Sound and Emotion in Given Names

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An analysis of the distribution of phonemes in men's and women's names confirmed several past findings, e.g., women's names were more variable and longer, contained more vowels, and were more likely to end with a vowel, especially schwa. Assigning emotional character to individual phonemes revealed that emotional information was encoded in name sounds. Men's names included significantly more cheerful, active, nasty, and unpleasant phonemes while women's names contained more soft, pleasant, passive, and sad phonemes. Phonemic information successfully classified sex. Finally, common androgynous names were found to be emotionally feminine in their distribution of phonemes.

Introduction

According to the prevailing viewpoint (Saussure 1983, 67-68), meaning does not come from sounds but rather from the association of the object, action, or concept described (the signified) with the randomly selected sounds that refer to it (the signifier). The main tenet of sound symbolism, however, is that the distribution of sounds in words is not random. Sound symbolists such as Fónagy (1983/1991) maintain that sound patterns in words are both non-random and informative. They claim that word meaning is encoded in the sound picture of a word. Here I will look at men's and women's names in terms of their sound symbolism, and will demonstrate, using a data set of 5.5 million names, that sounds in both men's and women's names are not randomly distributed and, furthermore, that they are emotionally informative.

Sounds, Images, and Emotions

When Saussure (1983) insisted that the distribution of sounds in words was random, his main supporting evidence came from the fact

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that objects have names with different sounds in different languages, thus refuting any claim of one-to-one correspondence between sound and meaning. As a Canadian, I may call a certain fruit *apple* or *pomme,* while in my mother tongue (Greek) I would call it *meelo.* By the rule of one-to-one correspondence, identical sound patterns must appear in words from all languages describing the same object. This almost never happens. There is clearly no unique sound pattern in human languages which means 'apple'. What Saussure and those who accept his viewpoint have failed to realize, however, is that "not identical" does not mean "random." *Apple, pomme,* and *meelo* are not identical but neither are they unrelated. Two of the words contain /l/, and two contain /m/. Fónagy (1983/1991, 59, 60, 62, 68) identified /m/ and /l/ as "soft" and "tender" sounds. By sound symbolic argument, the three words would be non-identical but emotionally overlapping names for the same object. The meaning conveyed by these names would be one of softness or sweetness. It is quite possible that words which do not overlap in phonemes may overlap in terms of the meaning of the various phonemes of which they are constructed.

Neither of the two extreme positions on sound symbolism (sounds always carry meaning, sounds never carry meaning) is tenable. Saussure himself (1983, 67-68) made exceptions to his principle of random-sounding signifiers for onomatopoeia, although he believed this was not a major force in language formation.

Whissell (2000) asked volunteers to create words in a non-English language called "Drogish" for a computer game. These words described heroism, cowardice, and other attributes. The created words showed strong sound symbolism and their sounds were cluster analyzed into coherent subgroups. According to this analysis, the sounds of the created equivalents of "weak," "foolish," "suspicious," and "jumpy" were similar; the created equivalents of "sad," "happy," "wise," "trusting," "gentle," "calm," and "feminine" were grouped together on the basis of their sounds alone, as were the invented words for "hate," "strong," "brave," "nasty," "coward," and "masculine."

While the meaning of each and every word can not necessarily be read from its sound picture, aspects of the meaning of many words can

be inferred. The most supportable stance on the question of sound symbolism would be an intermediate one which states that words probably carry meaning in their sound patterns, but that this is not necessarily true for all words or for any individual word. Likely those words closest to their creation (in time, or in terms of an absence of manipulations and changes) would be among the words most likely to carry meaning in their sounds. The remainder might still carry meaning, but this meaning would be less clearly evident.

Sound symbolists point to at least two different types of meaning which are carried by the sounds in words. The first type is iconic meaning, where the sound picture serves as a metaphor (or mental image, or icon) for what is being described. Margaret Magnus (www.conknet.com/~mmagnus/lrs.html) studied the iconic meaning of words and concluded that those beginning with *br* convey specific information about breakage (examples are *branch, breach,* and *bruise*). Jakobson and Waugh (1979) cite many anecdotal examples of "large" sounds (e.g., *u* in *huge*) being used to describe large things and "small" sounds (e.g., *i* in *bit*) small things.

The second type of meaning carried by sounds is emotional meaning. Tsur (1992), and before him Fónagy (1983/1991), as well as Jakobson and Waugh (1979), discuss the manner in which sounds convey emotions. They suggest that the power of sound to convey emotion comes from the fact that pre-linguistic human sounds were most likely to occur as emotional reflexes. Whissell (1999; 2000) built upon suggestions made by these earlier authors and created a quantified system for the analysis of the emotions that underlie sounds. In creating this system, she referred to the interaction between the sound-production system and the emotion-expression system. For human beings these systems are both located in the face and throat.

According to Ekman (1972), who based his work on that of Darwin (1872/1965), facial expressions of emotion are both universal and unlearned. We are all born with, and in our early years automatically develop, the ability to express emotions on our faces and to read them on the faces of others. The function of facial expressions of emotion is communication, so emotional expression has the same function as

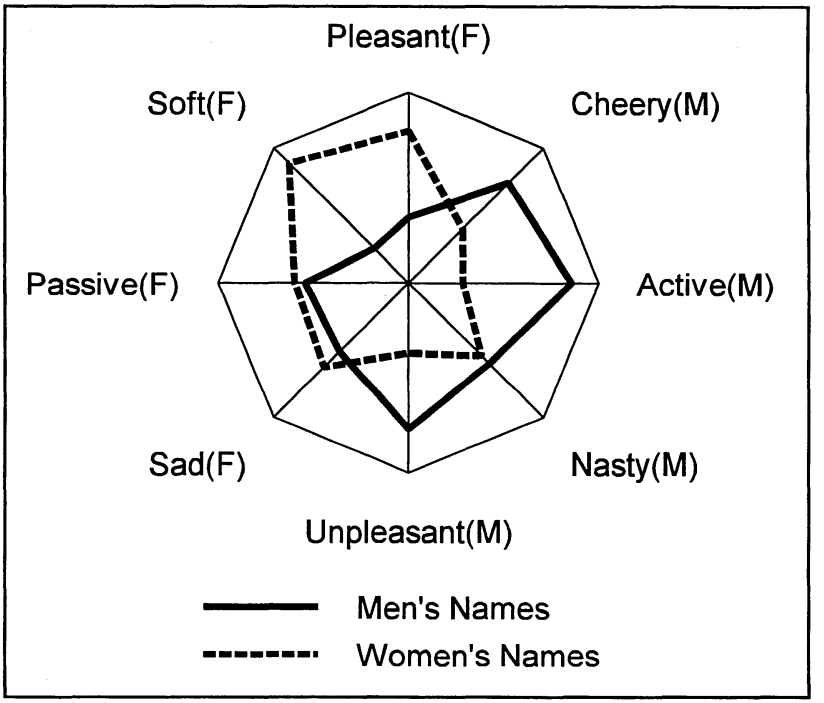
language. Ekman and Friesen (1972, 184-89) have described some of the instinctive muscular movements of the face which signal different emotions. In rough terms (the system is quite well developed), surprise is signalled by a raised brow, widely opened eyes, and an open mouth. Saying the word *puff* will produce many of these same effects, certainly the open mouth and likely the raised brow and opened eyes as well. Happiness is signaled by raised corners of the mouth and the appearance of zygomatic folds which create more prominent cheeks. Saying the word *cheese* will produce raised mouth corners, deepen the folds, and plump out the cheeks. Sadness is signalled by a slack or drooping jaw and a general sagging of the face. Saying the word *alas* mimics these muscular effects. Anger is expressed by gritted teeth or tight lips and by growling. Saying the word *grim* mimics these reactions. (Saying a word is of course not equivalent to producing a full-blown emotional expression; it is more like producing a low-level cue or clue to that same expression.)

Although she recognized the importance of the emotion/language interaction in the face, Whissell's quantification of emotion in sounds did not rely on facial expression. Instead it made reference to words and to people's opinions of the emotions underlying the words. After previous research, Whissell (1999; 2000) had at her disposal close to 16,000 words that had been rated by volunteers in terms of their emotionality. Ratings had been made in accordance with the dimensional theory of emotion (Plutchik 1980; Russell 1978; Eysenck 1965) which suggests that a large amount of emotional information may be conveyed by scores along two orthogonal dimensions. The dimensional theory refers to a Cartesian space with x-y coordinates such as that shown in figure 1. In Whissell's model, pleasantness was the y (vertical) dimension and activity was the x (horizontal) dimension.

Whissell had ratings for pleasantness (pleasant-unpleasant) and activity (active-passive) for her word base. From these, using the simple mathematics of rotation in x-y space, she derived ratings for cheerfulness-sadness, and nastiness-softness. In figure 1, the four latter emotional terms exist in the spaces between the four former ones because they are combinations of them. Cheerfulness is the word used

to describe a combination of pleasantness and activity, sadness the word used to describe a combination of unpleasantness and passivity, and so on.

Figure 1. Two-dimensional Display of Emotional Space



The eight emotional measurements are divided into male and female sections. Standard (z) scores for men's and women's names are shown by the solid and dotted lines, respectively.

Whissell (2000) looked at the phonemes appearing in words with particular emotional shadings. If a phoneme appeared at a higher than normal rate in words with high scores for cheerfulness, it was classified as a potentially cheerful phoneme. The same phoneme might appear frequently in active words as well and be classified as active. The full classification system for 35 phonemes is described in table 1 (adapted from Whissell, 2000). The emotional character of each phoneme in this

table is defined in terms of the types of words in which it was found most often. Whissell proposed a technique of phonoemotional analysis to profile a sample of words in terms of their use of phonemes from the eight categories. Using a list of 280 baby names from an informal web source, Whissell identified several statistically significant phono-emotional differences between boys' and girls' names:

> Both types of names (girls' and boys') peak in the Sad and Passive range. Both show a low usage of Active and Nasty phonemes. The curve for boys' names, however, is significantly above that for girls' names in this region, and girls' names include significantly more Pleasant and Soft phonemes than boys' names. (2000, 639)

The finding with respect to sex differences was expected and in fact predicted by a theory of sex differences in emotion (Whissell 1996a; Whissell and Chellew 1994) which says that men and women experience all emotions and there is a great deal of overlap between the sexes. Women, however, experience and display passive and pleasant emotions more often than men, and men experience and display active and unpleasant emotions more often than women. If the emotions used in analyzing phonemes (figure 1) were divided into masculine and feminine emotions, then pleasant, soft, passive, and sad would be feminine while active, cheerful, nasty, and unpleasant would be masculine. This model of sex differences was supported by analyses of personality descriptors, the Bem Sex Role Inventory, and coping strategies. It also received support from a series of studies of popular fiction (Whissell 1994; 1996b; 1998). In the results described above, boys' names scored higher than girls' names on two masculine emotions and girls' names higher than boys' names on two feminine ones. Similar sex differences are evident in figure 1; they will be discussed below.

The research reported here was designed to examine the emotional nature of sounds likely to appear in men's and women's names. The first broad hypothesis of the research (generated on the basis of the tenets of sound symbolism) was that sounds would not be randomly distributed in men's and women's names. The second hypothesis (based on phono-emotional analysis and sex differences) was that sounds in names would present an emotional picture of men as more active and less pleasant and women as more pleasant and more passive.

Table 1. Distribution of Phonemes Across Emotional Space.

Sex Differences			Emotional Categories							
% Men's	% Women's	Phoneme	PLS	CH	ACT	NA	UN	SA	PSS	SO
26	34*	ɛ	.	o	.	.	.	.	o	o
9*	8	z	o	.	.	.	.	.	o	o
31	36*	l	o	.	.	.	.	o	o	o
11*	9	ɔ	.	.	.	.	.	.	o	o
21*	19	m	.	.	.	.	.	.	o	o
27*	23	æ	.	.	.	.	.	.	o	.
6*	4	ʌ	.	.	.	.	.	.	o	.
< 1	2*	ð	.	.	.	.	.	o	o	o
33	34*	n	.	.	.	.	.	o	o	.
< 1*	< 1	aw	.	.	.	.	o	o	o	.
10*	3	o	.	.	.	.	o	o	o	.
9	10*	b	.	.	.	.	o	o	.	.
15	15*	k	.	.	.	o	o	.	o	.
22	17*	d	.	.	.	o	o	o	o	.
39*	39	r	.	.	o	o	o	.	.	.
18*	15	t	.	.	o	o	o	.	.	.
4	4*	g	.	.	o	o	.	.	.	.
3	4*	p	.	.	o	o	.	.	.	.
1	5*	š	.	.	o	o	.	.	.	.
4	4*	u	.	.	o	o	.	.	.	.
13	8*	ə˞	.	.	o	o	.	.	.	.
27	37*	ɪ	.	.	o	o	.	.	.	.
< 1*	< 1	ŋ	.	.	o	o	.	.	.	.
1*	1	oy	.	.	o	o	.	.	.	.
22*	11	a	.	.	o	.	.	.	.	.
8*	1	č	.	.	o	.	.	.	.	.
8*	4	f	.	.	o	.	.	.	.	.
21*	12	ǰ	.	.	o	.	.	.	.	.
< 1	< 1*	ʊ	o	o	.	.	.	.	.	.
7*	2	w	o	o	.	.	.	.	.	.
2	4*	ay	o	o	.	.	.	.	.	o
20	31*	i	o	o	.	.	.	.	.	o
6	7*	θ	o	o	.	.	.	.	.	o
7*	4	v	o	o	.	.	.	.	.	o
	Unclassified									
7	39*	ə								
9	12*	e								
2	2*	h								
16	18*	s								
< 1	< 1*	ʍ								
1*	< 1	y								
< 1*	< 1	ž								

o = Phoneme appeared significantly more often in words of this emotional character.
* = Phoneme appeared significantly more often for names of the starred sex.

PLS = Pleasant UNP = Unpleasant NA = Nasty ACT = Active
CH = Cheerful SA = Sad SO = Soft PSS = Passive

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Background

Previous Studies of Given Names

In the research literature, studies of given names appear in sociology, psychology, anthropology, and linguistics; a summary of early contributions of the social sciences is found in Lawson (1984). Some studies have addressed the nonrandom distribution of sounds in men's and women's names, though they have not generally done so from the phonoemotional perspective, with the exception of Alspach (1917).

Name Variability. Studies of the variability of names have noted that women's names are more variable than men's names (Barry and Harper 1995). Men's names tend to have a longer life expectancy (longer tenure on popularity lists) than women's names (Lieberson, Dumais, and Baumann 2000), and common names account for a greater proportion of men's names than of women's names (Lieberson and Bell 1992). As well, Otta (1997) has noted a strong tendency to name male children after their male parent, which could explain both the variability findings with respect to men's names and the longevity findings. The hypothesis generated on the basis of the literature with respect to name variability is that women's names will be more variable, men's names less so.

Name Length. Women's names tend to be longer than men's, whether they are full names (Slater and Feinman 1985) or nicknames (de Klerk and Bosch 1996). A measure of length, taken in either phonemes or syllables, was predictive of sex of name (Barry and Harper 1995; Cassidy, Kelly, and Sharoni 1999). Even when men's and women's names include an equal number of phonemes it is likely that women's names will take longer to pronounce because they contain more vowels and vowels have a longer duration than consonants. The hypothesis generated from the literature with respect to name length is that women's names will be longer than men's.

Name Endings. Slater and Feinman (1985) studied the beginnings of names as well as their endings, and noted that sex differences were not as obvious for starting phonemes as for ending ones. Several authors have noted the tendency of women's names to end in schwa (Cassidy, Kelly, and Sharoni 1999; Barry and Harper 1995). Failing a final schwa, women's names tend to end in other vowels or the sonorant consonants /l/, /m/, /n/, and /r/ (Slater and Feinman 1985). De Klerk and Bosch (1996) noted the presence of /i/ at the ends of girls'

nicknames. Men's names are more likely to end in non-sonorant consonants, and Barry and Harper (1995) took note of the role of stops and fricatives and incorporated these into a scheme for predicting sex of name. The hypothesis generated on the basis of studies of name endings is that women's names will be more likely to end in a vowel, especially schwa or /i/, and that if women's names end in a consonant it will more likely be a sonorant. In comparison, men's names will be more likely to end in a stop or fricative consonant.

Name Emotionality. A very early introspective study of invented names (Alspach 1917) suggested that name sounds convey emotional information. The observer in this study assigned character to individuals on the basis of name phonetics. In more recent work, Smith (1998) developed a scoring system for political names which included negative scoring for names ending in a fricative or affricate and positive scoring for a terminal /i/. Scoring on the complex "comfort factor" was used to predict electoral success.

There have been hints as to the existence of emotional differences between men's and women's names. Otta (1997) reported that women's names were chosen more often than men's names on the basis of their sounds (their aesthetics). De Klerk and Bosch (1996) noted that boys' nicknames were more humorous and critical while girls' nicknames were more affectionate. Cassidy, Kelly, and Sharoni (1999) described men's names as "crude" in comparison to women's names. Mehrabian and his associates (who were dealing with ratings of names, not phonetic analysis) concluded that men's names were seen as being more successful than women's names while women's names were more cheerful, warm, and moral (Mehrabian 1997; Mehrabian and Valdez 1990; Mehrabian and Piercy 1993a; 1993b). In Lieberson and Bell's work (1992), men's names were rated as being more active. Whissell's theory of sex differences (1996a; 2000) and the research described above suggest that masculine emotions and masculine names are more active and unpleasant than feminine names. The hypothesis arising from the research on name emotionality is that names will encode emotional reactions, that these will be different for men's and women's names, and that in spite of considerable overlap between the sexes, women's names will be more pleasant and less active than mens' names.

Prediction of Sex on the Basis of Name Phonology. Several studies suggest that name sex can be predicted on the basis of phonetic

information (Barry and Harper 1995; Cassidy, Kelly, and Sharoni 1999). Both employed descriptors related to phoneme choice, length, ending phoneme, and location of stress. They showed prediction success in the range of 60-80%. Barry and Harper (1995), who used frequently occurring names, reported better prediction for women's names. Cassidy, Kelly, and Sharoni (1999), who employed stereotypical names listed by individuals in response to a categorical prompt, showed equally strong prediction for both male and female names. These studies lead to the hypothesis that name sex will be predicted successfully on the basis of phonetic information, with the expectation that such prediction will be moderate or better (in the range 60-80%).

Name Androgyny. A special case of names involves those used to designate men or women. Such names often begin as men's names and migrate across the gender gap, ending up as women's names instead of men's (Lieberson, Dumais, and Baumann 2000; Cassidy, Kelly, and Sharoni 1999). Because namers of male children apparently object to the feminine associations of androgynous names (and because the reverse is not also true), androgynous names tend to be used more often for females than for males. Cassidy, Kelly, and Sharoni (1999) report that androgynous names sound more feminine than the general run of men's names; in other words, they are more likely to follow the phonological rules for women's names than for men's. The hypothesis arising from this research states that androgynous names will be used more often as women's rather than men's names, and furthermore that they will sound more feminine than most men's names.

Sound Patterns. Existing research leads to no clear predictions with respect to the sound patterning of names (the change in phoneme use across phoneme position within a name). Since no specific hypothesis was available, it was decided to examine the distribution of phonemes of different emotional types in different positions (up to 7) in men's and in women's names.

Method

Name Sample

The names studied in this research were 5.5 million first names of respondents and dependents as reported by the U.S. Census Bureau for 1990 (www.census.gov/genealogy/www/freqnames.html). The number of 5.5 million refers to tokens (individuals). There were actually 5494

distinct names (name types) in the study. These names represent about 90% of the total of valid records and include any name which appears roughly 30 times or more for women or 120 times or more for men. The sampling ratio is 1/40. The sex of the name holder was taken as reported on the form. This information has been processed and published electronically by David Word and is available at www.census.gov/genealogy/names/nam_meth.txt.

Name Scoring

All names were submitted to a broad mid-American phonemic transcription by means of a computer program written by John Wasser (http://people.ne.mediaone.net/wasser/speak/index.html). The program translates English text into phonetic text using a palette of 16 vowels and 25 consonants, examples of which may be found in table 1. Of the total of 41 phonemes, 35 were associated with some type of emotional character. As can be seen in table 1, certain phonemes tended to group around certain emotions, and a single phoneme could be classified as belonging to more than one emotion. The phonemes /l/ and /m/, for example, previously referred to by Fónagy (1983/1991) as soft and sweet, were classified as soft and passive (/l/ was also classified as pleasant and sad). The phoneme /i/ was classified as soft, pleasant, and cheerful.

The result of phonoemotional scoring was a vector of eight scores describing each name in terms of the number of pleasant, cheerful, active, nasty, unpleasant, sad, passive, and soft phonemes which it contained. Names were also analyzed in terms of their length (in number of phonemes), number of vowels, and final phoneme. Men's and women's names were also compared in terms of first phonemes and the overall use of individual phonemes. The scores are shown in the appendix.

Results

The presentation of results will follow the order of findings outlined in the section on previous studies and the order of hypotheses as they were developed there.

Name Variability. The issue of name variability was addressed in four ways: first, the total number of names in the list was compared for men (1219) and women (4275), with the finding that the latter was

significantly more varied (chi squared for goodness of fit, $p < .05$). Second, the median frequencies of men's names (.012%) and women's names (.002%) were compared to one another and found to be significantly different (Kruskal-Wallis test, $p < .05$). Third, it was noted that the top ten names accounted for 23% of all men's names in the sample but only 11% of all women's names. Similarly, 59 names comprised 50% of the men's sample (half of all men carry one of 59 names), but it took 138 names to include 50% of the women's sample. Thus, the hypothesis that women's names are more variable and men's are more uniform was fully supported.

Name Length. Name length in this study was measured in terms of number of phonemes. The difference between men's and women's names was significant and in the expected direction, i.e., women's names tended to be longer than men's, but the difference was not large (means were 4.99 versus 5.21 phonemes, t-test, $p < .0001$). Roughly one-fifth of a phoneme separated the men's from the women's names. The hypothesis as to name length (that women's names would be longer) was supported. However, because women's names contain significantly more vowels overall (2.3 vs. 1.94, t-test, $p < .0001$), and because vowels take longer to pronounce than consonants, the actual difference in time taken to say men's and women's names might have been underestimated by using the phoneme count. Since men are more likely than women to use nicknames or shortened name forms (de Klerk and Bosch 1996), the sex difference in name length may become more obvious when less formal names are included.

Name Endings. The percentage use of all phonemes as ending phonemes for men's and women's names is reported in the appendix, where the phonemes for which sex differences were significant are indicated with asterisks. Sex differences were present for most phonemes. Women's names ended significantly more often than men's names in schwa or /i/ (chi squared for goodness of fit, $p < .05$). Men's names ended significantly more often than women's in stop and fricative consonants (chi squared for goodness of fit, $p < .05$). In addition, women's names ending in consonants were more likely to end in one of two sonorants, /l/ or /n/. This finding rests on a conditional probability, however. Sonorant /l/ and /n/ endings were actually more common in men's than women's names, but given that when a woman's name did end in a consonant, it was most likely a sonorant. Of men's names,

18.7% ended in /n/ and of women's names 17.1%. At the same time, /n/ was the most common consonant ending for women's names. When /l/ is considered, 9.6% of men's names and 5.6% of women's names ended in /l/; /l/, however, is the second most common consonant to be found at the end of women's names.

A similar finding applies to men's names that end in /i/. This ending was more common overall for women's names (22.5 vs. 12.9%), but if men's names ended in a vowel, it was most likely /i/. The next most common vowel ending for men's names was /ə˞/, as in the final syllable of *Peter* (4.7% of all names), followed by /o/ (2.9%). Hypotheses referring to the ending phonemes in men's and women's names were fully supported.

Cramer's V, a measure of association, for the relationship between ending phoneme and name sex was .59. A parallel analysis for beginning phonemes presented some interesting differences but indicated a lower degree of relationship (V = .32). Percent usage for all phonemes as starting phonemes is reported in the appendix. The most common beginning sounds for men's names were /j̆/ (19.4%), /r/ (11.4%), and /d/ (8.3%). The most common beginning sounds for women's names were /m/ (12.4%), /k/ (11.1%), and /j̆/ (9.7%). In general, consonants were more common than vowels at the start of both men's and women's names; however, considered alone, vowels were more commonly used to begin women's names than men's. Past findings of lesser association between starting vowel and sex of name than ending vowel and sex of name were replicated. The appendix reports the average number of times each sound appeared in each type of name and indicates which sex used the phoneme at significantly higher rates.

Name Emotionality. Emotional differences between men's and women's names which were hypothesized on the basis of name phonology suggest that women's names include more pleasant, passive, soft, and sad phonemes while men's names include more active, unpleasant, cheerful, and nasty phonemes. Specific findings (with means in parentheses, t-tests, $p < .0001$) include:

1. Men's names contain more active phonemes (1.81 vs 1.57).
2. Men's names contain more unpleasant phonemes (1.25 vs 1.10).
3. Men's names contain more nasty phonemes (active plus unpleasant) (1.62 vs 1.61).

4. Men's names contain more cheerful (active plus pleasant) phonemes than women's names (1.79 vs 1.67).
5. Women's names contain more pleasant phonemes (.96 vs .84).
6. Women's names contain more passive phonemes (2.3 vs 2.28).
7. Women's names contain more soft phonemes (pleasant plus passive) (1.61 vs 1.37).
8. Women's names contain more sad (passive plus unpleasant) phonemes (1.22 vs 1.19).

These differences are evident in figure 1. It is also clear from this figure that the largest differences were associated with the categories active (men's names had more active phonemes) and soft (women's names had more soft phonemes). All differences were in the direction predicted by Whissell's (1996a) theory of sex differences. "Masculine" emotions (those where men are expected to score higher) and "feminine" emotions are identified in figure 1 and each sex obtained higher scores on the predicted group of emotions.

It remains to point out that although men's names sounded more emotionally masculine and women's more emotionally feminine, there was considerable overlap between the sexes, as is obvious in figure 1. Wilks' lambda is a measure of overlap that ranges from 0 (no overlap) to 1 (complete overlap). Lambda was above .99 for each emotional category. We can state, at one and the same time, that men's and women's names are emotionally different and yet they overlap to a considerable extent.

Prediction of Sex of Name on the Basis of Phonology. A discriminant function analysis had access to scores for the eight emotional categories, to name length, to the proportional use of vowels in each name, and to two measures of name endings. Masculine name ending scores were assigned on the basis of endings which fit the masculine pattern outlined in the section above (consonants, and /ɚ/ or /o/ endings). Feminine ending scores were assigned on the basis of endings which involved schwa, /ɪ/ or /i/. There were three analyses: one with common tokens (2.4 million, which included all names with a frequency of at least .03%), one for all tokens (5 million), and one for types only (5494).

The first analysis was one of tokens (the same name was allowed to appear more than once in the data set). Prediction was 80% successful overall, but men's names were more successfully identified (84%) than

women's names (73%). The Wilks' lambda measure of overlap was reduced (by the joint use of these predictors) to .55. Thus for a total of 2.4 million relatively common name tokens, it was possible to predict sex correctly on the basis of the variables described above 80% of the time.

Additional analyses were performed for the entire set of name tokens, regardless of frequency. The same pattern–with slightly lower success rates–was observed: overall, 74% of the names were correctly classified (79% of men's names and 68% of women's names). This result is remarkable because it applies to a very large set of names (5.5 million), many of them of ethnic origin (cf. Hough 2000) which were subjected to no preselection. It is also significant at a level far greater than chance ($p < .0001$). In comparison, Cassidy, Kelly, and Sharoni (1999) used what were commonly thought of as men's and women's names and Barry and Harper (1995) used only 100 common names, representing about 200,000 individuals.

A final discriminant function analysis was applied to types–the 5494 individual names with no repetitions. Prediction was achieved at the rate of 67% overall (81% for men's names, 64% for women's). These results match those of Barry and Harper (1995) in that prediction on the basis of names (types) is not as successful as prediction on the basis of individuals (tokens). When each name serves as a single entry into the analysis, it is more difficult to accurately discriminate men's and women's names. This is because more common names are more easily classified than less common ones. When more common names are weighted by appearing several times, prediction improves. A similar process accounts for the fact that prediction improves when it is limited to relatively common names, in this case the 300 most common (80%), as opposed to all names (74%). As the data set being treated gets larger and the names in it become more and more unique, the ability to predict name sex is still present, but it decreases. It was also easier to predict men's names than women's in all the discriminant function analyses.

Androgynous Names. Common androgynous names (those appearing among the 200 most frequent names for males and females) are more likely to be used as women's names (chi squared for goodness of fit, $p < .0001$). This was true 28/29 times (97%). When the limitation of appearance in the top 200 list was removed and any name which appeared anywhere on both the male and female lists was considered

androgynous, the trend reversed and 77% of 319 androgynous names were found to be used more often by men. The obvious conclusion is that uncommon androgynous names tend to be used more often by men. These names are potentially of less public interest because of their lower frequencies. If a certain critical frequency must be reached before a name is considered by the general public as androgynous, then the fact that one set of parents named their daughter Tom, Dick, or Harry would have no effect on the status of those names.

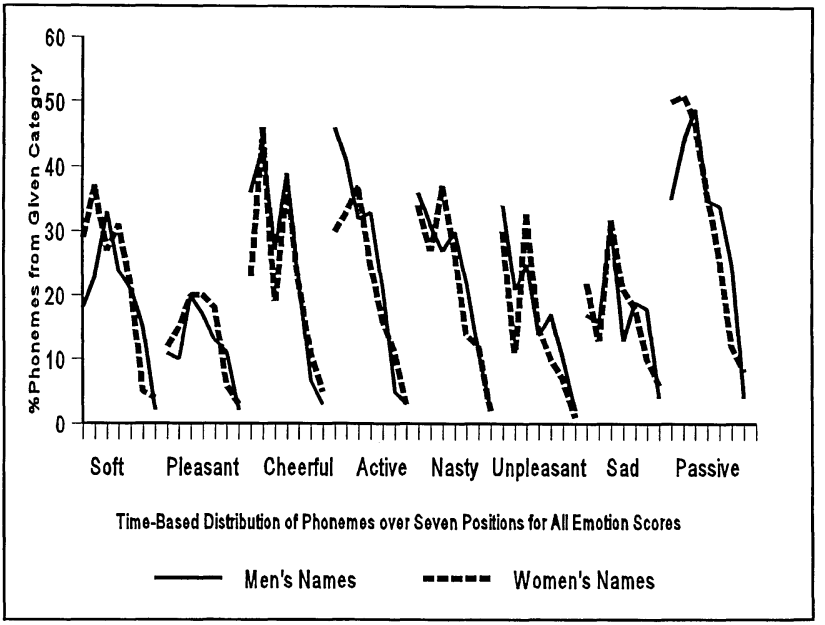
Emotional scores for common androgynous names (those occurring among the most popular 200 names) were: cheerful 1.52, active 1.45, nasty 1.38, unpleasant .86, sad 1.21, passive 2.24, soft 1.55, and pleasant .90. These should be compared with the scores for men's and women's names in the section on emotionality above. For most emotions, androgynous means were closer to women's means than to men's. The exceptions are pleasantness, where the mean is equidistant from both sexes and passivity, where androgynous names approximate men's names. In fact, for the four "masculine" emotional scores (cheerfulness, activity, nastiness, and unpleasantness), the means for androgynous names are hyper-feminine; they are further away from men's names than are even non-androgynous women's names.

The hypothesis that common androgynous names are more often used as women's names was supported, but qualified by the fact that less common androgynous names exhibited a reverse trend. The hypothesis that androgynous names were emotionally feminine in nature was also supported.

Lieberson, Dumais, and Baumann (2000) mention that /l/, /n/, and /i/ are the most common ending phonemes for androgynous names. This fact was also observed in the present data for both the set of common androgynous names (79%) (as opposed to 41% for all names) and the complete set of androgynous names (62%), although the effect was smaller for the complete set. The phonemes /l/, /n/, and /i/ are all subject to the conditional probability mentioned above. Each phoneme is more commonly found for one sex or the other (/l/ and /n/ in men's names, /i/ in women's names) but each is also commonly found in the names of the opposite sex under certain conditions; for example, if a man's name ends in a vowel, it is likely to be /i/. In some ways, /n/, /l/ and /i/ may be considered androgynous endings; their opposites would be schwa and the stop and fricative consonants which are sex-stereotyped endings.

Patterns of Emotion Across Time. Figure 2 plots the appearance of the eight emotional classes of phonemes across position in a name. Positions 1-7 were analyzed for all names; later positions were not plotted. The dotted line represents women's names, the solid line men's names. The y-axis reports the percent of names which include phonemes falling into a given emotional category for each position. Figure 2 represents the experience of a listener upon hearing a first name. Overall patterns, such as the high use of passive phonemes in the first positions and the low overall use of pleasant phonemes, are obvious from the figure. Of interest is the pattern established for pleasant and sad phonemes which reach peak usage in the third position of a name. As well, cheerful phonemes exhibit a distinct M pattern for both men's and women's names with peaks at the second and fourth positions and a local trough at the third.

Figure 2. Distribution of Phonemes Over Time.



Emotional sex differences for starting phonemes are also evident in figure 2. Women's names tend to begin with passive and soft phonemes, men's with active and cheerful ones. The plots for active and passive

phonemes are complementary in terms of their sex differences. Men's names begin with a burst of active phonemes, while women's names do not peak in this respect until the third position. Women's names begin with a preponderance of passive phonemes, while men's names do not peak in this respect until the third position. Soft phonemes also show an early peak for women's names and a later one for men's names. It is not possible to obtain a good picture of name endings from figure 2 because of different name lengths.

Analysis of Vowel Categories. Vowels generally were more common in women's than in men's names, as mentioned above. As an adjunct to the comparison of vowels, it was decided to compare men's and women's names in terms of different categories of vowels (Ladefoged 1993; Borden, Harris, and Raphael 1994; Singh and Singh 1976). Two commonly recognized categories are based on the vertical position of the tongue during articulation (low vs. high vowels) and on its horizontal position (back vs. front vowels). A third is based on the duration of the vowel and the extremity of positioning of the tongue (tense vs. lax vowels).

In the formation of front vowels such as /ɪ/, /i,/ /æ/, /ɛ/, and /e/ the tongue occupies a horizontal position toward the front of the mouth, with the result that the pharynx is widened. In the formation of back vowels such as /u/, /ɔ/, /o/, /ʊ/, and /a/, the tongue is held further back and the resonating cavity of the pharynx becomes smaller. The acoustic correlate of this tongue position is a higher frequency for the second formant for front vowels. Overall, front vowels were used more often in women's names (mean of .29 per name) and less often in men's names (mean of .23 per name). (All differences reported in the section are statistically significant per z tests.) A sex difference in favor of women was observed in four of the five front vowels (/i/, /ɪ/, /ɛ/, and /e/, but not /æ/). Back vowels, however, were used more often in men's names (mean of .10 per name vs. mean of .05); this was true for three of the five vowels (/o/, /ɔ/, and /a/, but not for /u/ or /ʊ/), where differences were very small (see appendix).

The high vowels /i/, /ɪ/, /u/, and /ʊ/ are produced with the tongue in a slightly raised position. Their opposites are the low (non-high) vowels /æ/, /ʌ/, and /a/. The vertical position of the tongue influences

the length of the front (oral) resonating cavity. Schwa is neutral in terms of height. The acoustic correlate of higher tongue position is a lower first formant. High vowels are used more often in women's names (mean of .15 per name vs. mean of .11), and this is true for all four vowels. Low vowels are used more often in men's names (mean of .11 vs. mean of .07), and this is again true for all such vowels.

The tense vowels (/i/, /e/, /a/, /ɔ/, /o/ /u/, ay/, /aw/, and /oy/) are produced with more extreme tongue positions than with the lax vowels (/ɪ/, /ɛ/, /æ/, /ʊ/) and they are held for a longer time. Tense vowels are more commonly found in men's names (mean of .18 vs. mean of .16). Five of nine tense vowels (/a/, /ɔ/, /o/, /aw/, and /oy/) follow this trend. Lax vowels are more common in women's names (mean of .20 vs. mean of .17), and three of the five vowels (/ɛ/, /ʊ/, and /ɪ/) exhibit this difference. Thus the position of the tongue in the articulation of women's names is more relaxed, more forward, and higher. The position of the tongue in men's names, in contrast, is more tense, further back, and lower. In emotional terms, high vowels are more pleasant and active than low ones, while tense vowels are more pleasant and active than lax ones.

Discussion

Several findings of past research have been confirmed by the present study. Men's names are less variable and shorter than women's names. Schwa and /i/ endings are more common in women's names, while obstruent (fricative and stop) endings are more common in men's names. Common androgynous names are used more often as women's names and have sound patterns more similar to women's than to men's names. Name phonology is predictive of name sex. The replication of these findings with an extremely large data set not limited to common or English-origin names is of some interest, but it is not the main contribution of the research. The innovative portion of this study deals with a model of name emotionality and with the manner in which patterns of phoneme use adhere to this model.

If little girls are made of "sugar and spice and all things nice" while little boys are made of "snakes and snails and puppy dogs' tails" (at least in popular opinion), their names should signal this fact. These findings show that they do. The childhood rhyme encapsulates (without

reference to their origins) the sex differences of the model used in this study and presented in figure 1. Stereotyping tends to exaggerate sex differences (Whissell 1996a), but it also tends to be based on real rather than imagined differences. In spite of considerable overlap, men's names contain more sounds which express masculine emotions (active and unpleasant ones) while women's names have more sounds which express feminine emotions (passive and pleasant ones).

Even the distribution of ending phonemes can be explained in terms of the model of sex differences. The /i/ ending common in women's names is classified as pleasant and soft, while the obstruent endings in men's names are classified as active and/or unpleasant. (It should be mentioned that the most common ending, schwa, was not emotionally classified, having shown up in previous analyses as having no distinct tendency to appear in particular classes of emotional words.) Endings of androgynous names tend to favor soft or passive phonemes such as (/l/, /n/, and /i/).

The pattern of phoneme use across time is also interesting from an emotional perspective. Active and passive phonemes exhibit complementary patterns for the sexes. Men's names begin with a burst of active phonemes (more than are found in women's names), while women's names begin with a burst of passive ones (more than are found in men's names). The clue to sex differences resides not only in the ending phoneme but in the beginning one as well, when it is analyzed in terms of its emotional implications.

Hough (2000) attempted to explain sex differences in name phonology as the outcome of sex differences in name source. Women's names (and the schwa ending which characterizes them) tend to come from French and Latin sources while men's names (and their consonant endings) tend to come from Germanic and Biblical sources. This may be perfectly true; in fact, Lieberson and Bell (1992) make a similar observation, but why would parents choose names from these sources in such a manner? And why should the phonoemotional differences created by their choices (which are entirely independent of the schwa difference because schwa was not emotionally scored) so closely match a theory of sex differences in emotion? It is unlikely that the emotional differences

between women's and men's names observed in these data are the result of emotionally different languages of origin. It is more likely that parents looking to name offspring select, from among existing alternatives, names with the sex-appropriate sound picture (Barry and Harper 2000). Women's names may be more likely to come from French and Latin because these languages can better express the feminine emotional pattern shown in figure 1, and men's names are more likely to come from Germanic languages because they can better express the masculine emotional pattern.

The conclusions reached here are not, as is true in many other cases, limited by the size and bias of the sample on which they are based. They are limited, however, by the language studied (English), by the phonetic transcription program used, and by possible errors or omissions in the assignment of emotional character to individual phonemes. The transcription program was a broad one which did not evaluate such things as pitch, stress, or regional accent. The assignment of character to phonemes is still in its formative stages, and should more accurately be regarded as a first approximation than as the final word on emotional sound symbolism.

In spite of these limitations, however, this study has shown that the distribution of sounds in men's and women's names is not random. Above and beyond the overlap observed along many dimensions, it is clear that men's and women's names do not begin in the same way (both favor consonants but different consonants; women's names are more likely to begin with a vowel), do not end in the same way (men's names are much more likely to end in obstruent consonants, women's in vowels, especially schwa and /i/), and do not use phonemes in the same way (men's shorter names include more consonants, women's longer names include more vowels). Differences in phoneme use between men's and women's names can best be understood as reflecting emotional differences which are explained by a model of masculine and feminine emotions. Men's names include more phonemes with masculine emotional associations (active, cheerful, nasty, unpleasant) and women's names include more phonemes with feminine ones (passive, sad, soft, and pleasant).

APPENDIX

Differences in Phoneme Frequency Between Men's and Women's Names

Average use of all phonemes (All M, All F).
Percentage use of beginning phonemes (Beg M, Beg F).
Percentage use of ending phonemes (End M, End F).
* = sex with the significantly higher value for each phoneme.
< .1 or < .001 indicates that a very small number of cases was observed.

Phoneme	All M	All F	Beg M	Beg F	End M	End F
ɛ	.051	.069*	2.9	4.4*	<.1*	00.0
a	.047*	.019	1.0*	.5	00.0	<.1*
ɔ	.023*	.017	1.4*	.8	00.0	<.1*
ʊ	<.001	<.001*	00.0	00.0	2.9*	.4
ʌ	.011*	.009	<.1	00.0	.1*	00.0
ay	.005	.007*	<.1	<.1	<.1	<.1
aw	.001*	<.001	00.0	.1*	<.1	<.1*
ɚ	.027*	.015	.7*	.3	4.7*	2.2
u	.007*	.008*	00.0	00.0	.4*	.2
oy	.004*	.003	00.0	00.0	.6*	.1
e	.023	.026*	.2	1.4*	.4*	.3
ə	.012	.075*	.6	.9*	.6	34.5*
æ	.055*	.046	2.7	4.3*	.1	1.4*
o	.023*	.008	.1	.1*	00.0	00.0
i	.043	.069*	<.1	.8*	12.9	22.5*
I	.057	.075*	.3	.9*	.1	2.2*
θ	.013	.013*	1.7*	.2	1.4	2.5*
ð	<.001	.003*	<.1	.3*	00.0	00.0
š	.003	.011*	.5	2.7*	<.1*	<.1
ž	<.001*	<.001	00.0	00.0	00.0	00.0
ʍ	<.001	<.001*	<.1	.1*	00.0	00.0
č	.014*	.005	2.2*	1.0	<.1	.1*
ŋ	.002*	<.001	00.0	<.1*	.1*	.1
b	.020	.021*	4.2	5.1*	.3*	<.1
d	.051*	.034	8.3*	6.5*	11.8*	.7
p	.007*	.007	2.3	3.2*	.5*	.1
t	.037*	.031	3.0	3.1*	6.5*	2.9
g	.009*	.007	2.4*	1.8	.4*	<.1
k	.031*	.029	7.3	11.1*	4.7*	.2
f	.017*	.007	2.6	1.7	2.2*	<.1
v	.014*	.009	.7	2.2*	.3*	.1
h	.005	.005*	2.3*	2.2	00.0	00.0
ǰ	.054*	.025	19.4*	9.7	1.1*	.1
l	.061	.073*	3.6	7.7*	9.6*	5.6
m	.044*	.039	7.7	12.4*	3.9*	.4
n	.079	.100*	1.3	2.4*	18.7*	17.4
r	.083*	.079	11.4*	4.6	.3*	.2
s	.031	.035*	4.2	6.2*	6.7*	3.3
w	.015*	.003	4.7*	.8	1.4*	<.1
y	.002*	.001	.3	.6*	00.0	00.0
z	.021*	.017	.1*	.1	7.0*	2.6

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