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Collaboration, Cognitive Effort, and Self-Reference in United Kingdom Top 5 Pop Music
Lyrics 1960-2015

Amanda E. Krause[1,2] and Adrian C. North[1]

[1]School of Psychology, Curtin University,
Kent Street, Bentley, WA 6102, Australia

[2]Melbourne Conservatorium of Music, The University of Melbourne,
Gate 12, Royal Parade, Parkville, VIC 3010, Australia

Email: amanda.krause@unimelb.edu.au / adrian.north@curtin.edu.au

Tel: +61 (0)8 9266 7279

Abstract

This research investigated associations between the lyrics of every song to have reached

the weekly United Kingdom top 5 singles chart from 1960-2015 and the number of people

responsible for recording each song. Following computerised content analysis of the lyrics

of the 4,534 unique songs, the results showed that the number of musicians involved was

related negatively to use of cognitive terms, consistent with previous research on social

loafing; and was also related negatively to instances of self-reference and use of language

concerning social interaction, arguably in reflection of the inherent constraints on such that

arise from collaborating with others.

Key words: lyrics, music, social loafing, self-reference, social interaction

Collaboration, Cognitive Effort, and Self-Reference in United Kingdom Top 5 Pop Music

Lyrics 1960-2015

Music lyrics are culturally important. Numerous surveys indicate that music has

been the favoured leisure time activity in many western countries for several decades

(Lonsdale & North, 2011; Rentfrow & Gosling, 2003), and the lyrics can be a direct way of

communicating ideas within a song. We sing them in our cars, they provide succour to

millions in times of hardship, and they help to shape numerous personal world-views and

cultural zeitgeists. Despite this we know very little about lyrics from a psychological

perspective. In particular, although there is a good-sized literature indicating the

prevalence of collaboration in the production of music (e.g., Simonton, 2000), very little

psychological research has considered the implications of collaboration for the products of

expert musicians. The present research, in contrast, considers the role of the number of

musicians involved in the lyrics of each of the songs to reach the weekly top 5 best-selling

singles chart in the United Kingdom between 1960 and 2015. The lyrics were computer-

analysed in terms of 13 different variables to address whether the number of musicians

involved was associated with reduced individual effort, incidence of self-reference, and

incidence of reference to social interactions.

Social Loafing and Effort

Numerous musicological works have of course considered collaborations. For

example, Everett (1999) considered Lennon and McCartney's music in terms of the

interpersonal relationships between the band members over time; and Whissell (1996,

1999, 2003, Whissell & Whissell 2000) found that, compared to McCartney, Lennon "used

fewer pleasant words, and more nasty, soft, and sad ones", among a number of other

differences. The psychological phenomenon of greatest potential relevance to this is social

loafing (see Karau & Williams, 1993, 2001). This states that each individual concerned

exerts less effort or performs less effectively when working collaboratively than in isolation.

Karau and Williams (1995) summarise a number of the theoretical explanations for social

loafing that have been proposed including social impact theory (in which the demands

made of individuals by an outside source (e.g., a manager) are diffused across the

individuals concerned); arousal reduction (in which the presence of co-workers reduces

arousal and therefore reduces performance on simple tasks but increases performance on

complex tasks); an evaluation-based approach (such that collaboration makes it more

difficult to identify and evaluate the performance of a given individual); and dispensability

of effort (such that the individual working in a group context perceives their unique input as

inessential to success). Other research has considered the possibility of a number of

mediating and moderating variables such as the attainability of, and value placed upon,

the goal in question (e.g., Karau & Williams, 1993); feeling less well-qualified to undertake

the work in question than are others in the group (e.g., Kerr & Bruun, 1983); the perception

that colleagues may take the opportunity to contribute a lower degree of effort in a

collaborative context (e.g., Jackson & Williams, 1985); or the perception that a submaximal

level of effort is all that is required in order to meet the goal in question (e.g., Latané,

Williams, & Harkins, 1979). Several studies have demonstrated these phenomena in

various domains and countries in recent years (e.g., Anshel, 1995; Czyż, Szmajke, Kruger,

& Kübler, 2016; De Backer, Boen, De Cuyper, Høigaard, & Vande Broek, 2014; Gabrenya

Jr., Latane, & Wang, 1983; Karau & Williams, 1993; Liden, Wayne, Jaworski, & Bennett,

2004; Martin & North, 2015; Meyer, Schermuly, & Kauffeld, 2016; Pratarelli & McIntyre,

1994; Tan & Tan, 2008).

However, there have been only three attempts to account for collaboration between successful musicians from an overtly psychological perspective. Outside the context of social loafing, Simonton (2000) considered 911 operas by 59 composers, showing that aesthetic success was predicted better by the identity of the composer than by the identity of the librettist. Jackson and Padgett (1982) showed that from 1967 onwards, the songs produced by Lennon and McCartney working predominantly as individuals were of higher quality than were their true collaborations, consistent with the social loafing hypothesis. However, in another attempt to apply social loafing to collaborations between commercially-successful musicians, Pettijohn and Ahmed's (2010) analysis of number 1 singles on the Billboard charts from 1955-2009 showed that individual songwriters were no more likely to enjoy commercial success than were collaborative teams, although they also report that solo and paired collaborations accounted for 78% of number 1 singles.

In addition to the limited range of the existing evidence concerning music, these three studies are limited in two other important ways. First, with the exception of Simonton's (2000) research, they consider only a limited range of music, and there has been no attempt to consider a larger sample of commercially-successful pieces. This is particularly unfortunate, given the high level of collaboration evident in the typical production methods associated with pop music, the prevalence of the genre, and the large amount of commercial data (such as sales) that are available: research addressing these would provide an evidence base that better reflects the mundane listening of the general public. Second, the three existing studies consider musical collaboration in terms of commercial or artistic success: for example, Jackson and Padgett focussed upon artistic quality (defined as those songs selected for release as 45 rpm singles and on the basis of sales data), Simonton focussed on aesthetic success (defined through frequency of recording and performance in addition to other archival indicators), and Pettijohn and

Ahmed focussed on music that had enjoyed considerable commercial success; and this distinction may explain the differing findings. North and Hargreaves (1998), for instance, showed that liking for music and perceptions of artistic quality are not synonymous. In contrast, the key dependant variable in social loafing may instead be the amount of effort that each individual contributes to the final product. The present research operationalises this degree of effort in the production of a large sample of commercially-successful pop music lyrics via three indices, namely complexity (i.e., mean number of characters per word), variety (i.e., number of different words divided by the number of words), and cognitive terms (i.e., reference to cerebral processes such as modes of discovery, mental challenges, learning practices, intuition, rationalism, and calculation). Social loafing leads us to expect that each of these should be related negatively to the number of musicians who produced the recording in question.

In addition to these factors, however, more detailed consideration of the literature on social loafing suggests that the phenomenon may be much more difficult to identify in the context of specifically co-production of pop music lyrics than in those other productive contexts addressed by previous research. Karau and Williams's (1993) meta-analysis, most notably, argues that an individual's propensity to engage in social loafing will be reduced in a number of circumstances that typically arise in the co-production of pop music. Specifically, they argue that propensity to engage in social loafing is reduced when the individual believes that the performance of the group will be evaluated by other people (which clearly occurs in the case of pop music); when individuals collaborate in smaller rather than larger groups (and note that the numbers of musicians involved in producing a pop song is typically smaller than the group sizes employed in research on social loafing); when the individuals concerned are provided with a standard against which to judge their performance (which is provided by the prevalence of music that is commercially- and

artistically-successful); when the task in question is intrinsically meaningful or interesting to

the individuals concerned (such as, arguably at least, co-production of commercial music);

and when the individuals concerned are collaborating with a highly-valued group (such as

other successful musicians).

References to Self and Relationships Among Several People

The present dataset provides an opportunity to address another aspect of pop

music lyrics. Several more general content analyses of pop music have highlighted the

focus of this genre over time on interpersonal relationships, and in particular first-person

accounts of these. The phenomenon appears to have persisted over the history of pop

music. As early as 1971, Cole's review of the lyrics of the top 10 songs for each year of the

1960s concluded that, "love-sex was the predominant theme" (p.389). Christenson and

Roberts (1998) reported similarly that interpersonal romantic relationships were described

in at least 50% (and typically a much higher proportion) of songs from the periods 1941-2,

the mid 1960s, early 1980s, and late 1980s; and Dukes, Bisel, Borega, Lobato, and

Owens (2003) found that 81% of their sample of songs from 1958-1998 concerned love.

Nonetheless, it is reasonable to suspect that this focus on the self and interpersonal

relationships may be an inverse function of the number of musicians associated with a

given recording. There may be fewer references to the self in lyrics associated with a

larger number of musicians because the number of contributors makes it inherently difficult

to focus on the concerns of one given individual. Following a similar line of reasoning, the

number of collaborating musicians might be related negatively to the extent to which the

lyrics address social processes and interpersonal relationships because the larger number

of individuals involved means that they would inherently find it more difficult to reach a

consensual viewpoint concerning others. The present research operationalises these

issues by considering the frequency of reference to the first person (hereafter 'self

reference'), and several different types of words that reflect the degree of concern in the

lyrics with interpersonal relationships.

In the light of these arguments, the present research computer-analysed the

variables outlined above in the case of the lyrics of each of the songs to have reached the

top 5 of the United Kingdom weekly singles sales chart between March 1960 and

December 2015. The number of people who performed on each song was derived for

each given recording, and three hypotheses were tested concerning the relationships

between these two sets of variables.

Hypothesis 1: The lyrics will provide evidence of social loafing, such that the degree of

complexity, variety, and use of cognitive terms in the lyrics will be negatively related to the

number of musicians involved in recording the song in question.

Hypothesis 2: The number of musicians involved in recording each song will be associated

negatively with the amount of self-reference contained within the lyrics.

Hypothesis 3: The number of musicians involved in recording each song should also be

associated negatively with aspects of the lyrics concerning relationships between several

individuals.

Method

Lyrics. The research employed all those lyrics from the period March 1960 to

December 2015 that appeared on the United Kingdom top 5 weekly singles charts.

Allowing for instrumentals, a total of 4534 unique sets of lyrics were employed. The chart

information was derived from Gambaccini, Rice, and Rice (1996) (March 1960 to

December 1995) and www.officialcharts.com (January 1996 onwards), as these provide

the same data as that employed by the British Broadcasting Corporation (BBC) in its

weekly chart radio programme and in the organisation's determination of music

programming playlists. BBC radio dominated audience share throughout the period in

question, so that the songs had considerable exposure to the general public. From 1960-

2015, 4,534 unique songs appeared on the charts. Lyrics for each were obtained

predominantly via the internet (most notably www.azlyrics.com) and a second version was

also obtained to corroborate their accuracy. In the rare event that these two versions failed

to correspond, a third version was sourced as the tie-breaker. In some cases, there were

multiple versions of a given song (e.g., '12" version', 'album version', and so on), and so

the version employed was that intended for radio airplay (usually designated as the 'radio

edit', '7" version' or similar). The lyrics were then cleaned via two processes, so that the

analyses employed a verbatim copy of each that featured consistent use of language.

First, redundancies were reintroduced so that, for instance, 'Chorus' was replaced with the

text of the chorus, the text was repeated in instances of 'x2', and similar. Second,

contractions (e.g., 'It's') were replaced with full text (e.g., 'It is') and deliberately mis-

spelled contractions (e.g., 'Lovin'', 'Goin'', 'Wanna') and other misspellings (e.g., "Becuz")

were corrected (to e.g., 'Loving', 'Going', 'Want to', 'Because').

     Coding of lyrics. The lyrics were computer-analysed using Diction 7.0 (Hart,

Carroll, & Spiars, 2013). Diction has already been used in a large number of published

studies in order to analyse text (Bligh, Merolla, Schroedel, & Gonzalez, 2010; Hart, 2014;

see also http://www.dictionsoftware.com/published-studies/), including one previous

application to song lyrics (from the Great Depression - Cook & Krupar, 2010).

Computerised analysis allows for the large quantity of text to be coded reliably (Amernic,

Craig, & Tourish, 2010; Bligh et al., 2010; Ober, Zhao, Davis, & Alexander, 1999; Sydserff

& Weetman, 2002), and in doing so Diction employs the statistically most-common words

in discourse (Abelman, 2014), based on 20,000 reference texts (Sydserff & Weetman, 2002). In deriving the scores for a given set of lyrics, Diction compared each to a total set of 10,000 words, which are classified into 35 discrete 'dictionaries' or variables. Table 1 details the subset of these of relevance to testing the present hypotheses. Each dictionary contains 10-745 words which do not overlap (Ober et al., 1999). The software calculates the frequency with which words from each of the dictionaries appears in each set of lyrics, resulting in a score for each set of lyrics on each variable. The variables that are based on word-counting are supplemented by a small number of others that analyse the properties of the words themselves (such as the mean number of letters per word and the number of different words). To control for variations in the length of various lyrics, scores on each variable were divided by the total number of words. The resulting values were subsequently divided by the number of people who recorded each song to represent input per individual. Inter-correlations between the Diction variables are reported in Appendix A. Note that although several of the Diction variables were correlated with one another, the analyses retained these individual variables given the strong likelihood that they nonetheless represent cognitively-different concepts and are calculated on a different basis to one another.

- Table 1 about here -

Derivation of band size. A number of sources (e.g., music industry websites and music biography encyclopaedias) were consulted in order to determine the number of named musicians associated with recording each song (hereafter 'band size'). This was corroborated against a second source, and in the case of irreconcilable ambiguity ($N =$ 140) the data was treated as a missing value and excluded from analyses. Recording

studio staff, instrument technicians, and others not associated with the actual performance of the song were excluded from the band size calculation. Similarly, session musicians were excluded from the calculation since (a) data on these proved highly unreliable and/or was difficult to obtain; and (b) the social presentation of the song was of it emanating from the named band (or solo artist, duet, or similar) so that employing only these in the calculation of band size is most appropriate in the context of the present hypotheses. For similar reasons, named solo artists were assigned a value of 1, named duets were assigned a value of 2, and so on. In the case of bands that have featured changes in membership over time, we calculated band size on the basis of the number of band members during the specific year in which the song in question appeared on the sales chart.

Results

To test Hypothesis 1, a Generalized Linear Mixed Model (GLMM) analysis, implemented through SPSS's (Version 22) GENLINMIXED procedure, was performed in which the three Diction variables (complexity, variety, and cognitive terms) were entered as predictor variables and band size was entered as the dependent variable. The overall model was statistically significant ($F(3, 4318) = 4.168$, $p = .006$, $\eta_p^2 = .003$, see Table 2). Results showed that although complexity and variety were not associated with band size, there was a negative relationship between the use of cognitive terms and band size: the more members of the band there were so the fewer cognitive terms per band member were employed in the lyrics. The means in question for the number of cognitive terms per band size are displayed in Appendix B.

A separate GLMM analysis considered the relationship between band size and the total number of words in each set of lyrics. This analysis was statistically significant, ($F(1,

4392) = 12.740, $p < .001$, $\eta_p^2 = .003$; $\beta = -0.001$, $t = -3.569$, [-0.001, 0.000]; see Appendix

B for means by band size). The negative relationship between band size and the total

number of words in the lyrics lends further support for the notion of social loafing: smaller

bands produce lyrics with more words in them.

- Table 2 here -

To address Hypotheses 2 and 3, ten Diction variables (namely, self-reference,

levelling, collectives, blame, communication, human interest, rapport, cooperation,

diversity, and exclusion) were entered as predictor variables into a separate, second

GLMM analysis. This model was also statistically significant, $F(10, 4311) = 49.571$, p

$< .001$, $\eta_p^2 = .103$; see Table 3. The results showed that incidences of self-reference were

related negatively to band size. Moreover, several other variables concerning interpersonal

relationships were also related negatively to band size, namely levelling, collectives,

blame, communication, rapport, cooperation, diversity, and exclusion.

- Table 3 here -

Discussion

The results supported Hypothesis 1. Although the length of words employed (i.e.,

complexity) and number of different words employed (i.e., variety) were not related to band

size, the latter was inversely-related to use of cognitive terms, implying a less cerebral

approach among larger groups of individuals, and consistent with the notion of social

loafing. In short, although band size was not related to the linguistic complexity of the

words used, it was associated negatively with the degree of focus on intellectual concepts.

Although it would be purely speculative to expand on this much further, it is interesting that the findings should discriminate between the formation of the words employed (i.e., their complexity and variety) and the subject matter of those words (i.e., cognitive terms), and future research might consider why social loafing should be evident in the case of only the latter (perhaps as a consequence of processes concerning impression formation on the part of the musicians themselves).

The results also supported Hypothesis 2, since band size was related negatively to incidences of self-reference: the greater the number of people who contributed to the recording so the fewer instances there were of references to the first person. Similarly, the results support Hypothesis 3, as band size was related negatively to a number of other aspects of the lyrics concerning interpersonal relationships: the greater the number of band members, so the fewer instances there were of words that concerned plurality and wider social groups ('collectives'); appropriation of blame ('blame'); social interaction ('communication'); instances of attitudinal similarity ('rapport'); behavioural interactions leading to a group product ('cooperation'); interest in individuals or groups differing from social norms ('diversity'); the sources and effects of social isolation ('exclusion'); and which ignored individual differences ('levelling'). Indeed, it is notable that all those variables listed in Table 3, with the sole exception of human interest, gave rise to statistically significant results in the direction expected: as such, this arguably speaks to the pervasiveness of band size effects across the various ways in which coverage of interpersonal relationships might manifest itself in lyrics.

The results concerning both Hypotheses 2 and 3 can be explained in terms of band size itself inherently restricting the musicians' opportunity to address these issues: in the case of self-reference, larger band sizes mitigate inherently against opportunities to refer to oneself in the first person; and in the case of reference to social interactions, band size

mitigates inherently against the opportunity to form a consensual view concerning others

that can be portrayed in the lyrics. For the sake of clarity, we should highlight that, of

course, the findings concerning hypotheses 2 and 3 do not reflect social loafing per se, but

rather represent a related way in which group processes and band size are related to the

content of lyrics. Moreover, one interesting further possibility concerning hypotheses 2 and

3 might well benefit from further data and theorizing. Specifically, when addressing

interpersonal relationships, collaborating groups of musicians might engage in some form

of de-individuation process, in which they behave as a single entity and attempt to

represent this single 'band viewpoint' when addressing interpersonal relationships (rather

than attempting to aggregate and reconcile the differing views of the individual band

members); or alternately they may (work harder than they would as individuals and)

instead attempt to produce a consensual view that captures the opinions of all band

members, albeit in diluted form. In short, it would be very interesting to see the results of

careful unobtrusive observation that addressed the detail of the *process* undertaken by

groups of musicians attempting to address interpersonal relationships.

We should also acknowledge explicitly two limitations to the current findings. First,

the small beta values indicate only weak relationships between the variables. This seems

tolerable in the context of the present research, however. A very large number of variables

would be reasonably expected to influence the subject matter and specific content of a

given set of lyrics, and so it seems more appropriate to give precedence to statistical

significance in the context of the present methodology. Nonetheless, although band size

alone can contribute to understanding of the content of lyrics, there is no suggestion that it

is sufficient to explain a substantial proportion of the variance between lyrics (and nor

should it necessarily). It would be particularly interesting if future research could identify

relevant possible covariates of band size and explicitly include these in the research

design: for instance, a number of studies have highlighted the role of complexity in the appeal of particular pieces of music, and considering a sample of songs with greater range lyrical complexity than that represented by the present sample may yield interesting findings.

Second, while the Method section details the care that was taken to ensure that the number of musicians who performed a given recording was measured accurately and reliably, it is nonetheless often difficult to determine the specific nature and extent of the contributions of all those involved. Popular accounts of musicians' creative processes contain several examples of songs that are formally credited to several but which are predominantly the product of only one person, although there are unfortunately few instances in which expert musicians have quantified or otherwise detailed the nature of their individual contribution to a given collaborative recording. Similarly, there are also strong anecdotal grounds to suspect an occasional but significant contribution to the final recorded product by studio staff such as producers and session musicians, record company marketing departments, and familiars and associates of the musicians. Until a substantial body of quantitative data concerning this becomes available on a sufficient scale, we assume that any inaccuracies in the present data set would not demonstrate any systematic bias over the course of a large sample such as that employed here: this assumption remains to be tested, however.

Nonetheless, given the successful identification of social loafing in the present data set, three specific hypotheses for further research arise from consideration of the conclusions reached by previous research on social loafing. First, Karau and Williams's (1993) meta-analysis found that social loafing is less pronounced among women. As such it is possible that the proportion of females involved in production of a given song is related negatively to the incidence of social loafing. Such a hypothesis would be better-suited to

experimental research, rather than the more naturalistic data reported here, since within

the present data set it is impossible to determine the actual input of each individual

collaborator. Second, Karau and Williams (see also Earley, 1989) found that social loafing

is less prevalent among individuals from collectivist cultures, since these place more value

on outputs at the level of the group rather than the individual. Again, the present dataset

does not permit a test of this hypothesis, but the possibility clearly indicates that there may

be value in an attempt to replicate the present findings via corresponding data from a

collectivist culture. Third, as noted earlier, Karau and Williams indicate that individuals

might be more predisposed to social loafing when those with whom they are collaborating

are expected to perform at a high level: this might imply that social loafing is more

prevalent among very highly-successful groups of musicians, and less common among

less prestigious groups of musicians. Such research might not be able to employ

naturalistic data of the type employed here, given the difficulty of establishing comparisons

between groups that differ solely in terms of their previous success, and might instead be

accomplished more easily using laboratory tasks involving false feedback concerning the

success of their compositions to groups of musicians.

More generally, we would encourage future researchers to develop methodologies

that permit testing between the various theoretical accounts for social loafing that have

been proposed in the literature to date. In the context of music composition, the current

amount of theorising far outstrips the availability of hypothesis-driven data. For example, it

may be possible to test for differences between lyrics in terms of a number of factors

identified in the more general literature on social loafing. This work might consider factors

such as the attainability of, and value placed upon, the goal in question (e.g., by

comparing the outputs of composers who are already successful against those who have

attained limited or no commercial success); feeling less well-qualified to undertake the

work in question than are others in the group (e.g., by comparing products by bands in

which there is one member who has a clear talent for producing lyrics against those bands

in which there is no recognised main lyricist); the perception that colleagues may take the

opportunity to contribute a lower degree of effort in a collaborative context (e.g., in the

case of bands in which there are a sub-set of individuals who typically lead songwriting

duties); or the perception that a submaximal level of effort is all that is required in order to

meet the goal in question (e.g., in the case of bands that have already enjoyed a long-

lasting period of commercial success versus bands who are only embarking on their

career). Such work will require a number of methodological challenges to be overcome,

most notably the identification of reliable data. Indeed, controlling for the effect of factors

such as these was impossible within the scope of the current project, and this may well

have suppressed the effect sizes reported here. Nonetheless, if research can achieve this

then it will make a valuable theoretical contribution to understanding of the composition of

music lyrics.

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Appendix A.

Correlations Amongst the Diction Variables

	Complexity	Variety	Cognitive terms	Self-reference	Levelling	Collectives	Blame	Commun-ication	Human interest	Rapport	Cooperation	Diversity	Exclusion
Band size	-.06***	-.05**	-.23***	-.40***	-.17***	-.03*	-.19***	-.25***	-.29***	-.14***	-.11***	-.09***	-.15***
Complexity		.99***	.03*	.04**	.03*	.06***	.01	.02	.07***	.01	.01	.01	.01
Variety			.04**	.04**	.02	.01	.00	.01	.06***	.01	.01	.01	.01
Cognitive terms				.41***	.11***	.00	.09***	.14***	.34***	.09***	.06***	.04*	.12***
Self-reference					.19***	.00	.17***	.37***	.33***	.13***	.11***	.07***	.16***
Levelling						.01	.06***	.11***	.20***	.05***	.07***	.07***	.12***
Collectives							.00	-.01	.01	.01	.01	.00	.01
Blame								.10***	.10***	.05**	.03*	.07***	.03*
Communication									.19***	.10***	.07***	.08***	.09***
Human interest										.13***	.07***	.07***	.11***
Rapport											.07***	.08***	.06***
Cooperation												.03	.03
Diversity													.05***

Note. N ranged between 4322 and 4408.

* *p* < .05, ** *p* < .01, *** *p* < .001

Appendix B
Mean Cognitive Terms and Number of Words by Band Size.

Number of band members	Cognitive terms			Total number of words		
	M	*SD*	*N*	*M*	*SD*	*N*
1	30.733	60.317	1829	319.826	178.614	1863
2	12.057	19.773	554	376.824	200.602	562
3	9.637	14.445	382	323.861	173.727	387
4	7.826	10.320	680	292.284	148.533	697
5	6.137	8.068	587	297.277	145.336	592
6	4.767	7.718	137	316.326	194.000	138
7	4.971	9.524	75	312.573	165.988	75
8	1.769	2.341	34	291.714	125.201	35
9	2.101	2.045	19	282.790	94.281	19
10	0.439	0.760	3	387.000	407.803	3
11	1.941	2.112	13	435.308	363.860	13
12	2.606	2.095	3	287.333	123.127	3
13	4.644		1	273.000		1
14	2.231	2.044	3	288.667	108.611	3
17	3.405		1	161.000		1
27	0.857		1	208.000		1

Table 1.

Summary of the 'Diction' dictionaries (taken from Hart, 1997)

Dictionary	Definition
Self-reference	Contains all first-person references.
Levelling	Words used to ignore individual differences and to build a sense of completeness and assurance.
Collectives	Singular nouns connoting plurality that function to decrease specificity e.g. social groupings, task groups (e.g. army), and geographical entities.
Blame	Terms designating social inappropriateness (e.g. naïve), evil, unfortunate circumstances, unplanned vicissitudes, and outright denigrations.
Communication	Terms referring to social interaction.
Cognitive terms	Contains words referring to cerebral processes, both functional and imaginative.
Human interest	Includes standard personal pronouns, family members and relations, and generic terms (e.g. friend).
Rapport	Words denoting attitudinal similarities among people.
Cooperation	Words describing behavioural interactions among people that often result in a group product.
Diversity	Words describing individuals or groups of individuals differing from the norm.
Exclusion	Describes the sources and effects of social isolation.
Variety	The number of different words divided by total words.
Complexity	Mean number of characters per word.

Table 2.

GLMM Analysis Concerning the Social Loafing Hypothesis (N = 4322).

Variable	*F*	*p*	Beta	*t*	95% CI		η^2
Complexity	3.031	.082	-0.017	-1.741	-0.036	0.002	0.001
Variety	2.630	.105	0.111	1.622	-0.023	0.245	0.001
Cognitive terms	6.259	.012	-0.011	-2.502	-0.020	-0.002	0.001

Note. Degrees of freedom = 1, 4318; CI = confidence interval.

Table 3.

GLMM Analysis Results Concerning Hypothesis 2 and 3 (N = 4322).

Variable	*F*	*p*	Beta	*t*	95% CI		η^2
Self-reference	46.048	< .001	-0.004	-6.786	-0.005	-0.003	0.011
Levelling	3.920	.048	-0.002	-1.980	-0.003	0.000	0.001
Collectives	10.451	.001	-0.001	-3.233	-0.001	0.000	0.002
Blame	55.107	< .001	-0.015	-7.423	-0.019	-0.011	0.013
Communication	7.967	.005	-0.005	-2.823	-0.009	-0.002	0.002
Human interest	3.380	.066	-0.001	-1.838	-0.003	0.000	0.001
Rapport	16.714	< .001	-0.010	-4.088	-0.014	-0.005	0.004
Cooperation	5.482	.019	-0.011	-2.341	-0.021	-0.002	0.001
Diversity	7.874	.005	-0.014	-2.806	-0.023	-0.004	0.002
Exclusion	10.278	.001	-0.008	-3.206	-0.013	-0.003	0.002

Note. Degrees of freedom = 1, 4311; CI = confidence interval.