INFLUENCE OF AGE, GENDER AND SAMPLE DURATION ON THE CHARISMA ASSESSMENT OF GERMAN SPEAKERS

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Abstract: We investigated 14 German politicians to systematically analyze typical boundary conditions in the perceptive charisma assessment, such as age and gender of speakers and evaluators. Beyond, we surveyed the correlation between the perceptive results and some prosodic correlates. The test data included 84 speech samples of 7 female and 7 male speakers, aged from 31 to 68 years. The samples were extracted from publicly available videos. We also tested the influence of the playback time on the assessment. Our preliminary results suggest that males receive a higher mean charisma assessment. We observed interrelations between assessment and age group of speakers and listeners, while the sample duration had a less significant effect.

1 Introduction

According to its use in sociology, politics, psychology or management, the term "charisma" can be considered from different viewpoints. We refer to a definition as "compelling attractiveness or charm that can inspire devotion in others". Consequently, this survey was stimulated by various studies in the field of voice attractiveness, which deal with the perceptive and instrumental assessment of speakers in different languages including a voice-based (beside other features) analysis of a speakers' charisma [1] [2] [3] [4].

Although some relevant, mainly prosodic factors of influence have been found, previous research was usually dedicated to the comparison of a few speakers only, e.g. in [3]. In contrast, classification tasks on a sufficient amount of speakers, as in [5], have involved large feature vector sets without considering the influencing factors in detail. We aimed at a speaker group to systematically analyze some boundary conditions in the perceptive charisma assessment, such as age and gender (cf. [6]) of both, speakers and evaluators. Furthermore, we surveyed the correlation between our perceptive results and prosodic correlates, suggested in previous studies [7] [8] [3]. Many studies consider a speech of actors, top-level managers or politicians as potentially charismatic, since they need i.a. rhetoric to create more "Followers", and they usually exhibit attributes which can be associated with leadership [1]. Our current survey follows the hypotheses to stay comparable to former results and with the expectation of discriminable measurements, although we are skeptical, whether the focus on a narrow group of protagonists such as well-known politicians is constructive: Do listeners in a perceptive test really evaluate voice or prosodic features or rather certain semantic information including current buzzwords? Is the decision objective if the speaker is known, and can we assess charisma isolated from visual and other context? What is the proportion of "intrinsic charisma" in the signal versus trained or acted components?

To test some boundary conditions, we constructed a database with 84 speech samples of 14 typical German politicians, who reflect typical parliament members, including their age distribution [9]. We also examined the influence of the playback time on the listeners' assessment by varying sample durations in a range from 1 to 29 seconds.

With regard to subsequently analyzed prosodic correlates such as pitch and articulation rate, we confirmed the findings of earlier studies on voice preference and charisma, to be published in a separate contribution. Beyond, to demonstrate the implementation of our findings, we prototyped the Android software "CharismApp" involving a simple user interface and baseline algorithms, which support a rough charisma estimation.

2 Experimental methods

2.1 Speech data

The test database contains 84 speech samples of 14 German politicians in public debates, mainly during German Parliament sessions from January, 2010 till June, 2017 [10] [11] ... [23].

The gender proportion is balanced with 7 females and 7 males, whereas the age distribution is limited to a range from 31 to 68 years due to the availability of freely-accessible data with a consistent speech quality and preparation effort. Nevertheless, the age range might reflect typical members of the German Parliament as shown in Table 1. The mean age of the selected male and female speakers was similar (male: 50.3 ± 13.6, female: 50.4 ± 6.7 years). All speech

Table 1 – Speaker selection (age indication at the date of speech recording)

Male speaker	Age	Party	Female speaker	Age	Party
Frank-Walter Steinmeier [10]	61	SPD	Angela Merkel [12]	60	CDU
Sigmar Gabriel [11]	57	SPD	Katrin Göring-Eckardt [13]	48	B'90/Grüne
Gregor Gysi [14]	68	Die Linke	Renate Künast [15]	54	B'90/Grüne
Christian Lindner [16]	31	FDP	Sahra Wagenknecht [17]	47	Die Linke
Philipp Rösler [18]	39	FDP	Martina Renner [19]	48	Die Linke
Thomas Jarzombek [20]	40	CDU	Petra Sitte [21]	55	Die Linke
Ingo Gädechens[22]	56	CDU	Halina Wawzyniak [23]	40	Die Linke

data were extracted from publicly available YouTube videos, sampled at 44.1 kHz, 32 bit, stereo and stored in the Ogg-Vorbis container format. We converted the data into the Wav format and normalized the signal amplitudes. We randomly selected meaningful speech chunks of each speaker with varying durations in a range from 1 to 29 seconds. The six speech samples per speaker are named by the initials and serially numbered, e.g. for Christian Lindner with "CL-12". The complete list of samples is referenced in [9].

2.2 Perception test

All 84 samples and 6 random repetitions (SG-51, PR-85, TJ-11, IG-36, SW-74, MR-43) for measuring the retest reliability and inter-rater agreement were presented to 20 listeners, aged between 19 and 64, all of them native speakers of German (18 males and 2 females). As a matter of course, the gender bias influences the assessment results. With regard to our definition of charisma as "compelling attractiveness or charm ...", we asked the listeners to evaluate the perceived charisma on a 5-point MOS scale (cf. Table 2).

The perception test was performed with the Multiple Forced Choice (MFC) listening experiment in Praat [24]. Age, birthplace, gender, mother tongue, test environment and type of

Table 2 – Assessment scale for the charisma perception

CHRM score	Charisma judgment
5	very strong
4	strong
3	mean
2	low
1	no charisma

loudspeaker were documented for each proband. The stimuli sequence was random. At each presented sample after the charisma judgment, the probands were asked, whether they recognize the speaker as a first indication without validating their hypothesis.

3 Results and discussion

3.1 Retest reliability and inter-rater agreement

The 20 listeners judged 62 out of 120 sample repetitions identical (51.6%). If indicating a reasonable judgment tolerance of $\Delta CHRM = \pm 1$, the number of similar judges amounts to 112 (93.3%), which we consider as a reliable retest. Allowing the same assessment tolerance of ± 1 between the raters, 165 out of the presented 240 samples were judged related, which constitutes an inter-rater agreement of 68.8%.

3.2 Influence of sample duration

Figure 1 shows that the charisma assessment for longer samples e.g. in time interval 21…25 s is significantly higher than for short ones with the interval 1…6 s as a reference, whereas the *CHRM* scores drop in the longest interval 25…29 s again. The mean overall assessment of 2.94 approximately corresponds with 3 as the median of our 5-point charisma scale. Assuming a linear regression, we suggest by this approximation an interval-based correction factor k_i for the charisma assessment to simplify the comparison between different speeches and extracted samples:

$$k_i = \frac{CHRM_{mean,all}}{CHRM_{mean,interval}} \tag{1}$$

Considering a low compensation effect of about max. $k_i \approx 1.0 \pm 5\%$, the charisma correction can be skipped in our study.

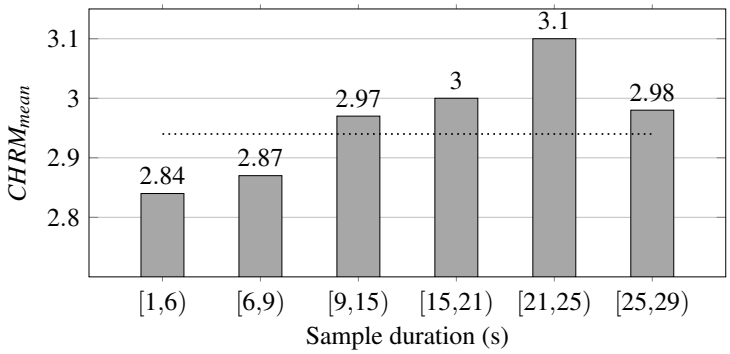

Figure 1 – Influence of sample duration on charisma assessment. Dotted line shows average score 2.94.

3.3 Influence of the age in speakers and listeners

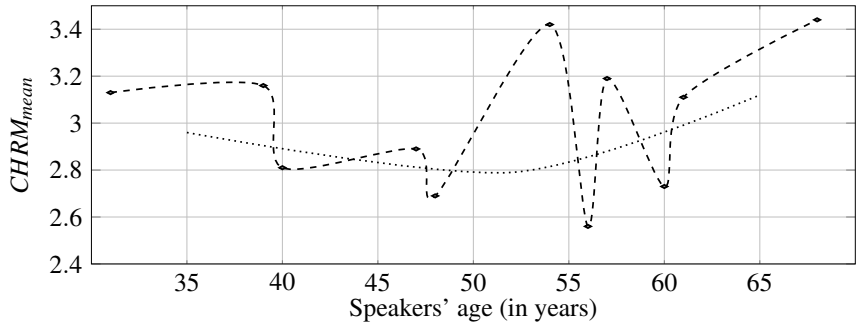

Figure 2 – Charisma assessment (all listeners) vs. age of speakers. Dotted line shows approximation.

Figure 2 illustrates the mean charisma assessment of all listeners, plotted over the age of the 14 speakers. There is no visible trend, disregarding the apparent small drop in middle-aged speakers. With regard to the limited number of speakers, we formed three reasonable age groups for the statistical analysis. The mean group-related charisma assessments are shown in Table 3.

Table 3 – Mean charisma assessment of 20 listeners depending on speakers' age group

Age of speaker (years)	**No. of speakers**	**No. of samples**	**$CHRM_{mean}$**
≤ 47	5	30	2.96
48…56	5	30	2.79
≥ 57	4	24	3.12

Figure 3 presents the mean charisma assessment in all speakers, plotted over the age of the 20 listeners. Among younger listeners (age < 30) and older ones (> 60 years) a higher variation of the mean assessment can be observed compared to middle-aged probands, therefore we have also split the listeners and their assessments into three age groups (summarized in Table 4).

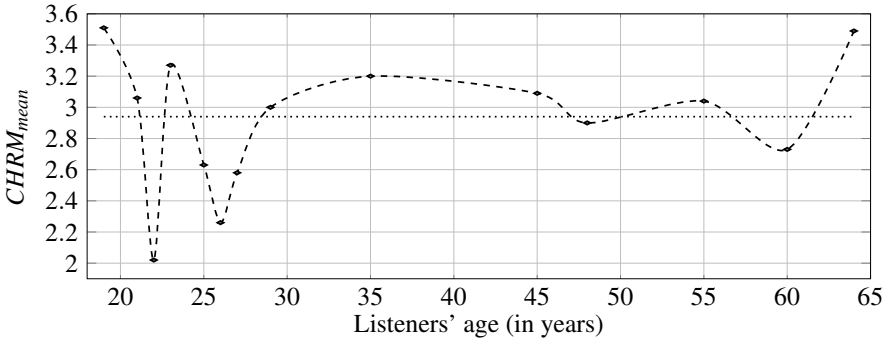

Figure 3 – Charisma assessment (all speakers) over age of listeners. Dotted line shows average score.

Table 4 – Mean charisma assessment, averaged over age groups for speakers and listeners

Age of listeners (in years)	No. of listeners	Speakers' age-related $CHRM_{mean}$			
		≤ 47	$48 \ldots 56$	≥ 57	all speakers
≤ 25	7	3.05	2.89	2.92	2.95
$26 \ldots 35$	6	2.75	2.76	2.90	2.80
≥ 36	7	2.96	2.62	3.49	2.99

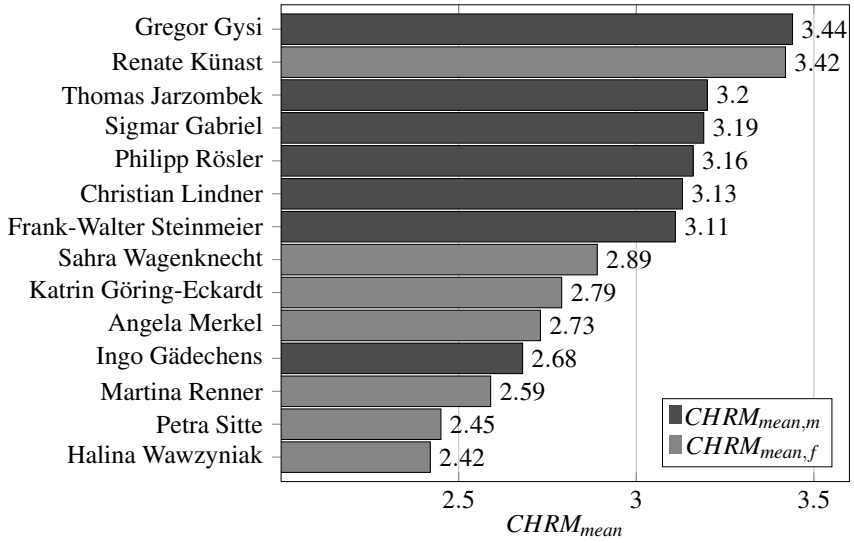

Figure 4 – Mean charisma assessment of 14 speakers with indication of their gender

3.4 Influence of gender

Figure 4 shows the assessment ranking of the 14 speakers, in which the upper half is dominated by 6 out of 7 male speakers. The mean assessment of all male speakers amounts to 3.13, which is significantly higher than the mean assessment of all females at 2.76. Considering the limited assessment range practically used ($CHRM_{mean}$ = 1.83 ...4.33), the gender-related difference represents a mean level of ca. 14.8%.

3.5 Effect of speaker verification

As shown in Figure 5, the listeners pretended to well-recognize the voice of German chancellor Angela Merkel across all samples (speaker verification rate $SVR = 89,1\%$ without validation). Two further female and three male politicians were also relatively prominent ($SVR > 30\%$) but a majority of eight politicians widely unknown ($SVR < 15\%$).

Comparing Figure 4 and Figure 5, we can expect a correlation between speaker verification and charisma assessment in general, which is nonetheless non-trivial. The average verification rate in all female speakers (27.2%) is higher than the corresponding one for males (22.8%). In contrast, only a single female (Renate Künast at rank 2) achieved the upper half of the charisma list, and the well-known speaker Angela Merkel merely performed at rank 10.

3.6 Summary of age and gender related results

The summarized results in Figure 6 indicate that males receive a higher charisma assessment in general. A potential correlation of assessments with the speakers' age would be speculative.

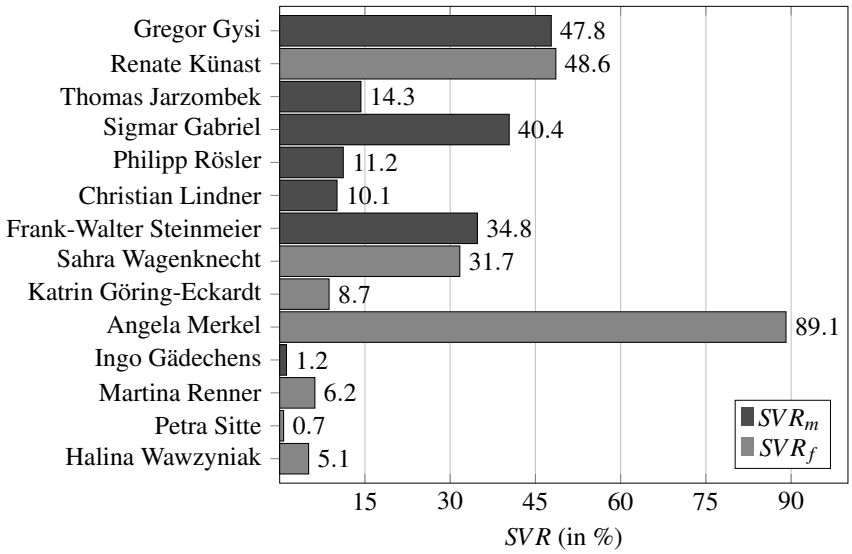

Figure 5 – Verification rate of 14 speakers with gender indication

The slight drop in our middle-aged group might be caused by the (coincidentally) higher proportion of female speakers. The assessment gap between female and male speakers is rising from ca. 7.6% in young listeners (aged ≤ 25) to ca. 26.8% in our older listeners (aged ≥ 36).

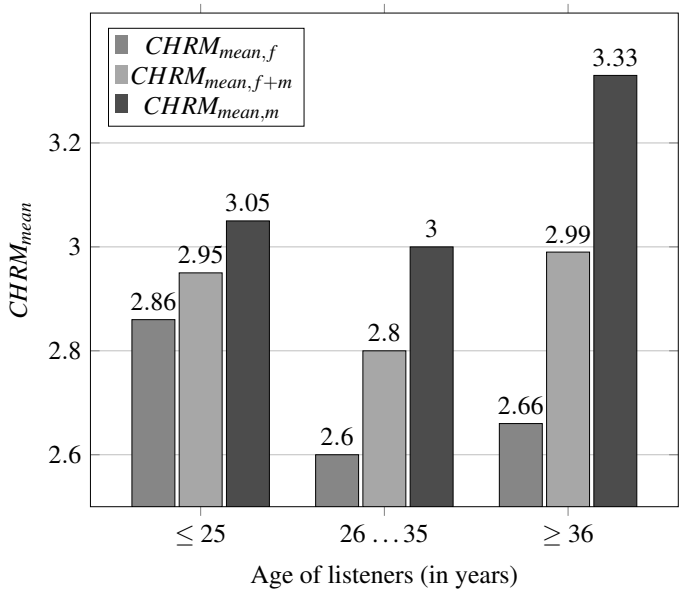

Figure 6 – Gender-specific charisma assessment depending on listeners' age

4 Conclusion and outlook

Irrespective of the gender bias in the listeners, the mean charisma assessment of male politicians turns out to be significantly higher than the assessment of female ones. The preference of male voices is rising for older listeners, whereas the results with regard to the influence of the speakers' age deserve more experiments for clarification. In the future (speech-based) charisma experiments, we will enlarge the speaker database to consolidate the preliminary results rather than focusing on a few specific people like politicians, managers or actors. Our results regarding the studied boundary conditions, together with the known prosodic correlates, will be implemented in the mentioned CharismApp software.

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