

Analysis of the Frequency of Human Body Parts in the Lyrics of Bob Dylan and Lady Gaga Reveals Over-Representation of the Heart and the Eyes

Ger Tjalling Rijkers^{1*}, Petrouschka Caelesta Dominique Verdouw²

¹Professor, Department of Science, University College Roosevelt, Middelburg, Netherlands

²Student, Department of Science, University College Roosevelt, Middelburg, Netherlands

*Address for Correspondence: Dr. GT Rijkers, Professor, Biomedical and Life Sciences (Emeritus), Department of Sciences, University College Roosevelt, P.O. Box 94, 4330 AB Middelburg, Netherlands

E-mail: g.rijkers@ucr.nl

Received: 22 Mar 2022 / Revised: 23 May 2022 / Accepted: 26 Aug 2022

ABSTRACT

Background: Human body parts and organs are frequently used in the lyrics of popular songs, including those of Bob Dylan and Lady Gaga. The relative frequency of the use of the various body parts could reflect the perceived physical appearance and attractiveness of the respective parts of the human body.

Methods: An analysis was made of the frequency of body parts in the song lyrics of Bob Dylan and Lady Gaga.

Results: The data show that a homunculus based on Bob Dylan as well as Lady Gaga lyrics has extreme disproportionate big hearts, eyes, and hands. The heart is mostly "my heart", while the eyes are "your eyes".

Conclusions: The frequent use of the heart could be caused by the fact that the heart ("my heart") also can represent various emotions and states of mind. The Bob Dylan homunculus additionally has a bigger head and feet, while the Lada Gaga homunculus has a bigger body and mouth and more hair.

Key-words: Bob Dylan, Body parts, Homunculus, Lady Gaga, Song lyrics

INTRODUCTION

Preformationism once was a popular theory in biology, stating that living organisms develop from microscopic small but otherwise fully formed human beings, a homunculus^[1]. Nicolaas Hartsoeker was a pioneer in this field because of a sketch in his 1694 *Essai de Dioptrique* of a homunculus in a sperm cell that illustrated this concept of preformationism clearly^[2]. Almost two and a half centuries later the term homunculus became popular again but now in the field of (neuro)sciences due to the work of William Penfield^[3,4]. Penfield mapped the human cerebral cortex through direct electrostimulation, thus trying to visualize the connection between a certain area of the brain hemispheres and the corresponding body segments^[5].

The cortical homunculus gives a distorted representation of the human body in which the hands, mouth, lips and tongue are oversized.

A major limitation of the Penfield homunculus is that the image of the human body is solely based on the activity of the cortex and that other parts of the brain are not taken into account. An alternative way to study the perception of the human body by the brain is an analysis of figurative art of human figures. Implicit is the assumption that the work of art primarily is determined by what goes on in the brain of the artist, and is less influenced by preferences of sponsors and/or prevailing societal trends of what constitutes a perfect body. The homunculi of for instance artists like Peter Paul Rubens, Sandro Botticelli, Rembrandt van Rijn and Pablo Picasso illustrate the spectrum of perceptions of the human body.

In literature and music, and later case in the lyrics, the perception of the human body by the author also can be recognized. Song lyrics are an integral part of literature, underpinned by the awarding of the Nobel prize for literature to Bob Dylan. In June 2020 Bob Dylan, at the

How to cite this article

Rijkers GT, Verdouw PCD. Analysis of the Frequency of Human Body Parts in the Lyrics of Bob Dylan and Lady Gaga Reveals Over-Representation of the Heart and the Eyes. SSR Inst. Int. J. Life Sci., 2022; 8(5): 3084-3091.



Access this article online
<https://ijls.com/>

age of 79 years, released his 38th album entitled *Rough and Rowdy Ways*. In the song "My version of you" he sings that he was ". . . looking for the necessary body parts . . . (to) create my version of you" [6]. In this paper, the lyrics of Bob Dylan and for comparison those of Lady Gaga are analyzed for the frequency of occurrence of the various body parts. With the data obtained it became possible to draw two homunculi, providing a visual tool to demonstrate the differences in perception of the human body by these artists.

MATERIALS AND METHODS

This study was performed within the Department of Science of the University College Roosevelt, Middelburg, The Netherlands and was started in June 2020.

Inclusion criteria. Data from the lyrics of Bob Dylan songs were retrieved from the official Bob Dylan website [7] using the built-in search function for words in lyrics. For Lady Gaga's lyrics, the discography was compiled from the Album of the Year website [8] and the lyrics were scanned manually for the occurrence of organs and body parts. All original songs written by Bob Dylan and Lady Gaga were included.

Exclusion criteria. Songs, which were written with other songwriters (such as for the Traveling Wilburys in the case of Bob Dylan) were excluded. Songs written but never released and songs written for and performed by other artists were also excluded.

The occurrence of an organ or body part in a given song was only counted once, even if it would have been used more frequently (such as "eye" which is mentioned seven times in "Sad-eyed lady of the Lowlands" by Bob Dylan [9] and "hair" in the Lady Gaga song with the same name is even mentioned 93 times [10]). The frequency of use of human body parts and organs in popular music, in general, was obtained from the lyrics.com database [11].

Most used common words in popular music were retrieved from the database Coding in Tune [12].

The most performed songs during live appearances of Bob Dylan and Lady Gaga were obtained from Setlist.fm [13]. Songs most streamed on Spotify were taken from Open Spotify [14,15].

The homunculus drawings in Figure 2 were made in CorelDraw 2020 (CorelDraw Corporation, Ottawa, Canada) taking the trunk ("body") as standard and the size of the other body parts proportional to their frequency of use. Hair, eyes, ears, nose and mouth are drawn in proportion to the head.

Statistical Analysis- Statistical analysis of differences in the use of body parts in lyrics between Bob Dylan and Lady Gaga was performed by two-sided Fisher's exact test [16].

RESULTS

Human organs and body parts are mentioned 897 times in the total number of 468 eligible Dylan songs, an average of 1.92 body parts per song. For Lady Gaga, body parts are mentioned 232 times in a total of 161 songs (excluding three instrumentals), an average of 1.44 body parts per song.

Most prominent in the lyrics of both Bob Dylan as well as Lady Gaga lyrics is the overrepresentation of the head, the eyes, and the heart (Table 1). In both the Bob Dylan and Lady Gaga song lyrics, the heart is the body part often mentioned (12.0% and 16.8% of total body parts, respectively; Table 1; difference not quite statistically significant). Similar to the lyrics of Bob Dylan and Lady Gaga, in the lyrics.com database, in which human body parts are mentioned over one million times, the heart (190,514 hits) takes the top position, the eyes are second (155,531) and the hands third.

Table 1: Relative and absolute frequencies of body parts in songs of Lady Gaga and Bob Dylan, as well as in all songs listed on Lyrics.com

	Lady Gaga	Percentage	Bob Dylan	Percentage	All songs ^a	Percentage	p-value ^b
Arms ^c	8	3.4	22	2.5	48091	4.3	
Ass*	9	3.9	1	0.1	36936	3.3	0.0001
Back(bone) ^d	0	0	1	0.1		0	
(Big) Toe(s)	2	0.9	8	0.9	4680	0.4	
Blood*	0	0	40	4.5	32191	2.8	0.0002

Body*	16	6.9	19	2.1	41203	3.6	0.0009
Bones	0	0.0	11	1.2	25281	2.2	
Brain(s)	1	0.4	24	2.7	26813	2.4	
Breast(s)	0	0	4	0.4	3050	0.3	
Ear(s)	2	0.9	26	2.9	16229	1.4	
Eye(s)	27	11.6	114	12.7	155531	13.8	
Face(s)	15	6.5	83	9.3	95422	8.4	
Foot. Feet*	4	1.7	51	5.7	34041	3.0	0.0097
Fist(s)	1	0.4	7	0.8	5704	0.5	
Hair *	16	6.9	30	3.3	27793	2.5	0.0235
Hand(s)	31	13.4	92	10.3	116139	10.3	
Head(s) *	14	6	105	11.7	88628	7.8	0.0115
Heart(s)	39	16.8	108	12.0	190514	16.8	0.0625
Heel(s) ^e	0	0	3	0.3	4984	0.4	
Jaw(s)	1	0.4	2	0.2	2807	0.2	
Knee(s)	3	1.3	17	1.9	17996	1.6	
Leg(s)	2	0.9	8	0.9	9952	0.9	
Lip(s)	7	3.0	15	1.7	30754	2.7	
Liver	1	0.4	1	0.1	1227	0.1	
Lung(s)	1	0.4	4	0.4	8506	0.8	
Mouth(s)*	25	10.8	24	2.7	20654	1.8	0.0001
Neck	0	0.0	10	1.1	10582	0.9	
Nose(s)	1	0.4	10	1.1	8567	0.8	
Rib(s)	0	0	2	0.2	1537	0.1	
Shoulder(s)	0	0	5	0.6	11542	1.0	
Skin	4	1.7	21	2.3	21636	1.9	
Stomach	0	0	3	0.3	2978	0.3	
Tooth, Teeth	1	0.4	9	1.0	7674	0.7	
Throat	0	0	5	0.6	5792	0.5	
Thumb(s)	0	0	4	0.4	2608	0.2	
Tongue(s)	1	0.4	8	0.9	11325	1.0	
Totals	232	100	897	100	1130863	100	

^aIn the "all songs" category of lyrics.com, multiple listings of the same song, including cover versions, can be included.

^bP values calculated by two-tailed Fisher's exact test of Chi-square.

^cArms were checked for being used in the anatomical sense.

^dThe context of the term "back" was checked in the relevant Lady Gaga and Bob Dylan songs and only the anatomical meaning of the back as in backbone was included. For the "all songs" category this manual check was impossible.

^e High heels were excluded.

* Indicates a significant difference in frequency between Lady Gaga and Bob Dylan.

The 3 most used words in popular music are "I" (7.4%), "the" (6.9%), and "you" (6.0%). "I", "me", and "my" together constitute 11.5% of the total vocabulary of song lyrics, "you" and "your" 7.7%. Therefore, to put the use of "heart" and "eyes" in the lyrics of Bob Dylan and Lady Gaga in context, the possessive adjectives of these words were analyzed, and the data are summarized in Fig. 1. Both artists sing mostly about their hearts ("my heart") rather than the heart of another (a loved one, a rival, or

anyone else in general). A diseased heart (either broken, bleeding, aching or otherwise malfunctioning) is more common in Lady Gaga's songs than in Dylan's (26% and 4% of cases, respectively; $p=0.0002$). As compared with the heart, eyes more often are "your eyes" than "my eyes". The higher fraction of "your eyes" in Lady Gaga's lyrics as compared to Bob Dylan is borderline significant ($p=0.06$).

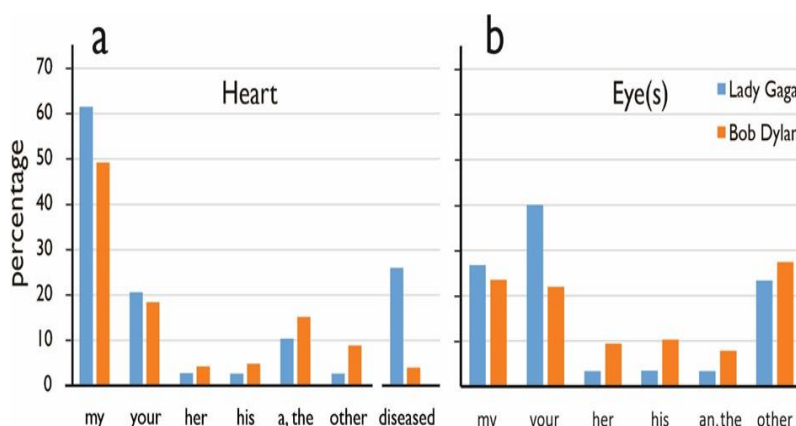


Fig. 1: Adjectives used for “heart” (panel a) and “eye” or “eyes” (panel b) in song lyrics of Lady Gaga (blue bars) and Bob Dylan (orange bars). Panel an also shows adjectives associated with a diseased heart (including breaking, aching, and bleeding)

A direct comparison between Bob Dylan and Lady Gaga of individual body parts shows significant differences for (in alphabetical order) blood, body, buttocks, hair, head, feet, and mouth (Table 1). The body itself and buttocks, mouth and hair are the body parts which are significantly more common in Lady Gaga's lyrics than in those of Bob Dylan. The head and feet are more frequently used by Bob Dylan. The human body, when depicted as a

homunculus proportioned according to the frequency of body parts in song lyrics of Bob Dylan and Lady Gaga is shown in Fig. 2. The visual representation emphasizes the disproportioned big heads, eyes, hands, and giant hearts. The Bob Dylan homunculus additionally has big feet and sparse hair, while the Lady Gaga homunculus has a bigger mouth and more abundant hair (Fig. 2).

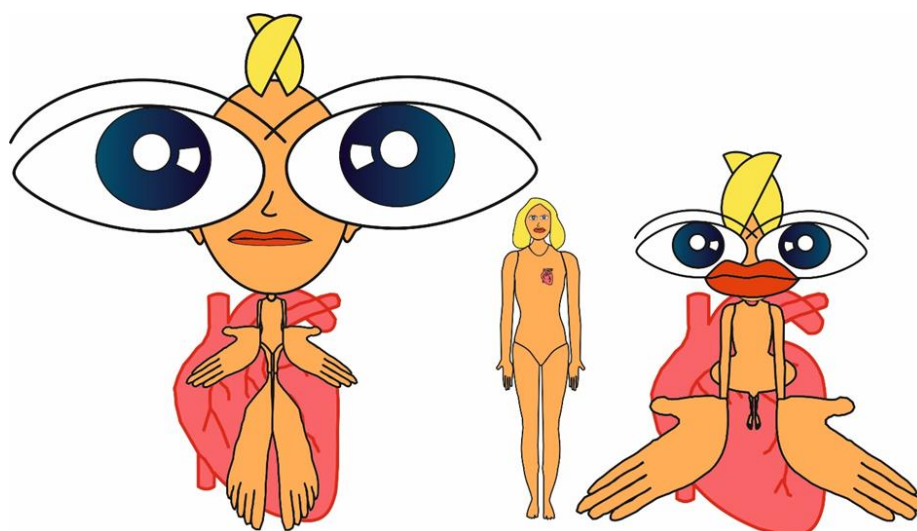


Fig. 2: Homunculus created based on relative frequencies of body parts mentioned in song lyrics.

Left: Bob Dylan, Middle: Normal body proportions;

Right: Lady Gaga. The heart is positioned behind the body because otherwise, it would obscure other body parts.

Not as much as during the actual writing process, but later, the impact of a given body part included in a certain song will depend on how often that song is played during a live performance, by radio, or on streaming platforms. The top 5 songs played most by Bob Dylan and Lady Gaga (Table 2) contain relative few

hearts and eyes. The same holds for the most streamed song titles (Table 3). The actual imprinting of the Bob Dylan and Lady Gaga homunculus in the brain of their listeners may therefore deviate slightly from the representation.

Table 2: Songs most performed during live appearances of Bob Dylan and Lady Gaga

Song title	Played	Heart	Eyes	Other body parts
Bob Dylan				
All along the watchtower	2222			
Highway 61 revisited	2038			nose
Like a rolling stone	2011		x	
Tangled up in blue	1710			hair, shoulder, face
Blowin' in the wind	1572			ear
Lady Gaga				
Poker face	844	x		face
Just dance	749		x	mouth
Paparazi	656			
Love game	591	x		mouth, hands, ass
Bad romance	541			hands

Only the top 5 most performed songs are indicated.

Table 3: Songs of Bob Dylan and Lady Gaga most streamed on Spotify

Song title	Streamed (x 10 ⁶)	Heart	Eyes	Other body parts
Bob Dylan				
Like a rolling stone	273.6		x	
Knockin' on heaven's door	261.6			
The times are a changing	180.1		x	bone, hand
Hurricane	172.1		x	hands, head, ass
Blowin' in the wind	149.9			ear
Lady Gaga				
Shallow	1.845.6			
Always remember	798.0		x	
Bad romance	768.1			hands
Poker face	739.4	x		face
Million reasons	635.2			head

DISCUSSION

The outstanding feature of both the Dylan and Lady Gaga homunculus is the size of the head, the eyes, and the heart. Of all body parts, the heart is frequently included in the lyrics of both artists, and mostly in the sense of "my heart". Apart from the heart as being "the hollow muscular organ which performs the function of a pump in the circulatory system", the Oxford English Dictionary lists 30 other meanings of the word heart. One of those, most probably the prime reason for its use in song lyrics is that the heart is "the seat or repository of a person's inmost thoughts, feelings, inclinations, etc.; a person's inmost being; the depths of the soul; the soul, the spirit"^[17]. Eyes, "your eyes", hold first place in terms of frequency in the lyrics of Bob Dylan and third place in

that of Lady Gaga. Hewig and colleagues^[18] by using objective eye trackers, showed that humans when gazing at a face specifically focus on the eyes because they are an indication of facial expressions and emotions. While it could be expected that eyes ("your eyes") and heart ("my heart") would frequently be combined in one song, that is not the case. In the Lady Gaga repertoire, there is just one song in which "heart" and "eyes" are the only 2 body parts mentioned. Bob Dylan has 3 songs with only "heart" and "eyes", one of them with the line "Should my heart not be humble, should my eyes fail to see". The song "Stay with me" on the album "Shadows in the Night", contains only cover versions of Frank Sinatra songs and therefore doesn't qualify^[19].

William Penfields' homunculus illustrates the relative size of somatosensory areas in the brain controlling different body segments. Would the functional organization of the brains of Bob Dylan and Lady Gaga differ from the participants in Penfield's studies? A significant difference is found in the size of the tongue and lips in the classical Penfield homunculus ^[5] as compared to Bob Dylan and Lady Gaga. Although not evident from Fig. 2, because it only gives the outline of the mouth, the frequency of the use of lips (1.7%) and tongue (0.3%) in Dylan's songs are only half of that of the mouth (2.7%). Also, Lady Gaga's songs, the frequency of the tongue (0.4%) is lower than that of the mouth (10.8%). Lady Gaga's lip frequency is twice as high as that of Bob Dylan (3.0) but still lower than that of the mouth. In the homunculus of Bob Dylan, hair is underrepresented. Literature states that hair colour, hair length and hairstyle all influence the perceived attractiveness ^[20,21]. That could be the reason for the high frequency of hair in Lady Gaga's songs. Another body part underrepresented in the lyrics of Bob Dylan, Lady Gaga and all popular music for that matter is the legs. In popular music, songs about legs do exist (ZZ Top, Rod Stewart) but far less than songs about feet or toes. The high frequency of feet in the Bob Dylan lyrics is from that perspective no exception.

Remarkable is the almost total lack of direct reference to primary or secondary sexual organs. In the complete oeuvre of Bob Dylan, just three times the word breast is mentioned, and it is completely lacking in the Lady Gaga lyrics. Dylan, on his most recent album, *Rough and Rowdy Ways*, in the song *Black Rider*, for the first time mentions the primary male sexual organ and only just once. The Lady Gaga oeuvre refers also only once to this organ, in the song *3-Way*. Indirect or hidden references to sexual organs, how direct they may seem (such as "bluffin' with my muffin", in Lady Gaga's *Pokerface*) were not incorporated in this analysis.

Other studies have shown that the Waist-to-Hip Ratio (WHR) also is one of the pivotal components in the determination of sexual attractiveness ^[22,23]. This is not reflected in the Bob Dylan lyrics because the 4 references to the waist and a single one to hips would result in a WHR of 4.0. The WHR for Lady Gaga would be 0.3 (once waist, 3 times hips), which is substantially below the reported ideal WHR in healthy pre-menopausal women of 0.67 to 0.8. It should be noted that hip circumference

to a large degree is determined by the buttocks (in the Lady Gaga vocabulary indicated by the more vulgar "ass"), the frequency of which is incorporated in the Lady Gaga homunculus.

Our study allows us to conclude the perceptions of the human body in the brain of songwriters. A major limitation of course that the analysis is confined to only two singer-songwriters, Bob Dylan and Lady Gaga and therefore the outcome cannot be generalized. This study, therefore, is a proof-of-principle study, which would require a broader and in-depth analysis before more general conclusions can be drawn. Although maybe at the extremes of the spectrum, it should be realized that both Bob Dylan and Lady Gaga are representatives of mainstream popular music, as indicated by the prominent role of the heart, eyes and hands in their lyrics. Other music styles such as rap, hip-hop and metal have a preference for other body parts than mainly the heart and eyes ^[12]. Another limitation is that in the total listings, the popularity (or obscurity) of a given song lyric is not taken into account. For example, the song "Someone's Got a Hold of My Heart", with 12 times "heart" in the lyrics is included in the Dylan album "The Bootleg Series, Vol 1-3: Rare & Unreleased 1961-1991", published in 1991 ^[24], but has never been performed in public. At the other end of the spectrum, "Like a rolling stone" with the line "as you stare into the vacuum of his eyes" is on the playlist of virtually every performance during Dylan's Never-Ending Tour ^[13]. It is difficult to correct these variables, also because it can be questioned whether the audience can decipher the lyrics when performed live by Dylan, especially in later years.

CONCLUSIONS

It can be concluded that analysis of the frequency of body parts in their song lyrics shows that the homunculus thus created by Bob Dylan as well as by Lady Gaga have extremely big hearts and eyes. In popular music in general the heart and eyes are the human body parts most frequently used and significantly outnumber other organs and body parts such as the mouth and hair. The Bob Dylan homunculus, as compared with Lady Gaga, has a bigger head and feet, while the Lady Gaga homunculus has a bigger body and mouth as well as more hair. Penfield in his experiments used direct electrostimulation to activate different cortical areas of the brain. It is unknown, if and when Bob Dylan and Lady Gaga used psychoactive drugs during their creative lyrics

writing sessions. More detailed research into external factors during the creative process of songwriting could be instructive when analyzing the use of human body parts in song lyrics.

CONTRIBUTION OF AUTHORS

Research concept- Ger Rijkers

Research design- Ger Rijkers and Petrouschka Verdouw

Supervision- Ger Rijkers

Materials- Petrouschka Verdouw

Data collection- Ger Rijkers and Petrouschka Verdouw

Data analysis and Interpretation- Ger Rijkers and Petrouschka Verdouw

Literature search- Petrouschka Verdouw

Writing article- Ger Rijkers and Petrouschka Verdouw

Critical review- Ger Rijkers and Petrouschka Verdouw

Article editing- Ger Rijkers

Final approval- Ger Rijkers and Petrouschka Verdouw

REFERENCES

- [1] Lawrence CR. Homunculus. The Embryo Project Encyclopedia. [updated 04 July 2018]. Available at: <http://embryo.asu.edu/handle/10776/1803>, 2008.
- [2] Carrell DT. Paternal Influences on Human Reproductive Success. In: The reproductive fitness of the human male gamete, 2010; pp: 1-5. doi: 10.1017/9781139169349.002.
- [3] Catani M. A little man of some importance. *Brain*, 2017; 140(11): 3055-61.
- [4] Snyder PJ, Whitaker HA. Neurologic Heuristics and Artistic Whimsy: The Cerebral Cartography of Wilder Penfield. *J Hist Neurosci.*, 2013; 22(3): 277-91.
- [5] Penfield W, Boldrey E. Somatic motor and sensory representation in the cerebral cortex of man as studied by electrical stimulation. *Brain*, 1937; 60: 389–443.
- [6] Bob Dylan.com [Internet]. The Official Bob Dylan Site. My own version of you. [2020; cited 2022 Jul 22]. Available at: <http://www.bobdylan.com/songs/my-own-version-of-you/>.
- [7] Bob Dylan.com [Internet]. The Official Bob Dylan Site. [2018; cited 2022 Jul 22]. Available at: <http://www.bobdylan.com/>.
- [8] Albumoftheyear.org [Internet]. Lady Gaga. [2022; cited 2022 Jul 22]. Available at: <https://www.albumoftheyear.org/artist/686-lady-gaga/>.
- [9] Bob Dylan.com [Internet]. The Official Bob Dylan Site. Sad-Eyed Lady of the Lowlands. [1966; cited 2022 Jul 22]. Available at: <http://www.bobdylan.com/songs/sad-eyed-lady-lowlands/>.
- [10] Genius.com [Internet] Lady Gaga. Hair. [2009; cited 2022 Jul 22]. Available at: <https://genius.com/Lady-gaga-hair-lyrics>.
- [11] Lyrics.com [Internet]. The web's largest resource for Music, Songs and Lyrics. [2022; cited 2022 Jul 22]. Available at: <https://www.lyrics.com/>.
- [12] Banko D. Statistics: Most used words in lyrics by genre. *Coding in Tune, Exploring Music Technologies*. [2018; cited 2021 Dec 15]. Available at: <https://codingintune.com/2018/04/09/statistics-most-used-words-in-lyrics-by-genre/>.
- [13] Setlist.fm [Internet] Lady Gaga Tour Statistics. [2022; cited 2022 Jul 22]. Available at: <https://www.setlist.fm/stats/lady-gaga-1bd665bc.html>.
- [14] Open.spotify.com [Internet] Bob Dylan-Top 20 Most Streamed Songs on Spotify [2021 Dec; cited 2022 Jul 22]. Available at: <https://open.spotify.com/artist/74ASZWbe4lXaubB36ztrGX>.
- [15] Open.spotify.com [Internet] Lady Gaga-Most Streamed Songs on Spotify [2021 Dec; cited 2022 Jul 22]. Available at: <https://open.spotify.com/artist/1HY2JdONmPuamShAr6KMms>.
- [16] Graphpad.com [Internet] San Diego. QuickCalcs. Analyze a 2x2 contingency table. [2022; cited 2022 Jul 22]. Available at: <https://www.graphpad.com/quickcalcs/contingency1/>.
- [17] Oed.com [Internet] Oxford. Oxford English Dictionary. Online edition. [2022; cited 2022 Jul 22]. Available at: <https://www.oed.com>.
- [18] Hewig J, Trippe RH, Hecht H, Straube T, Miltner WH. Gender differences for specific body regions when looking at men and women. *J Nonverb Behav.*, 2008; 32(2): 67-78.
- [19] Bob Dylan.com [Internet]. The Official Bob Dylan Site. Shadows in the Night [2015; cited 2022 Jul 22]. Available at: <http://www.bobdylan.com/albums/shadows-in-the-night-2/>.
- [20] Bereczkei T, Mesko N. Hair length, facial attractiveness, personality attribution: A multiple fitness model of hairdressing. *Rev Psychol.*, 2006; 13: 35-42.
- [21] Guéguen N. Women's hairstyle and men's behavior: A field experiment. *Scand J Psychol.*, 2015; 56(6): 637-40.



- [22]Bovet J, Lao J, Bartholomé O, Caldara R, Raymond M. Mapping female bodily features of attractiveness. *Sci Rep.*, 2016; 6: 18551.
- [23]Dixon BJ, Grimshaw GM, Linklater WL, Dixon AF. Eye-tracking of men's preferences for waist-to-hip ratio and breast size of women. *Arch Sex Behav.*, 2011; 40(1): 43-50.
- [24]Bob Dylan.com [Internet]. The Official Bob Dylan Site. Someone's got hold of my heart. [1983; cited 2022 Jul 22]. Available at: <http://www.bobdylan.com/songs/someones-got-hold-my-heart/>.

Open Access Policy:

Authors/Contributors are responsible for originality, contents, correct references, and ethical issues. SSR-IIJLS publishes all articles under Creative Commons Attribution- Non-Commercial 4.0 International License (CC BY-NC). <https://creativecommons.org/licenses/by-nc/4.0/legalcode>

