low sense of both traditionalism and untraditionalism.

These tables also allowed the detection of small differences across typefaces. For example, tables showed that Goudy Old Style was perceived as gentler compared to Century Schoolbook, even though they were able to communicate other qualities similarly. These tables could therefore help professionals gain a comprehensive understanding of which qualities a specific typeface can communicate to make sure that they are all in line with the message of their project. The data discussed in the present review is a fraction of what is available in the unified dataset present in the Open Science Framework project due to space limits. Interested readers are invited to explore the unified dataset for ratings on more qualities and typefaces.

All methods used in the manuscripts included in this review explicitly asked participant to judge the semantic qualities perceived in typefaces, an assessment method that has limits. Participants may find it difficult to explicitly perceive semantic qualities such as "hygiene" in typefaces. This does not necessarily mean that typeface cannot influence the perception of these qualities, but rather that participants are not aware of it. Secondarily, most of the impact that typeface has on users' choices and decisions in the real world is unconscious. Customers are rarely aware that they choose a particular product due to its typeface, and users are rarely aware that they are spending a significant amount of time on a website because of its typeface. Therefore, a method that measures the unconscious mechanism would be a more reliable way to test the strength of the effect in real-world contexts.

Numerous previous studies used implicit measures (i.e., measures that did not explicitly ask participants) to test the perception of semantic qualities in typefaces. For example, Lewis and Walker (1989) found that participants were faster in congruent trials when the word presented and the typeface used were in line (e.g., the word "slow" presented in Cooper Black, which had high scores for slow) compared to incongruent trials when the word presented and the typeface used were not in line (e.g., the word "slow" presented in Palatino Italic, which had high scores for fast).

This suggests a consistency between the conscious and unconscious perception of semantic qualities in typefaces and, most importantly, that it is not necessary to obtain explicit ratings to investigate the perception of semantic qualities in typefaces. It would therefore be helpful for the generalizability of previous research to use assessment methods that detect the unconscious association that participants make between typefaces and semantic qualities (see also Belboula & Ackermann, 2021; Hazlett et al., 2013).

A final point that should be noted is that it was not the aim of the current review to understand *how* semantic qualities arise from typefaces. The mechanisms underlying this phenomenon are still largely unclear. It could be argued that semantic qualities are cultural, that is, they arise from the associations that the reader makes between the typeface and past experience (Celhay et al., 2015). It could also be argued that the physical features of the typeface intrinsically communicate semantic qualities that are universally perceived by the viewers (Arnheim, 1960). More likely, both mechanisms occur and interact, which explains why some semantic qualities are universally perceived from the typeface, while others are more subjective.

Future studies should explore the mechanisms underlying this phenomenon further, for example by comparing ratings of people from different cultures. All studies in this review were conducted in Western countries, mostly the United States and the United Kingdom. More studies should be conducted in Asian, African and South American countries to test whether the ratings reported here are universal or specific to the Western population. However, these future studies may face significant challenges considering the different alphabets used across the globe, as well as the fact that the translation of the terms indicating the semantic qualities may reflect different concepts.

Limitations

Few studies included in this review were conducted in countries where English was not the first language, such as Germany (Wendt, 1968), Holland (Ovink, 1938) and Serbia (Nedeljković et al., 2017). Participants were therefore presented with qualities in the native language. Although authors reported the English translation in the manuscripts, they call for caution given that the translation may not always fully reflect the original word (Ovink, 1938).

Another point to be noted is that multiple of the studies included here were conducted decades ago, with the earliest being a century old (Poffenberger & Franken, 1923). This raises questions about the current validity of the findings. Considering that since the first study in 1923 there has been a substantial cultural change (e.g., World War II, the globalisation and the digital era), studies that presented printed typefaces to participants are not necessarily comparable with more recent studies. We therefore encourage future researchers to replicate previous studies to test whether the findings are still valid. This will also help to determine whether

physical properties of typefaces communicate consistent qualities independently of temporal trends and fashions.

A limitation of the unified dataset is that the ratings cannot be statistically compared because, although they are means, they are single values. Therefore, readers should not assume that differences between scores are statistically significant. Specifically, the closer the scores, the less confident the reader should be that they are statistically different. This is why we refrained from talking about significant differences when describing data from the unified dataset, and we limited the comparison of typefaces/qualities with low scores against those with high scores. Future studies should conduct appropriate studies with statistical analyses to confirm the trends that this review highlighted.

Conclusions

The aim was to provide useful and easily accessible data to professionals for the development of their work projects. The review described part of the data that we collected, but we encourage interested readers to visit the OSF link and download and explore the unified dataset in full. We believe that the dataset will help professionals to be more conscious of which typefaces are most appropriate to communicate specific qualities in their projects. We also encourage authors who published studies that fit the inclusion criteria of the present review and that we might have missed during the search to contact us in order to be included in the Open Science Framework project. Similarly, authors of future research are invited to contact us so that their data can be added to the OSF dataset, which we hope will grow further with time. We believe that the present review could be a reference point for future work on the subject and for the selection of appropriate typefaces in communication, marketing, and design projects.

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— Ying Li and Ching Suen

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