

RUNNING HEAD: THE TYPEFACE OF MUSIC

Does the typeface on album cover influence expectations and perception of music?

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ABSTRACT

CD and digital album covers are part of the music purchase/consumption experience, yet very little is known about how album cover design influences people's expectations concerning, and their perception of, music. This paper explores the effect of the typeface curvilinearity of album cover design on people's expectations and perception of music. Typeface curvilinearity has been shown to influence expectations across other sensory modalities, such as taste (gustation). Across three studies, we demonstrate how angular versus rounded typeface can impact expectations concerning how the music will sound. We also demonstrate how angular and rounded typefaces influence emotion ratings of actual music samples. In Experiment 1, typeface curvilinearity influenced people's expectations of music, with participants expecting the music to sound more angular, masculine, fast, rough, happy, evil, violent, exciting, and active when the typeface on the faux CD album cover was angular compared to when it was round. Conversely, participants expected the music to sound more round, feminine, slow, smooth, sad, good, gentle, calm, and passive when the typeface was round than when it was angular. Experiment 2 demonstrated that typeface curvilinearity influenced people's ratings of emotional valence but not arousal in neutral music (i.e., music that is considered neither round nor angular). Specifically, participants evaluated the music as sounding more pleasant when the CD cover featured round typeface. Finally, in Experiment 3, we did not find evidence that CD album cover typeface influences people's perception of arousal or valence of music when the music itself is rated as sounding highly round or angular. These results will be of interest to designers and marketing experts when creating CD covers, logos, posters, and lyric videos.

KEYWORDS: music, typefaces, visual design, album art, perception, crossmodal correspondences

Introduction

“I want someone to look at the album cover and appreciate the aesthetic and image and let the artwork guide their listening experience”, Vlad Sepetov, a designer best known for designing album covers for artists like Kendrick Lamar and Schoolboy Q was quoted as saying. Sepetov certainly believes that the artwork on album covers can tell a story and offer people an insight into the music that may only be heard for the first time thereafter. As Sepetov puts it: *“...that first look at the sleeve tells you how you are going to listen to the album”* (Carroll, 2016). Consumer researchers similarly believe that a CD album cover must convey something about the music as it is an integral component of the product packaging (e.g., Fox, 2005; McGuire, 2005; Velasco & Spence, 2019). Illustrating the point, one consumer wrote the following in response to the cover art of albums released by the jazz label, Blue Note: *“The best Blue Note jackets are perfect echoes of their contents: Bold, direct, dramatic, soulful, strong, just like the hard bop on the thick vinyl inside. They’re cool”* (quote reprinted from Fox, 2005). One researcher conducting a qualitative survey of CD cover art in Brazilian hip-hop music described the study of graphic design for CDs as ‘cultural design’ (Pardue, 2005). Pardue proposes that the album cover be viewed as a ‘visual argument’ used to convince the consumer of something as much as the music itself. In sum, the suggestion is that album covers can guide one’s feelings and expectations towards the music and may even help determine the commercial success of the album (Carroll, 2016; Fox, 2005). Even with the shift from buying physical CDs to streaming, album covers continue to remain part of the listening experience. For instance, streaming services like Spotify and Apple Music allow users to scroll through digital album art to search for music and display the album cover while users listen to the song.

There is evidence to suggest that people associate certain colours with music of certain emotional qualities, where happy music is matched with colours that are more saturated, lighter, and yellower whereas sad music is associated with less saturated, darker, and bluer colours (Isbilen & Krumhansl, 2016; Palmer, Schloss, Xu, & Prado-León, 2013; Palmer, Langlois, & Schloss, 2016; Whiteford, Schloss, Helwig, & Palmer, 2018; Spence, 2020). Surprisingly, an initial empirical study has also demonstrated that specific visual elements of album cover design can influence how long people listen to the CD for, how much critics like the music, and how the music ranks on charts e.g., Billboard (Joye, Fennis, Kreuer, & Redies, in preparation based on unpublished data).

Given the importance of visual elements in album cover design to the music listening experience, studying how visual stimuli influence the perception of music constitutes an interesting topic for researchers working in the field of multisensory perception/crossmodal correspondences research. The focus of this particular paper is on the question of if, and how, album typeface influences people's expectations, and thereafter perception, of music.

Typeface is a particularly interesting aspect of design because it conveys meaning that goes beyond the semantic message conveyed by the text itself (e.g., Doyle & Bottomley, 2009; Morrison, 1986; see Velasco & Spence, 2019; Walker, 2016, for reviews). The research suggests that typeface conveys affective information – with, for example, curved typefaces being more strongly associated with positively-valenced emotions whereas angular typefaces are associated with more negatively-valenced emotions instead (e.g., Kastl & Child, 1968; Morrison, 1986). Furthermore, typeface can influence expectations and transmit information about a brand and its identity (e.g., see Bartholome & Melewar, 2009; Henderson & Cote, 1998; Salgado et al., 2014). This is presumably why so many businesses, and musicians for that matter, are so careful in terms

of their choice of logo and packaging design (see Velasco & Spence, 2019, for a recent review). In an earlier study observing typefaces on perfume bottles, italic and script style typefaces with lighter weights were considered more feminine while roman, sans-serif typefaces with bolder weights were considered more masculine instead (Wendt, 1968). Similarly, studies have found that typeface on packaging for a drink product influences the expectation of how it will taste such that people expected a drink to taste sweeter when there was a round typeface versus an angular typeface on the packaging (Velasco et al., 2014; Velasco et al., 2015). The relationship between typeface and taste can be considered an example of a “crossmodal correspondence”. This is the name given to the seemingly unrelated information from different senses that are matched with one another (see Deroy & Spence, 2015; Parise & Spence 2013; Spence 2011; Walker, 2016, for reviews). It appears that the curvilinearity of typeface may well be the main factor underlying typeface-taste crossmodal correspondences (though more recent studies have also looked at boldness as a secondary factor see Velasco et al., 2018). For example, round typefaces tend to be matched with the word ‘sweet’ whereas angular typefaces tend to be matched with the words ‘bitter’, ‘sour’, and ‘salty’ instead (see Velasco et al., 2014, 2015). This match may seem arbitrary, or surprising, at first but, as Velasco et al. (2015) have argued, “taste hedonics” influences why people match tastes to shapes in this very specific manner. Since people like sweet-tasting foods, they might associate a round shape with the taste-word ‘sweet’ or the taste of sweetness, as people are known to prefer round over angular forms (Bar & Neta, 2006; Dazkir & Read, 2012; Jadva, Hines, & Golombok, 2010; Leder & Carbon, 2005; Silva & Barona, 2009, Velasco, Hyndman, & Spence, 2018).

There is reason to believe that the curvilinearity of typeface may similarly influence people’s expectations and perception in the case of music. Research in the realm of shape-sound

crossmodal correspondences finds that people match the curvilinearity of a visual shape to various features of sound. For example, higher-pitched sounds tend to be associated with smaller, more angular shapes whereas lower-pitched sounds are associated with larger, rounder shapes (Evans & Treisman, 2010; Galace & Spence, 2006; Melara & O'Brien, 1987; Parise & Spence, 2012; Walker & Smith 1985; Walker, 2016). Furthermore, a study on musical timbre-shape relationships found that harsh timbres (such as the sound of crashing cymbals) corresponded with angular shapes while softer timbres (such as the sounds of a piano) corresponded with rounder shapes (Adeli, Rouat, & Molotchnikoff, 2014). While there is no research that directly tests the relationship between tempo and shape, there is some evidence to suggest that the two are related. For example, fast tempo music is associated with sour taste and sour taste is associated with angular shapes (Blazhenkova & Kumar, 2017; Knoeferle, Woods, K  ppler, & Spence, 2015). It is possible that fast tempo music might therefore also be associated with angular shapes due to the assumed transitive property of crossmodal correspondences across modalities (Deroy, Crisinel, & Spence, 2013). Additionally, faster sound sequences have been shown to be associated with brightness more than slower tempi sequences (Collier & Hubbard, 2001). Furthermore, perhaps shape-tempo correspondences may have something to do with the relationship between the shape of the movement used to make sounds on certain instruments and the tempo. For example, playing slow phrases on string instruments involves making long, curved bow movements while playing fast phrases on string instruments involves making quick, sharp bow movements (Salgado-Montejo, Marmolejo-Ramos, Alvarado, Arboleda, Suarez, & Spence, 2016). Curvilinearity is also associated with texture – round shapes are associated with smoothness and angular shapes are associated with roughness (Etzi, Spence, Zampini, & Gallace, 2015).

There is also evidence that round shapes are associated with low emotional arousal words and words that invoke feelings of safety, such as “passive”, “calm”, “femininity”, “weak”, “lazy”, and “gentle” while angular shapes are associated with high arousal words and words that invoke feelings of danger, such as “active”, “happiness”, “excited”, “masculinity”, “harsh”, “cruel”, “furious”, “agitated”, and “violent” (Ares & Deliza, 2010; Etzi et al., 2015; Lundholm, 1921; Palumbo, Ruta & Bertamni, 2015). This is likely because there is both a basic preference for curved figures as well as a fear of angular objects. Functional magnetic resonance imaging research has demonstrated activation of the anterior cingulate cortex (a part of the brain that responds to emotional aspects of stimuli and a reward centre) when viewing curved shapes and activation of the amygdala (involved in the processing of threat) when viewing angular objects (Bar & Neta, 2007; Larson, Aronoff, & Stearns, 2007; Larson, Aronoff, Sarinopolous, & Zhu, 2009; Vartanian, Navarrete, Chatterjee, et al., 2013). Hence, one might predict that angular typefaces and angular music would be rated as fast, rough, evil, masculine, violent, exciting, happy, and active. Conversely, one would expect round typefaces and round music to be rated as slow, smooth, good, feminine, gentle, calm, sad, and passive.

In the set of studies that are reported here, we investigated whether the typeface on faux CD album covers influenced peoples’ expectations, and thereafter their perceptions, of music. Using the semantic differential technique, as previously used in, for example, typeface correspondence studies, a series of three experiments was designed (see Wendt, 1968 and Walker, 2008, following-up on Osgood, Suci, & Tannenbaum’s, 1957, original work on the semantic differential technique).

Experiment 1, investigated whether the different design elements of typeface (curvilinearity and thickness) on faux CD album covers would influence people’s expectations of

the emotional and musical features as well as their expected general evaluations of the music. The curvilinearity (angularity/roundedness) of the typefaces was manipulated in order to determine whether they impacted people's expectations concerning the music's perceptual features (e.g., its tempo, texture, etc.), the emotional features of the music (e.g., gentleness, evilness, etc.), and people's general evaluations of the music (e.g., liking, quality etc.). Typeface thickness was also varied because previous research has found that typeface thickness influenced taste perception with bold typefaces being matched with sweet tastes and skinny typefaces with sour tastes (Velasco et al., 2015). Based on the aforementioned literature, the prediction is that participants in the round typeface conditions would expect music to sound round, feminine, slow, smooth, sad, good, gentle, calm, and passive than in the angular typeface conditions. Conversely, we predicted that participants in the angular typeface conditions would expect the music to sound more angular, masculine, fast, rough, happy, evil, violent, exciting, and active than in the round typeface conditions.

Experiment 2, investigated whether the different design elements of typeface (curvilinearity and thickness) on faux CD album covers would actually influence people's evaluations of the music when listening to a neutral-sounding music clip (i.e., a clip of music that is rated as neither angular nor round based on a pretest). Finally, in Experiment 3, we studied whether differences in typeface curvilinearity and thickness on faux CD album covers would influence people's perceptions of very angular and very round music. Specifically, we were interested in whether people would evaluate the music more positively under conditions with congruent typeface-music pairings (angular typeface-angular music and round-typeface-round music) as opposed to incongruent typeface-music pairings (angular typeface-round music and round-typeface-angular music).

Experiment 1:

Music Expectations Elicited by Viewing CD Album Typeface

Experiment 1 was designed to investigate whether the typeface on faux CD album covers would influence perceptual, emotional, and evaluative expectations concerning what the music would sound like. Based on prior literature on typeface and shape (see Velasco & Spence, 2019, for a review), a main effect of typeface curvilinearity was predicted such that participants in the angular typeface conditions would expect the music to sound more angular, masculine, fast, rough, happy, evil, violent, exciting, and active than in the other conditions (Adeli, Rouat, & Molotchnikoff, 2014; Evans & Treisman, 2010; Lundholm, 1921). Conversely, we predicted that participants in the round typeface conditions would expect the music to sound more round, feminine, slow, smooth, sad, good, gentle, calm, and passive than the other conditions. No predictions were made concerning the expected liking, quality, sophistication, or willingness to listen to the music and hence these were treated as exploratory variables. Furthermore, no predictions were made concerning the effect of typeface thickness (or the curvilinearity-thickness interaction) on expectations concerning music.

Methods

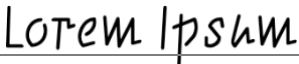
Pre-test. In the pre-test, the participants were presented with twelve different typefaces varying in terms of their curvilinearity and thickness (see Table 1 for the stimuli used) selected from the Adobe fonts database. The participants were instructed to indicate how angular or rounded each font was on a set of slider scales. Participants saw the words “lorem ipsum” in the twelve typefaces so the word itself was unlikely to be associated with roundness or angularity.

Thirty participants were recruited via the lab Facebook page. The participants were asked to click a link to participate in a 60 second questionnaire about typefaces if they wanted to participate and that there would be no compensation for participating. After thirty people participated in the survey, the link was removed from the Facebook page and the Qualtrics questionnaire stopped collecting data. The decision was made not to pay the participants in exchange for taking part in the survey as it was so short.

Participants saw the twelve typefaces (six round and six angular typefaces were preselected) presented in a randomized order and rated the curvilinearity of each typeface on a 10-point scale ranging from 1= very rounded to 10 = very angular. The participants couldn't see the numbers on the scale and they were simply asked to place their cursor where they wanted.

A one-way Analysis of Variance (ANOVA) determined that there was a significant difference in roundness-angularity ratings between the twelve typefaces ($F(11, 348) = 11.88, p < .001$). Bonferroni corrected pairwise comparisons revealed that the most angular typefaces were Elektrix, Graveblade, Aviano Future, and Chinese Rocks, which all rated as significantly more angular than all six of the rounded typefaces ($p < .001$ for all comparisons). The most rounded fonts were Eds Market Bold Script, Madre Script, and Annabelle. The latter three were all rated as significantly more rounded than five out of the six angular typefaces ($p < .001$ for all comparisons). See Table 1 for mean round-angular scores for and standard deviations for all pre-test typefaces.

Table 1: Mean round (1) - angular (10) scores and standard deviations for pre-test typefaces.

Typeface image	Typeface name	Mean	SD	N
	Elektrix**	7.10	2.63	30

LOREM IPSUM	Graveblade**	6.57	2.69	30
<i>LOREM IPSUM</i>	Aviano Future**	7.70	2.56	30
LOREM IPSUM	Chinese Rocks**	6.73	2.57	30
<i>LOREM IPSUM</i>	Talon	5.90	2.70	30
LOREM IPSUM	TwentyFourNinetyOne	6.33	2.70	30
<i>LOREM IPSUM</i>	EdsMarket**	2.87	2.26	30
LOREM IPSUM	LizaDisplay	4.37	2.40	30
<i>LOREM IPSUM</i>	MadreScript**	3.93	2.35	30
LOREM IPSUM	Annabelle**	3.90	2.33	30
<i>LOREM IPSUM</i>	Gautreaux	4.30	2.09	30
LOREM IPSUM	Guapa	4.23	2.49	30

Note - ** indicates $p < .001$ for multiple comparisons.

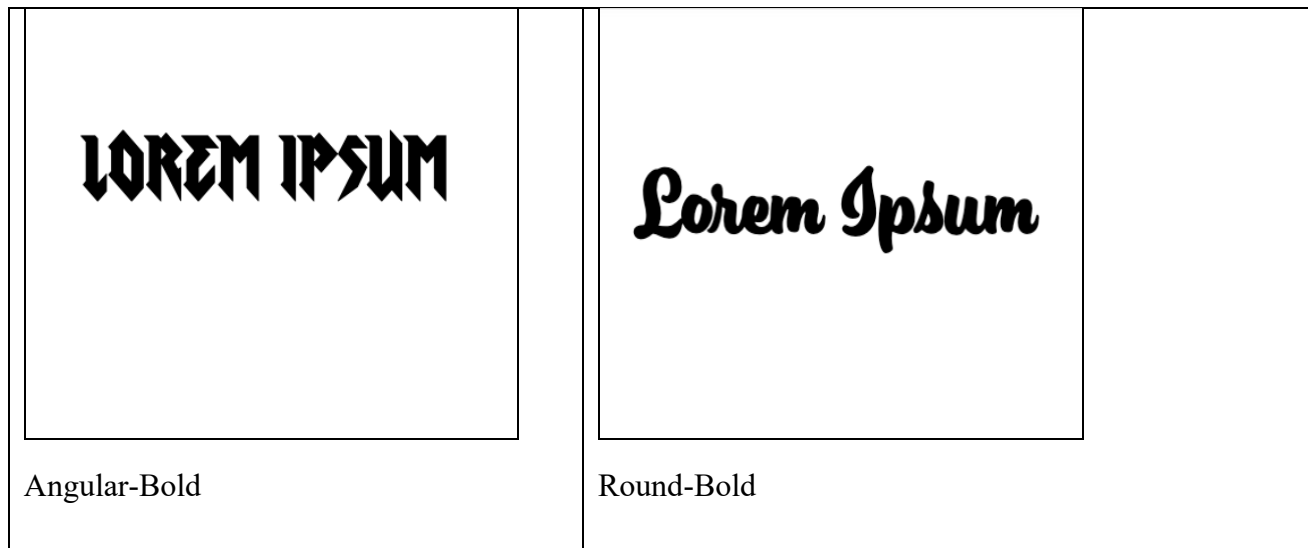
Based on these results, the following typefaces were chosen for the main experiment: Graveblade (angular, bold), Elektrix (angular, skinny), Eds Market Bold Script (rounded, bold), and Annabelle (rounded, skinny).

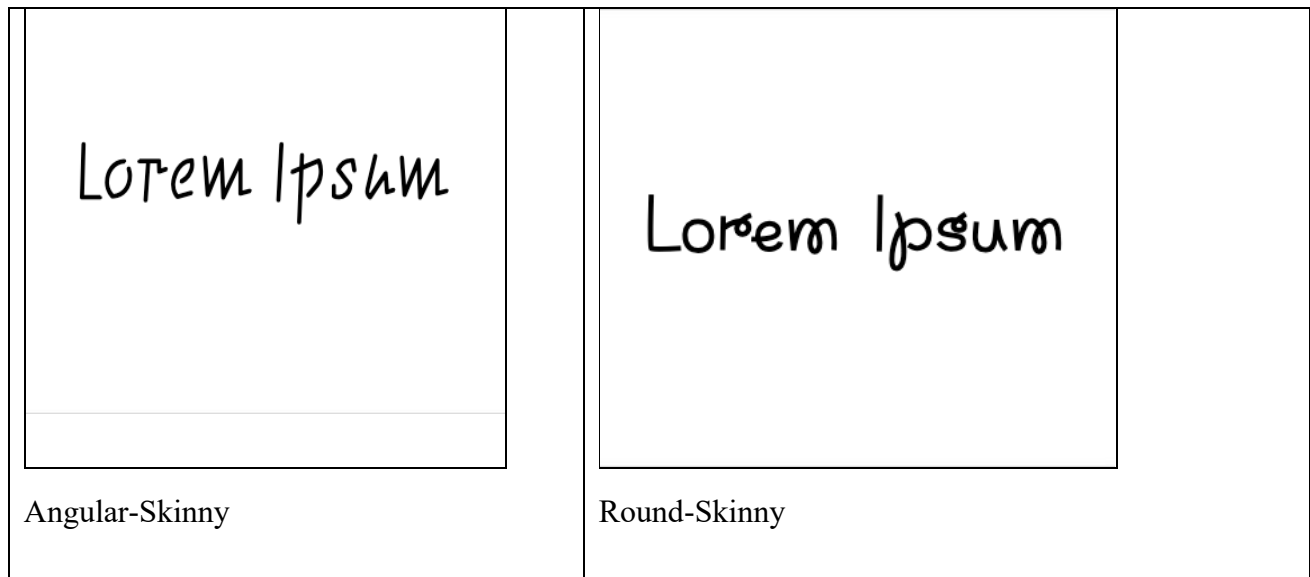
Main Experiment. Four hundred participants were recruited via Prolific Academic (49.5% Female, $M_{\text{age}} = 25.6$ years, $SD_{\text{age}} = 7.9$). Five participants were excluded for failure to enter a valid Prolific Academic ID or else entering an incorrect study code. The participants were paid £0.50 in

exchange for taking part in an experiment estimated to take five-minutes (in accordance with Prolific Academic’s policy of paying a minimum of £6.00 per hour).

Typeface stimuli. The participants were randomly assigned to one of four conditions in a 2 (curvilinearity: angular vs. rounded typeface) x 2 (thickness: bold vs. skinny typeface) between-participants experimental design. All of the participants saw a fake CD album cover with the words “Lorem ipsum” on the front in black text in a white square. Note that the participants were only told that the white squares with words were album covers so as not to add any other distinguishing features which might have confounded our results. In the angular-bold typeface condition, the participants saw the Graveblade typeface. In the angular-skinny typeface condition, participants were presented the Eletrix typeface, whereas in the rounded-bold condition, the participants were presented the Eds Market Bold Script typeface instead. In the rounded-skinny condition, the participants were presented the Annabelle typeface. See Figure 1 for a chart of all typefaces used.

Figure 1. Visual stimuli presented to participants (fake CD album covers) in Experiment 1.



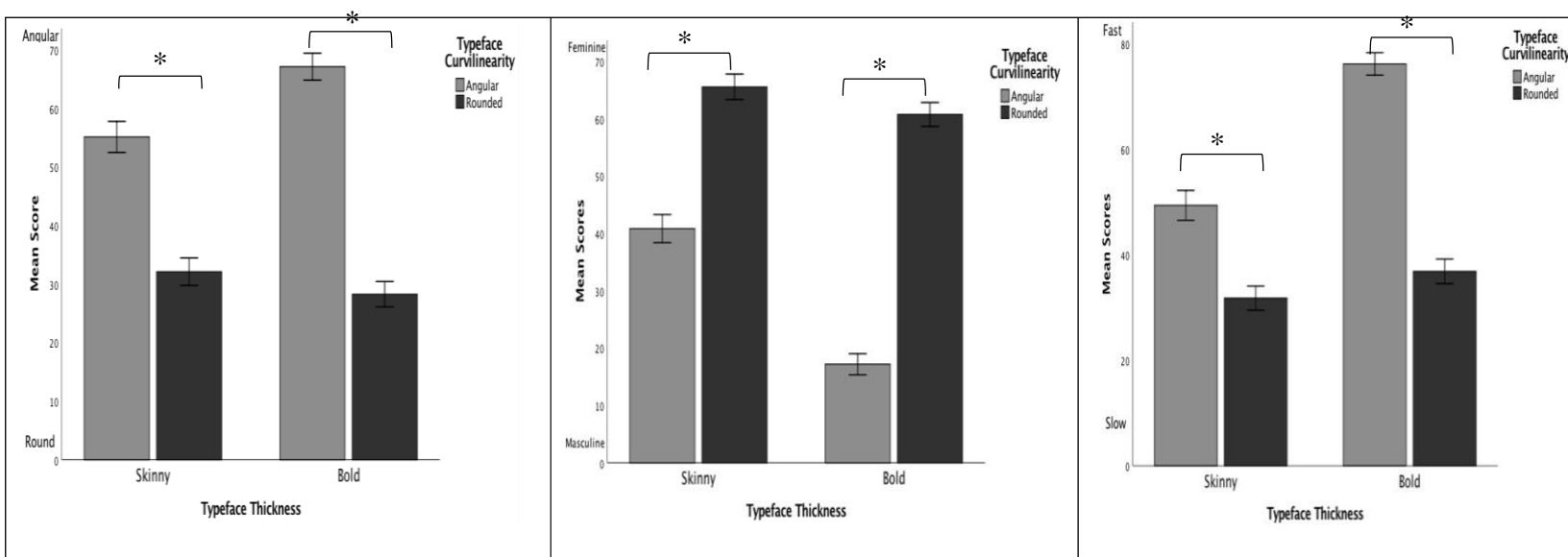


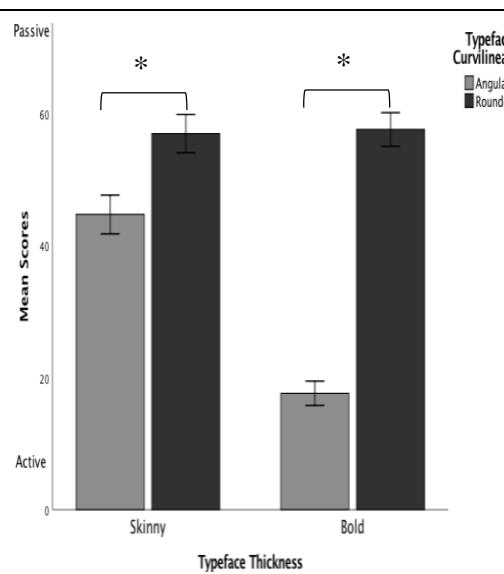
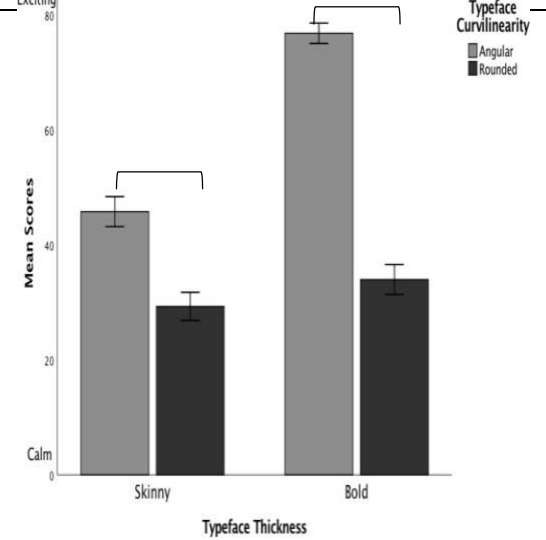
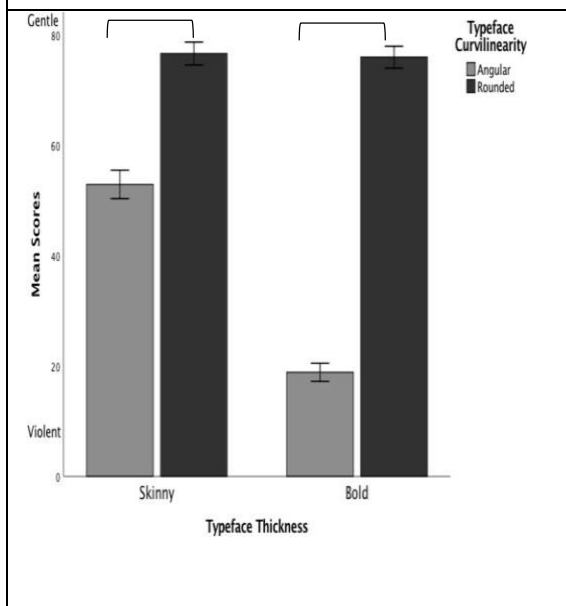
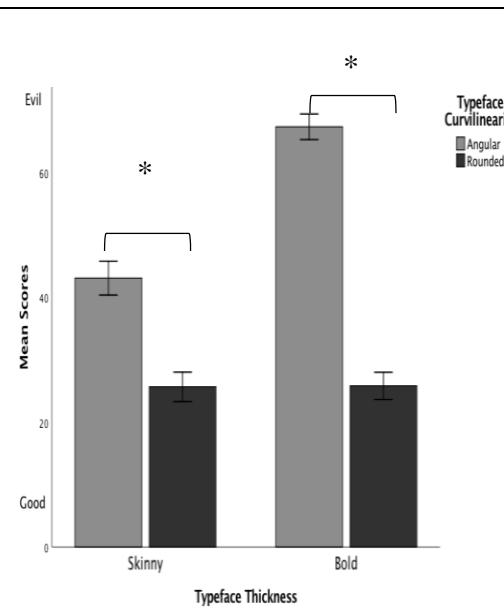
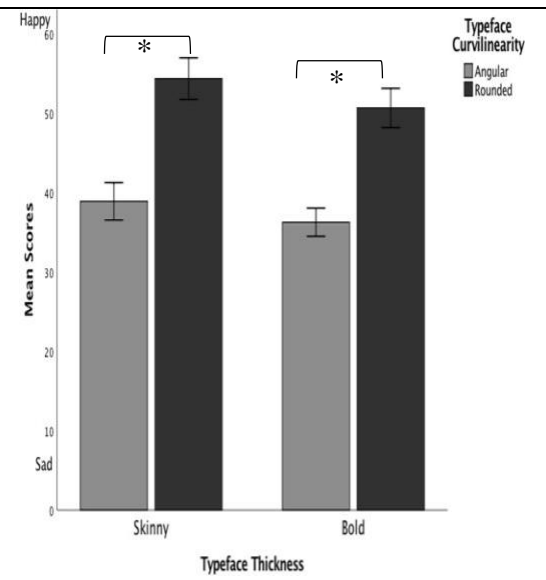
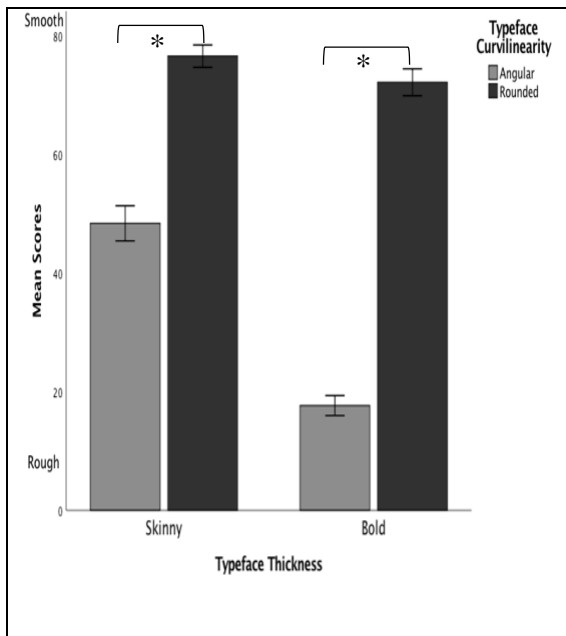
The participants were told to look at the CD album cover and predict/imagine how the music would sound on a series of 9 bi-polar adjective scales and 4 evaluative scales ranging from 0 – 100. There were no markers along the scale to indicate points other than the 0 and 100 anchors so the participant merely dragged their cursor to a point on the line between 0 and 100 that they felt best represented their response. The order of scales presentation was randomized. The participants were instructed to move the slider along the scale to a point between two adjectives (e.g., masculine – feminine). The participants were asked to predict the perceptual qualities of how they thought the music might sound: round-angular, masculine-feminine, slow-fast, rough-smooth, sad-happy, good-evil, violent-gentle, calm-exciting, and active-passive. The participants were also asked to make general evaluations concerning expected liking, quality, sophistication, and their willingness-to-listen.

Results

A multivariate analysis of variance (MANOVA) was conducted first in order to test whether there were any main effects on the combined dependent variables. The analysis revealed an overall

statistically significant main effect of the curvilinearity of the typeface, $F(13, 380) = 35.93$, $p < .001$, Wilks $\Lambda = .449$, as well as an overall statistically significant main effect of the thickness of the typeface, $F(13, 380) = 8.30$, $p < .001$, Wilks $\Lambda = .779$. There was an overall statistically significant interaction effect between these factors, $F(13, 380) = 5.90$, $p < .001$, Wilks $\Lambda = .832$. The mean responses for angular-rounded, fast-slow, rough-smooth, happy-sad, evil-good, gentle-violent, calm-exciting, masculine-feminine, active-passive, liking, quality, sophistication, and willingness-to-listen scales are displayed in Figure 1. Note that the y-axes are different for each graph so that direction of differences in mean scores are visible.





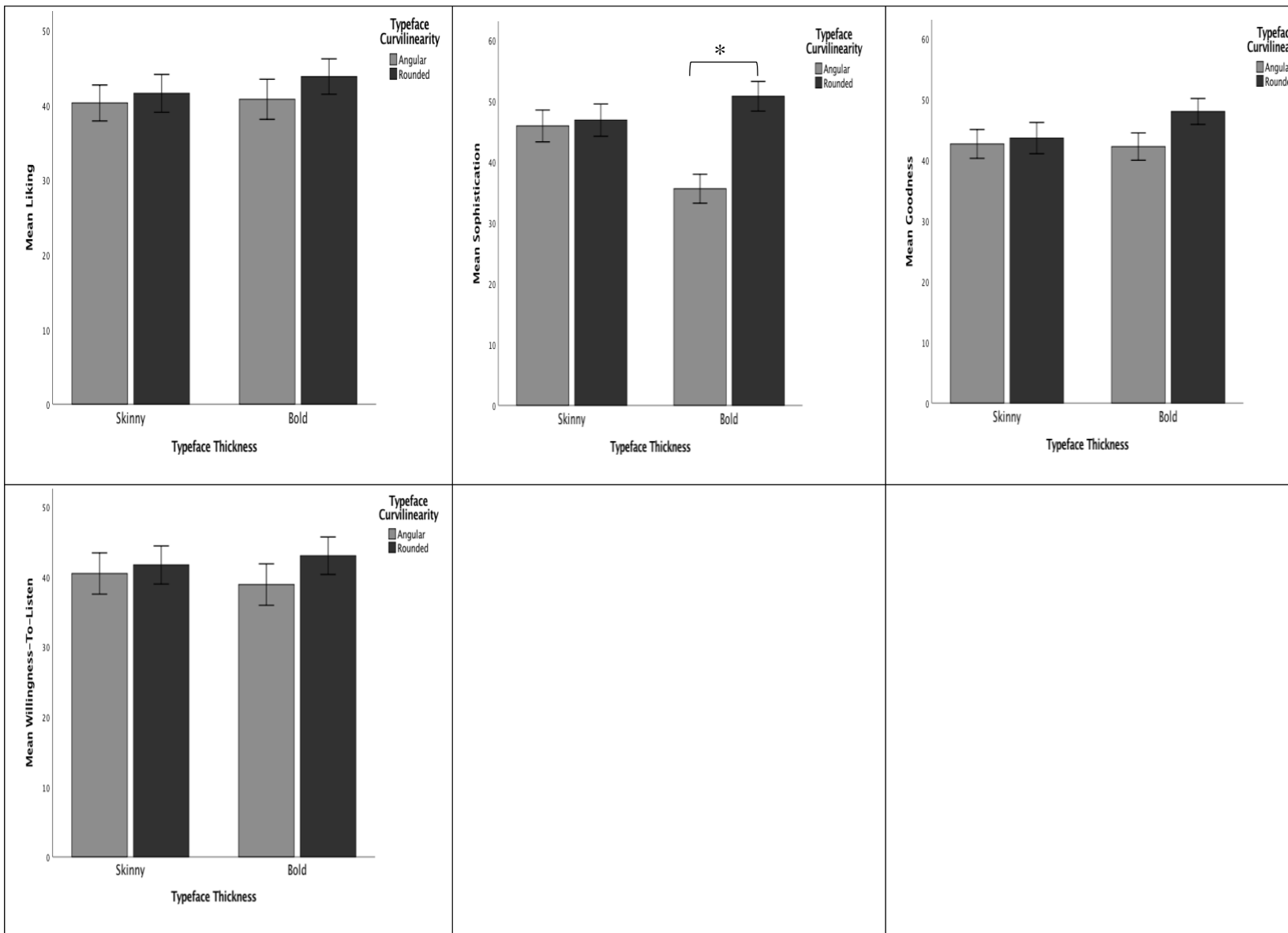


Figure 1. Mean scores by condition for all dependent variables in Experiment 1. Error bars show +/- 1 standard error. Note: * $p \leq .001$ for multiple comparisons

Univariate ANOVAs were run for each dependent variable for typeface curvilinearity, thickness, and interaction. The results are presented in Table 2.

Table 2. Univariate main effects of typeface curvilinearity, thickness and interaction for ratings of each dependent variable in terms of F value, p value, and effect size (partial eta squared) in Experiment 1. *Degrees of freedom = 1 and Degrees of Freedom Error = 392. Note – significant results $p < .01$ are in bold.*

Dependent variable	Effect	F	p	η^2
Angularity-Roundness	Curvilinearity	169.54	<.001	.30
	Thickness	2.94	.09	.01
	Curvilinearity*Thickness	11.11	<.001	.03
Masculinity-Femininity	Curvilinearity	249.55	<.001	.39
	Thickness	43.45	<.001	.10
	Curvilinearity*Thickness	19.03	<.001	.05
Slowness-Fastness	Curvilinearity	139.59	<.001	.26
	Thickness	43.86	<.001	.10
	Curvilinearity*Thickness	20.35	<.001	.05
Roughness-Smoothness	Curvilinearity	335.36	<.001	.46
	Thickness	60.49	<.001	.13
	Curvilinearity*Thickness	33.95	<.001	.08
Sadness-Happiness	Curvilinearity	41.14	<.001	.10
	Thickness	1.86	.17	.01
	Curvilinearity*Thickness	0.05	.82	.00
Goodness-Evilness	Curvilinearity	158.40	<.001	.29
	Thickness	27.15	<.001	.07
	Curvilinearity*Thickness	26.47	<.001	.06
Violence-Gentleness	Curvilinearity	370.94	<.001	.49
	Thickness	68.38	<.001	.13
	Curvilinearity*Thickness	63.26	<.001	.14
Calmness-Excitement	Curvilinearity	155.13	<.001	.28
	Thickness	56.19	<.001	.13
	Curvilinearity*Thickness	30.59	<.001	.07
Activeness-Passiveness	Curvilinearity	101.20	<.001	.21
	Thickness	26.12	<.001	.06
	Curvilinearity*Thickness	28.53	<.001	.07
Liking	Curvilinearity	0.75	.39	.00

	Thickness	0.30	.58	.00
	Curvilinearity*Thickness	0.12	.73	.00
	Curvilinearity	10.23	<.001	.03
Sophistication	Thickness	1.61	.21	.00
	Curvilinearity*Thickness	7.94	.01	.02
	Curvilinearity	2.07	.15	.01
Quality	Thickness	0.71	.40	.00
	Curvilinearity*Thickness	1.06	.30	.00
	Curvilinearity	0.89	.35	.00
Willingness-to-listen	Thickness	0.00	.96	.00
	Curvilinearity*Thickness	0.26	.61	.00

Pairwise comparisons were conducted for significant effects of typeface curvilinearity, typeface thickness, and the curvilinearity-thickness interaction (see Tables 3 - 5).

Table 3. Pairwise comparisons for all significant effects for round and angular typeface conditions in Experiment 1. *Note $p < .05$ for multiple comparisons and that the second adjective has a higher value.*

Dependent variable	Typeface curvilinearity	Mean	SE	P
Angularity-Roundness	Angular	61.15	1.67	<.001
	Rounded	30.21	1.69	<.001
Masculinity-Femininity	Angular	29.04	1.52	<.001
	Rounded	63.18	1.54	<.001
Slowness-Fastness	Angular	62.87	1.70	<.001
	Rounded	34.37	1.71	<.001
Roughness-Smoothness	Angular	33.04	1.59	<.001
	Rounded	74.42	1.61	<.001
Sadness-Happiness	Angular	37.61	1.64	<.001
	Rounded	52.55	1.66	<.001
Goodness-Evilness	Angular	55.19	1.65	<.001
	Rounded	25.73	1.66	<.001
Violence-Gentleness	Angular	35.92	1.48	<.001
	Rounded	76.36	1.49	<.001
Calmness-Excitement	Angular	61.35	1.68	<.001

Activeness-Passiveness	Rounded	31.66	1.69	<.001
	Angular	31.16	1.83	<.001
Sophistication	Rounded	57.25	1.84	<.001
	Angular	40.79	1.78	<.001
	Rounded	48.87	1.80	<.001

Table 4. Pairwise comparisons for all significant effects for skinny and bold typeface conditions in Experiment 1. *Note $p < .01$ for multiple comparisons and that the second adjective has a higher value.*

Dependent variable	Typeface curvilinearity	Mean	SE	P
Masculinity-Femininity	Skinny	53.23	1.53	<.001
	Bold	38.99	1.53	<.001
Slowness-Fastness	Skinny	40.63	1.71	<.001
	Bold	56.60	1.71	<.001
Roughness-Smoothness	Skinny	62.52	1.60	<.001
	Bold	44.94	1.60	<.001
Goodness-Evilness	Skinny	34.36	1.66	<.001
	Bold	46.56	1.66	<.001
Violence-Gentleness	Skinny	64.82	1.49	<.001
	Bold	47.46	1.49	<.001
Calmness-Excitement	Skinny	37.57	1.69	<.001
	Bold	55.44	1.69	<.001
Activeness-Passiveness	Skinny	50.82	1.83	<.001
	Bold	37.59	1.83	<.001

Table 5. Pairwise comparisons for all significant effects for curvilinearity-thickness interaction effect in Experiment 1. *Note $p < .01$ for multiple comparisons and that the second adjective corresponds to a higher value e.g higher values = more feminine and lower values = more masculine.*

Dependent variable	Typeface curvilinearity	Typeface thickness	Mean	SE	p
Masculinity-Femininity	Angular	Skinny	40.87	2.15	<.001
		Bold	17.21	2.15	<.001

Slowness-Fastness	Round	Skinny	65.59	2.17	<.001
		Bold	60.78	2.17	<.001
	Angular	Skinny	49.44	2.40	<.001
		Bold	76.29	2.40	<.001
Roughness-Smoothness	Round	Skinny	31.83	2.42	<.001
		Bold	36.92	2.42	<.001
	Angular	Skinny	48.41	2.25	<.001
		Bold	17.67	2.25	<.001
Goodness-Evilness	Round	Skinny	76.62	2.27	<.001
		Bold	72.21	2.27	<.001
	Angular	Skinny	43.07	2.33	<.001
		Bold	67.31	2.33	<.001
Violence-Gentleness	Round	Skinny	25.65	2.35	<.001
		Bold	25.81	2.35	<.001
	Angular	Skinny	52.95	2.09	<.001
		Bold	18.88	2.09	<.001
Calmness-Excitement	Round	Skinny	76.69	2.11	<.001
		Bold	76.03	2.11	<.001
	Angular	Skinny	45.82	2.37	<.001
		Bold	76.87	2.37	<.001
Activeness-Passiveness	Round	Skinny	29.32	2.40	<.001
		Bold	34.00	2.40	<.001
	Angular	Skinny	44.70	2.58	<.001
		Bold	17.62	2.58	<.001
	Round	Skinny	56.94	2.61	<.001
		Bold	57.56	2.61	<.001

Principal Components Analysis

Because a large number of dependent variables were collected, a factorial analysis was conducted to see if these variables could be consolidated into a smaller number of composite variables. The 13 dependant variables were subjected to principal components analysis (PCA). The suitability of this approach was tested first. The correlation matrix revealed the presence of several coefficients above 0.3. The Kaiser-Meyer-Okin value was .898, thus attaining the recommended value of .6 (Kaiser, 1970, 1974) and the Bartlett's test of sphericity (Bartlett, 1954) reached statistical significance, thus supporting the factorability of the correlation matrix. PCA revealed the presence of three components with eigenvalues over 1, explaining 43.48%, 22.25%, and 9.35% of the

variance, respectively. Two components were kept, based on the inspection of the scree plot. In addition, the two-component solution met the interpretability criterion. As such, two components were retained. The two-component solution explained 65.74% of the total variance. A Varimax orthogonal rotation was performed. Component 1 consisted of the following variables: violence-gentleness (.909), roughness-smoothness (.906), calmness-excitement (-.846), masculinity-femininity (-.818), activeness-passiveness (.765), goodness-evilness (-.750), and roundness-angularity (-.715). Component 2 consisted of the following variables: liking (.910), quality (.895), willingness-to-listen (.884), sophistication (.650), and sadness-happiness (.315). See Figure 2 for a loading plot from the PCA conducted on the dependent measures.

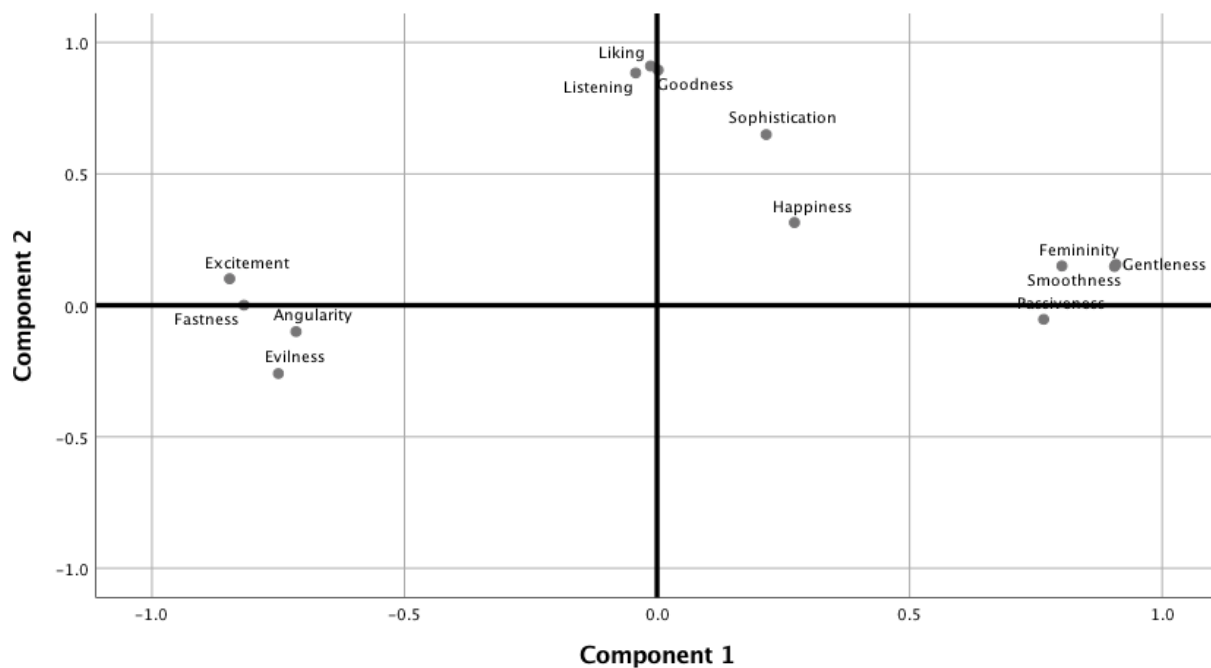


Figure 2: Loading plot from the PCA conducted on the dependent measures of expectations about music in Experiment 1. Note that higher rating on the scale corresponds with responses for roundness and lower ratings with angularity.

The results of the PCA are consistent with previous research that has used factorial analysis of semantic differential data to measure the underlying concepts and factors that might explain people's attitudes and judgements about various kinds of stimuli (Osgood, 1952; Osgood & Suci, 1955; Osgood et al., 1957). Previous research studying perception of shape, odours, and taste show that people's judgements can typically be explained by three categories- valence, arousal, and intensity (Etzi et al., 2016; Osgood, 1952; Osgood & Suci, 1955; Salgado-Montejo et al., 2015; Wang, Wang, & Spence, 2016). Valence refers to scales such as good/bad, pleasant/unpleasant, etc., arousal refers to scales such as active/passive, smooth/rough, calm/excited, etc., while potency refers to scales such as strong/weak; powerful/powerless etc. (Etzi et al., 2016). From the results of our PCA, it would appear that components 1 and 2 represent arousal and valence, respectively. The arousal component had loadings on activeness-passiveness, violence-gentleness, roughness-smoothness, masculinity-femininity, goodness-evilness, and roundness-angularity, and calmness-excitement. The valence component had loadings on liking, quality, willingness-to-listen, sophistication, and sadness-happiness. This is in line with previous research which suggests that people evaluate both music and visual art in terms of valence and arousal (Campos-Bueno, DeJuan-Ayala, Montoya, & Birbaumer, 2015; Roda, Canazza, & DePoli, 2007).

Discussion

The results of Experiment 1 support the hypothesis that the curvilinearity of typeface influences people's expectations concerning music. While we made no predictions concerning the influence of typeface thickness on people's expectations about the music, there was an effect of typeface thickness and a significant interaction term for ratings of expected masculinity, fastness, roughness, evilness, violence, excitement, activeness, and sophistication. Furthermore, thickness

only influenced expectations about the music for conditions of CD album covers with angular but not rounded typefaces. Specifically, people expected the music in the album cover displaying angular-bold typeface to be significantly more angular, fast, evil, violent, rough, active, and exciting compared to the other conditions. Furthermore, people expected the music in the angular-skinny typeface condition to be significantly more sophisticated than in the angular-bold typeface condition.

One possible explanation for why we did not observe a significant difference between musical expectations for the bold and skinny rounded typefaces is that the typefaces might have been perceived as more similar to each other than the two angular typefaces. One limitation with these experiments is that the typefaces differed between the thickness conditions because the typefaces chosen were specialty typefaces from the Adobe fonts library and hence bold and skinny variations of the same font were not always available. This limitation is further discussed in the General Discussion. Hence, although the pre-test found no significant differences of angularity or roundedness between the angular and rounded typefaces, respectively, it is possible that minor differences in their appearance could explain why the interaction effect between curvilinearity and thickness was not observed for the rounded typefaces. Another possibility is that boldness may emphasize the sharp edges in the angular typeface whereas the boldness is less relevant for round typefaces because there are no sharp angles to emphasize.

Furthermore, no significant main effects of typeface curvilinearity and thickness were found on ratings of liking, quality, and willingness to listen. It is possible that asking people to make more general evaluations about liking a piece of music they have never heard may be a strange request as participants responses were all clustered near the midpoint of the slider scale.

Additionally, while the results of the results of the PCA generally indicate that people's evaluations of music can be categorized according to valence and arousal, there are a few scales which do not seem to neatly fall within the categories of valence and arousal. For example, the PCA classified both goodness-evilness and masculinity-femininity in the same component even though these scales don't necessarily cohere as well with the other scales within this component. For the purpose of the following experiments, however, we will treat both goodness-evilness and masculinity-femininity as arousal variables based on the results of the PCA and treat this as one of the limitations of our study.

Having demonstrated that typeface influences people's expectations of how the music will sound, we now go on to investigate whether typeface can actually influence people's perceptions of how music sounds. Specifically, we are interested in understanding whether typeface can influence peoples' perceptions of arousal and valence in a clip of neutral music.

Experiment 2: CD Album Typeface and the Perception of Neutral Music

The results of Experiment 1 demonstrated that the properties of the typeface displayed on blank album covers influenced people's expectations concerning how the music would sound. In this study, we were interested in understanding whether the typeface on CD album covers would influence people's actual perception and evaluation of music. In order to address this question, a 'neutral'-sounding piece of music was chosen based on a pre-test. What is called 'neutral' music is actually a piece of music that was rated as neither distinctly angular nor distinctly round sounding.

In the main study, the same 2 (curvilinearity: angular vs. round) x 2 (thickness: bold vs. skinny) between-participants design used in Experiment 1 was used. The participants rated the

neutral music clip on the same dependent variables used in Experiment 1. The variables were then averaged to calculate a composite *Arousal* score and *Valence* score (based on the results from the PCA in Experiment 1, which indicated that the dependent variables collected reduced to two main components).

A main effect of typeface curvilinearity on *Arousal* score was predicted based on the results from Experiment 1. In Experiment 1, people expected high arousal music in angular typeface conditions and low arousal music in round typeface conditions. Similarly, it was anticipated that the neutral music will be perceived as more arousing in angular typeface conditions than round typeface conditions because of differences in expectations about how the music will sound based on the visual stimuli. No predictions were made concerning the effect of typeface curvilinearity on *Valence* score. Furthermore, no predictions about typeface thickness or a curvilinearity- thickness interaction effect were made.

Methods

Pre-test. In the pre-test, participants were presented with nine different 15 second audio clips. The clips were edited to 15 seconds because previous research has shown that people need a minimum of 8 seconds to register an emotional response in musical stimuli (Bachorik, Bangert, Loui, Lark, Berger, Rowe, & Schlaug, 2009). The audio clips were chosen from albums of production music that had been used for film and television trailers such that they varied in style, affect, and genre but were not readily recognizable. The participants were asked to indicate how angular or rounded each audio clip was on a set of slider scales. Fifty-one participants were recruited via Prolific Academic. The participants were paid £0.30 as compensation for taking part in this 3-minute study (in accordance with Prolific Academic's policy of paying a minimum of £6.00 per hour).

Participants heard the nine audio clips of music that varied in terms of their tempo, instrumentation, and affect. They were presented in a randomized order and participants rated the angularity/roundedness of each audio clip on a scale ranging from 0 = very rounded to 100 = very angular. Participants were asked to indicate if they had previously heard the music clips.

Participants were not familiar with any of the music clips.

A one-way ANOVA determined that there was a significant main effect of the audio clip $F(8, 458) = 23.84, p < .001$. Bonferroni-corrected pairwise comparisons revealed that the most neutral (i.e., neither significantly angular nor round sounding) audio clip was the Jessica Jones' trailer music ($M = 49.57, SD = 27.69, p < 0.05$, for all multiple comparisons).

Main Experiment. Four-hundred participants (43.5% Female, $M_{age} = 27.9$ years, $SD_{age} = 9.7$) were recruited via Prolific Academic. One participant was excluded for entering an incorrect study code. The participants were paid £0.30 in exchange for taking part in this 3-minute study (in accordance with Prolific Academic's policy of paying a minimum of £6.00 per hour). The approximate duration of the study was calculated using the average duration for the Experiment 1.

Stimuli. The participants were randomly assigned to one of four conditions in a 2 (curvilinearity: angular vs rounded typeface) x 2 (thickness: bold vs. skinny typeface) between-participants experimental design. All of the participants saw the same faux CD album covers as used in Experiment 1. All of the participants in all of the conditions heard the exact same neutral music clip (the Jessica Jones trailer music clip chosen based on the pre-test).

The participants were instructed to listen to a 15 second audio clip from a new single and were also presented with an image of the single's CD album cover. The participants then answered

questions about the music in the audio clip on the same series of questions assessing music perception and evaluation presented in Experiment 1.

Results

First, the data was transformed such that the scales were arranged from low arousal – high arousal (e.g. slow-fast). For the purpose of this study, we assumed “good” was low arousal and “evil” was high arousal and “feminine” was low arousal and “masculine” was high arousal (discussed further in the limitations section). Mean response for each dependent variable were calculated for each condition and a by-item analysis was conducted. A reliability analysis indicated that the questions assessing arousal – round-angular, masculine-feminine, slow-fast, rough-smooth, good-evil, violent-gentle, calm-exciting, and active-passive – formed a reliable scale ($\alpha=.749$) and therefore, they were averaged into a single *Arousal* measure. A reliability analysis also indicated that the questions assessing valence – sad-happy, liking, quality, sophistication, and willingness-to-listen – formed a reliable scale ($\alpha=.831$) and therefore, they were averaged into single *Valence* measure.

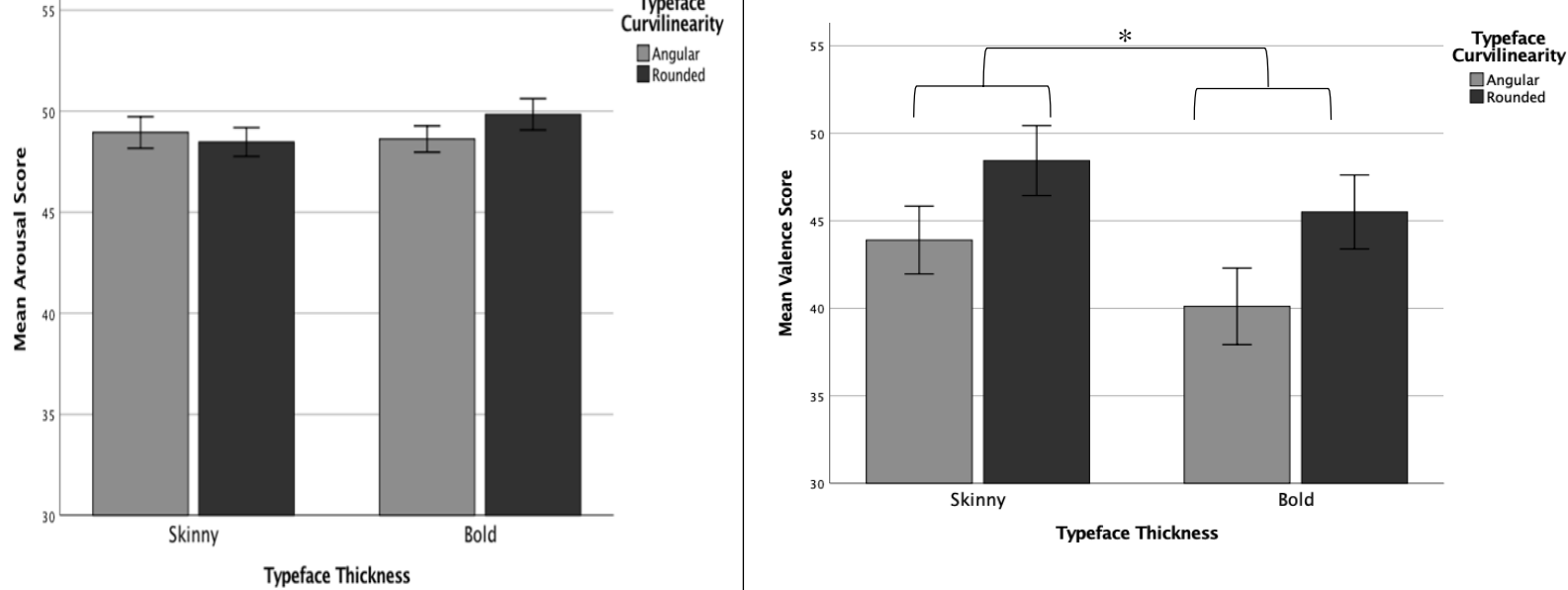


Figure 3: Mean responses for *Arousal* and *Valence* for each condition in Experiment 2. Error bars represent ± 1 standard error. Note: $*p < .05$

The results were analysed using a 2 (curvilinearity) x 2 (thickness) ANOVA. For *Arousal* score, there was no significant main effect of typeface curvilinearity or thickness, and no significant curvilinearity-thickness interaction. For *Valence* score, however, there was a significant main effect of typeface curvilinearity $F(1,395) = 5.80$, $p = .016$, $\eta^2 = .014$. Pairwise comparisons revealed that the *Valence* score was lower for angular typeface conditions ($M = 42.00$, $SE = 1.46$) than for round typeface conditions ($M = 46.97$, $SE = 1.46$), $p = .016$ for all comparisons. Mean responses for *Arousal* score and *Valence* score for each condition are displayed in Figure 2.

Discussion

The results of Experiment 2 show that typeface curvilinearity on CD album covers influences perception of valence but not arousal in neutral music. Specifically, the music was rated higher on valence in the round typeface conditions. This is supported by previous research which

shows that people prefer round typefaces over angular typefaces (Velasco, Salgado-Montejo, Marmolejo-Ramos, & Spence, 2014). Hence, there might be a transference of general positive valance of the pleasing typeface to perceived positive valance in the music (Velasco et al., 2014).

One possible reason why typeface didn't influence arousal ratings for the neutral music is because once the participants had been given an actual music sample to listen to, the impact of typeface was less salient in influencing people's perception of the music unlike in Experiment 1 where expectations about the music were solely based on visual information. Furthermore, the effect sizes in Experiment 2 were notably smaller than the effect sizes in Experiment 1, which is also most likely due to the fact that once participants were given an audio clip to listen to, people were no longer answering solely based on their expectations of what the music might sound like. Hence, it is possible that typeface became less salient when there was an actual music clip to listen to.

It is, however, also equally possible that there was a disconfirmation of expectation such that people's expectations of musical arousal based on typeface were too far removed from the reality of how the music sounded and hence typeface curvilinearity couldn't affect how arousing the music sounded (Piqueras-Fiszman & Spence, 2015). A future study may wish to ask participants whether the music met their expectations based on the typeface they saw as previous research has suggested that if experiences are very different from expectation, then the influence of expectation –e.g., based on the typeface stimulus – is ignored (Carvalho & Spence, 2019; Shermer & Levitan, 2010; Wang, Keller, & Spence, 2017; Woods, Lloyd, Kuenzel, Poliakoff, Dijksterhuis, & Thomas, 2011 NB: these exemplars didn't use typeface to influence expectation but used other visual and gustatory cues to influence expectation).

It is interesting to note that, unlike in Experiment 1, there were no observed interaction effects. This suggests that that typeface curvilinearity may be more important than typeface thickness in influencing people's expectations, or perception, of music.

One major limitation of this study is that, because two of the scales in the arousal component don't necessarily have to do with arousal (goodness-evilness and masculinity-femininity), the transformation of these two scales such that the scale went from low to high arousal was arbitrary. We assumed that goodness and femininity were low arousal and that evilness and masculinity were high arousal. Another limitation of this study is that was no audio test to ensure that participants had actually heard the music clip. Finally, participants only heard one piece of music and, while they may not have readily recognized the song, it is possible that the song might have evoked some specific associations. Future iterations of this study may wish to use multiple neutral sounding music clips.

Experiment 3: **CD Album Typeface and Perception of Angular/Round Music**

The results of Experiment 2 demonstrated that the properties of the typeface displayed on CD album covers influenced people's perceptions and evaluations of neutral music. This study investigated whether the congruency or incongruency of CD album typeface with music itself would also influence people's perception of arousal and valence of music. In order to address this question, a pre-test was conducted in order to determine what clips of music sound most 'angular' or 'round'. Then, participants listened to either the angular or round music and responded to the same dependent variables assessing arousal and valence presented in the previous studies. A 2

(curvilinearity: angular vs. round) x 2 (thickness: bold vs. skinny) x 2 (music: angular vs. round) between-participants experimental design was used.

We predicted a significant main effect of typeface curvilinearity on *Valence* score such that music in congruent typeface-music conditions (angular typeface-angular music and round typeface-round music conditions) would be rated higher on valence than music in incongruent typeface-music conditions (angular typeface-round music and round typeface-angular music conditions). Previous research in crossmodal correspondences has demonstrated that sensory stimuli are rated higher on liking when presented in congruent versus incongruent combinations (e.g. Sakai et al., 2005; Schifferstein & Verlegh, 1999; Seo & Hummel, 2011). This is likely due to higher processing fluency in contexts with congruent sensory stimuli, as neuroimaging studies have demonstrated that participants are faster at detecting odours when presented in congruent odour-picture combinations than in incongruent odour-picture combinations (Gottfried & Dolan, 2003; Reber, Schwarz, & Winkielman, 2004; Winkielman, Schwarz, Fazenderio, & Reber, 2003; Winkielman, Ziembowicz, & Nowak, 2015). No effects of typeface curvilinearity or thickness on *Arousal* score were expected because this experiment tested edge case scenarios i.e., an angular typeface is unlikely to make an angular piece of music sound even more arousing.

Methods

Pre-test. In the pre-test, the participants were presented with nine different 15 second audio clips. The audio clips were chosen from albums of production music that had been used for film and television trailers such that they varied in style, affect, and genre but are not recognizable. We specifically chose to use music from production music soundtracks because the music is not actually featured in the films or television shows and are therefore not easily recognizable. The

participants were asked to indicate how angular or rounded each audio clip was on a set of slider scales. Fifty-one participants were recruited via Prolific Academic. The participants were paid £0.03 as compensation for taking part in this 3-minute study (in accordance with Prolific Academic's policy of paying a minimum of £6.00 per hour).

Participants heard the nine audio clips of music that varied in terms of their tempo, instrumentation, and affect. The audio clips were presented in a randomized order and participants rated how angular/round they felt each audio clip was on a 100-point scale ranging from 0 = very rounded to 100 = very angular. Participants were asked to indicate if they had previously heard the music clips. Participants were not familiar with any of the music clips.

A one-way ANOVA determined that there was a significant main effect of the audio clip $F(8, 458) = 23.84, p < .001, \eta^2 = .30$. Bonferroni-corrected pairwise comparisons revealed that the most angular sounding music clips were the 'Fantastic Beasts: The Crimes of Grindelwald' trailer music ($M = 67.10, SD = 29.72, p < 0.001$, for all comparisons with round music), the "Venom" trailer music ($M = 67.57, SD = 24.91, p < .001$ for all comparisons with round and neutral music) "Assassin's Creed Odyssey" trailer music ($M = 68.14, SD = 27.17, p < 0.01$, for all multiple comparisons with round and neutral music). There were no significant differences in ratings of angularity between these three music clips. The most round sounding music clips were "The Crown" trailer music ($M = 23.55, SD = 25.67, p < .001$, for all comparisons with angular neutral music), the "Theory of Everything" trailer music ($M = 29.29, SD = 22.65, p < .005$ for all comparisons with angular and neutral music), and "The Shape of Water" trailer music ($M = 29.18, SD = 24.75, p < .001$, for all comparisons with angular and neutral music). Hence, the "Fantastic Beasts: The Crimes of Gindelwald" trailer music was chosen for the angular music clip and "The Crown" trailer music for the round music clip.

Main Experiment. Four hundred and eighty participants (43.6% Female, $M_{\text{age}} = 30.0$, $SD_{\text{age}} = 11.1$) were recruited via Prolific Academic (N=60 per condition) and paid £0.20 in exchange for taking part in the study (in accordance with Prolific Academic’s policy of paying a minimum of £6.00 per hour). Three participants were excluded for failure to enter the correct study code. The approximate duration of the study was calculated using the average duration for Experiment 2. Three people were excluded for not entering the correct study code.

Stimuli. The participants were randomly assigned to one of eight conditions in a 2 (shape: angular vs rounded typeface) x 2 (thickness: bold vs. skinny typeface) x 2 (music: angular vs. round) between-participants experimental design. All of the participants saw the same fake CD album covers that had been used in Experiments 1 and 2.

The participants were instructed to listen to a 15-second audio clip from a new single called “Lorem Ipsum” and were also presented with an image of the single’s CD album cover (presentation of music and image was simultaneous). The participants then answered questions about the music in the audio clip on the same set of dependent variables as the previous experiments.

Results

The results were analysed using a 2 (curvilinearity: angular vs. round) x 2 (thickness: skinny vs. bold) x 2 (music: angular vs. round) ANOVA. For *Arousal* scores (calculated using the same method as Experiment 2), there was no significant main effect of shape, thickness, or any significant interaction effects. There was, however, a significant main effect of music, $F(1, 469) = 97.36$, $p < .001$, $\eta^2 = .172$. Pairwise comparisons revealed higher *Arousal* scores for the angular music ($M = 52.66$, $SE = .42$) than for the round music ($M = 46.87$, $SE = .41$), $p < .001$ for all

comparisons. Similarly, for *Valence* scores, there was no significant main effect of shape, thickness or any significant interaction effects. There was a significant main effect of music, $F(1, 469) = 28.45$, $p < .001$, $\eta^2 = .057$. Pairwise comparisons revealed higher *Valence* scores for angular music ($M = 54.87$, $SE = 1.19$) than for round music ($M = 45.92$, $SE = 1.18$), $p < .001$ for all comparisons.

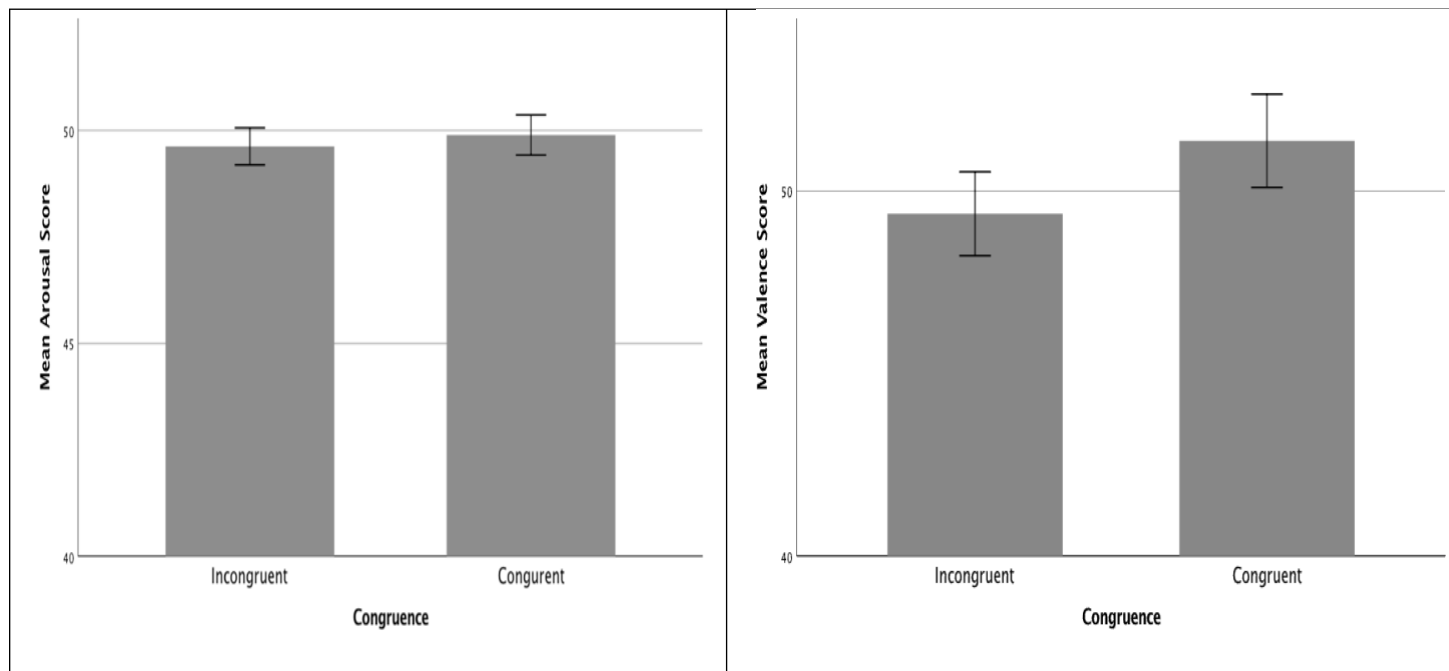


Figure 4. Mean responses by congruence condition for Experiment 3. Error bars indicate ± 1 standard error.

Furthermore, independent samples T-tests were conducted to determine if there was a significant difference between *Arousal* and *Valence* scores between the congruent (angular typefaces with angular music and round typefaces with round music) and incongruent (angular typefaces with round music and round typefaces with angular music) conditions. As predicted, there were no significant differences in *Arousal* scores between the congruent and incongruent

conditions. Surprisingly, however, the predicted difference in *Valence* scores between congruent and incongruent conditions was not found (see Figure 4).

Discussion

The hypothesis that *Valence* scores would differ between the congruent and incongruent conditions was not supported by these results. Furthermore, unlike in Experiment 2, there were no significant main effects of typeface curvilinearity and thickness on *Valence* scores. There was also no significant difference in *Arousal* scores between the congruent and incongruent conditions. It is possible that there were differences in how much people enjoyed each music clip which may have overpowered any differences the congruency conditions may have had on ratings of valence, although this cannot be confirmed since ratings of preference were not collected in the pre-test. In hindsight, it might have been helpful to collect hedonic ratings of all the music samples in the pre-test.

Like in Experiment 2, there were no significant main effects of typeface curvilinearity and thickness on *Arousal* scores. This is most likely due to the fact that the music is such a powerful and salient stimulus that the typeface doesn't influence how the music sounds. Since the music samples used were already extremely angular or round sounding, it is unlikely that typeface would further influence perception of the music.

There was, however, a significant main effect of music for both *Valence* and *Arousal* scores, which suggests that our manipulation was successful and that people rated the two music clips differently in terms of their valence and arousal. Specifically, angular music was rated as more arousing than round music. Interestingly, however, angular music was also rated as higher

on valence than round music, even though previous literature suggests that people prefer round objects to angular ones. There are several possible explanations for this. First, perhaps people prefer round visual stimuli but not necessarily ‘round’ auditory stimuli. Second, people may have just liked the angular music much more than the round music.

Like with Experiment 2, a limitation of this study is that there was no audio check question to ensure that people were actually listening to the music clips. However, given that there is a significant main effect of music, it suggests that participants must have been listening to the music at least some of the time.

General Discussion

The results of Experiment 1 confirm the hypothesis that the typeface present on a faux CD album cover can influence people’s expectations concerning the music that they would hear. Specifically, the participants expected the music to sound more angular, masculine, fast, rough, happy, evil, violent, exciting, and active when the typeface on the CD album cover was angular than when it was round. Conversely, the music was expected to sound more round, feminine, slow, smooth, sad, good, gentle, calm, and passive when the typeface on the CD album cover is round than when it is angular. The results of the PCA suggest that the dependent variables used in Experiment 1 assessed two main dimensions of music: namely, valence and arousal. Recent computational research has proposed that low level sensory properties of shapes and sounds is related to emotional arousal which might explain why people expected music in angular typeface conditions to sound different from the round typeface conditions (Sievers, Lee, Haslett, & Wheatley, 2019). Specifically, the frequency spectrum of a stimulus, the spectral centroid, of both visual and auditory stimuli can predict judgements about emotional arousal (Sievers et al., 2019).

It would be interesting to see if this analytic framework helps explain why people expect music to sound different between the two typeface conditions and whether the spectral centroids of angular typefaces and angular sounding music are relatively higher than the spectral centroids of round typefaces and round sounding music.

In the subsequent experiments, we measured how CD album cover typeface influences participants' perception of valence and arousal of music while they were actually listening to a piece of music. The results of Experiment 2 demonstrated that typeface on a CD album cover influences perception of the valence of neutral music but not arousal. Specifically, participants evaluated music as higher in overall *Valence Score* (i.e., higher in liking, goodness, willingness-to-listen, and happiness) in the round typeface conditions. This is perhaps due to people's overall preference for round over curved objects (e.g., Bar & Neta, 2006; Cotter, Silvia, Bertamini, Palumbo, & Vartanian, 2017; Leder, Tinio, & Bar, 2011; Velasco et al., 2015). Previous research has suggested that curved typefaces are associated with emotion of positive valence while angular typefaces are associated with emotions carrying negative valence (Kastl & Child, 1968; Morrison, 1986; see Velasco & Spence, 2019, for a review of typeface associations). Furthermore, consumer research has shown that packaging with curved lines communicates positive valence, thereby influencing positive consumer evaluations and intent to purchase (Salgado-Montejo, Leon, Elliot, Salgado, & Spence, 2015). A similar mechanism may underlie why people evaluate music more positively when presented with an album cover with a round typeface on it.

Finally, Experiment 3 showed that typeface on CD album covers does not influence perception of arousal or valence of music in boundary conditions (very round and angular sounding music). This is likely because there is a ceiling effect. Research in the realm of shape-taste correspondence has shown that shape only influences perception of sweetness when the sugar

concentration is below the sweetness threshold, i.e., the sugar concentration at which the sweetness detection is still small but people are above chance at detecting the sweet taste (Liang, Roy, Chen, & Zhang, 2013; Velasco, Hyndman, & Spence, 2018). In Experiment 3, the music was very obviously angular/round and therefore typeface had no impact on how the music was perceived.

There are several limitations to the above experiments, however. For one, curvilinearity and thickness were not the only things being manipulated as the four typefaces were completely different from each other. That said, the pre-test asked participants to rate the typefaces on curvilinearity so our results are still valid. However, because the typefaces were selected from a pre-existing library, we were not able to custom design fonts that only varied on curvilinearity and boldness. Future studies may wish to design custom typefaces that only vary in curvilinearity and thickness (see Velasco et al., 2014 and 2015 for examples of custom designed fonts in empirical studies).

Another concern is that valence and arousal may not be the only relevant factors. For example, previous sensory studies using factorial analysis have classified words like “excitement” and “happiness” with positive valence but have ignored the arousal dimension, even though it is likely that “excitement” is both high on valence and arousal (Etzi et al., 2016). The circumplex of affect model also suggests that emotions are interrelated in a way that goes beyond just valence and arousal - they can be represented in a more complex spatial model in which affective concepts are ordered in a circle starting with pleasure (0), excitement (45), arousal (90), distress (135), displeasure (180), depression (225), sleepiness (270), and relaxation (315)- see Figure 5 (Russell, 1980).

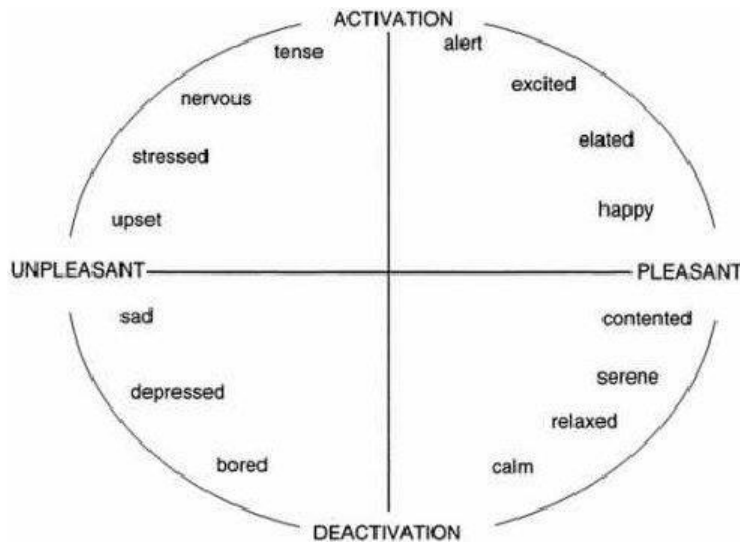


Figure 5: Circumplex model of affect as described by Russell, 1980 (reprinted from Joosten, Lankveld, & Spronck, 2010)

Furthermore, it is unclear how masculine-feminine necessarily falls into the arousal category. Future studies may wish to use an arousal-valence map and have participants rate the music on the 2D chart instead of semantic differential scales as demonstrated in Wang, Wang, and Spence (2016). There is, however, some validity to our claim that people think about music in two ways as there is a clear distinction between how people make judgments about how good a piece of music sounds (which measures valence) and how active a piece of music sounds or makes them feel (which measures arousal).

Future studies may also wish to collect data on people's sense of familiarity for each typeface as there is a relationship between familiarity and fluency (Westerman, Lanska, & Olds, 2014). While the typefaces used in this were not from the default library available on Microsoft Office, it is possible that might have felt a sense of familiarity and associated the typefaces with familiar brands e.g., band logos.

Furthermore, certain typefaces may be more strongly associated with certain genres of music, which may, in turn, play a role in how typeface influences expectations concerning music.

For example, the angular-bold typeface may be reminiscent of heavy metal band logos such as that of Metallica (Sievers, Lee, Haslett, & Wheatley, 2019). The present studies were limited in that they only used classical sounding music. It is possible that using rock or metal music might influence people's ratings of valence when paired with angular typeface album covers because they are seen as a good fit.

Additionally, it may be strange to ask people to rate music on adjectives such as “angular” or “rounded”. People may have their own personal interpretations for what those words mean. That said, there is evidence that people reliably associate adjectives such as “smooth/prickly” and “angular/rounded” with music (Watt & Quinn 2007). Additionally, our effects were significant so participants clearly were thinking about “angular” and “round” music in some systematic way.

It is also possible that participants' own musical experiences and preferences might influence their perception of music in addition to the effects of typeface. Our younger participants may have been less familiar listening to classical music which may have influenced their judgments about the music. Future studies may wish to present participants with music from a range of musical styles and genres.

Furthermore, album titles can convey both visual and semantic information. In these studies, the album covers displayed a neutral phrase, “Lorem ipsum”, as the song title. It would be interesting to test whether there is an interaction effect on expectations, perception, and evolution of music when the semantic content of song titles e.g., “Blue Bayou” or “Killing Spree” are written in different typefaces e.g., round vs. angular (see Lange, Heilbron, & Kok, 2018, for a review of neuroimaging data on how complex sensory and semantic associations may influence expectations).

Finally, a lot of music is intentionally incongruous, with lyrics and music that vary in affect e.g., the lyrics may be sad but the music is upbeat. Our stimuli used purely instrumental music which shows that typeface has the power to alter expectations and perception of instrumental music. However, future studies may wish to use stimuli with both lyrics and music to investigate whether typeface not only affects expectations and perception of the music but also whether it influences judgements about the lyrics.

While the aim of this study was to use an ecologically valid stimuli – digital album covers - to test the influence of typeface on expectations, perception, and evaluation of music, the CD album covers in these experiments only manipulated typeface. Usually, CD album covers contain multiple design elements such as images and colours which may all contribute to the expectations, perception, and evaluation of music. Future studies may wish to see if one could boost the differences in expectations, perception, and evaluation of music by placing the typefaces against curved/jagged backgrounds or changing the typeface colours (see Matthews, Simmonds, & Spence, 2019; Salgado-Montejo et al., 2015; Velasco, Hyndman, & Spence, 2018; Simmonds & Spence, 2017). A future study may also wish to change the position of the text on the cover as location of visual stimuli on food packaging has been shown to influence product evaluations (Simmonds, Woods, & Spence, 2018).

The findings from the experiments above are promising and contribute to the existing literature on the influence of typeface on expectations, perception, and evaluations of non-visual stimuli and how visual features influence perception and evaluations of music. Designers may find this research of interest when designing not only CD album covers but also band logos, concert posters, and lyric videos.

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