

Effects of tempo in radio commercials on young and elderly listeners

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Abstract

The aim of the present study is to investigate the effects of tempo manipulations in radio commercials, on listeners' evaluation, cognition and persuasion. Questionnaire scores from 131 young and 130 elderly listeners show effects of tempo manipulation on listeners' subjective evaluation, but not on their cognitive scores. Tempo effects on persuasion scores are modulated by the listeners' general disposition towards radio and radio commercials. In sum, it seems that not age but listeners' general disposition is of importance in evaluating tempo manipulation of radio commercials.

Index Terms: tempo manipulation, radio commercials, recall, persuasion, aging

1. Introduction

Speaking rate, or speech tempo, is an important prosodic parameter in speech communication. Speech tempo is affected by multiple conflicting demands which a speaker has to balance for effective communication. For example, fast tempo is an indication of the speaker's verbal proficiency, and hence of his or her credibility [1]. Slow tempo, on the other hand, facilitates listeners' recall of the content of the spoken message [5,6]. Speech tempo also conveys information about the speaker's emotional attitude [3]. Hence the optimal speech tempo in a particular communicative situation is a compromise between such conflicting constraints.

Presumably, these constraints result from different domains of processing by the listener. In this study, we will focus on three domains of processing spoken messages, viz. the evaluative, cognitive and persuasive domains. Studying the effects of tempo on these three domains simultaneously may provide further insights into these component parts of perceptual processing, and in their possible interactions.

In addition, we know that older speakers speak slower than younger listeners [7], and that older listeners also prefer slower speaking rates than young listeners [9,11], presumably because of reduced cognitive capabilities in older listeners [8]. This suggests that the balance of conflicting constraints on speech tempo may vary over the life span [4]. In the present study, we will therefore investigate several aspects of speech processing, in both young and elderly listeners.

From a practical perspective, better insights in the effects of tempo manipulations may be relevant for radio advertisers. Does time compression of a radio commercial (i.e., faster tempo) always improve perceived credibility of the speaker, or is this perhaps limited to younger listeners? Likewise, does time expansion (i.e., slower tempo) always improve the recall of the message's content, or is this perhaps limited to older listeners? If the age effects reported above also apply to persuasive messages such as radio commercials, then the optimal tempo manipulations in such messages would also depend on the age profile of the target audience.

In the present study, therefore, we will investigate the effects of tempo manipulations in two different radio commercials, for young adult listeners and for elderly listeners. Hence, tempo manipulation (fast, normal, slow) and age group are the two key factors in this study. Using a questionnaire, we will assess three domains of processing: evaluative (credibility, pleasantness), cognitive (recall), and persuasive (beliefs, attitudes and intentions).

2. Method

2.1. Design

The two key factors, age group (young, elderly) and tempo (fast, normal, slow) were both between-subjects factors. Two different radio commercials were used, which constituted a blocking factor. Each participant listened to two commercials of the same manipulated tempo, and answered a comparable set of questions for each commercial. This design corresponds with common practice in document design studies [e.g. 10].

2.2. Materials

Two existing radio commercials were selected that were relevant and appropriate for both young and elderly listeners. The first commercial was about a preventive lung capacity test (sponsored by the Dutch Asthma Fund). The second commercial was about installing smoke detectors (sponsored by the joint fire brigades in the Netherlands). Each of the commercials was spoken by one male speaker, and neither commercial contained any music. The duration of the commercial about the lung test was 20 seconds (4.85 syll/s), the one about smoke detectors 30 seconds (4.33 syll/s). The fast, normal and slow versions of each commercial were created by means of PSOLA manipulation of the time base, yielding durations of 0.8, 1.0 and 1.2 respectively, relative to the original duration. Tempo manipulations were done by means of Praat software [2].

2.3. Instrumentation

The questionnaire consisted of three parts. The first part inquired about personal information, such as age, sex, and education level. We also inquired about listening habits and about general opinion about radio commercials. Responses on these questions were used to separate the respondents into groups of young and elderly listeners, of frequent (≥ 1 h daily) and infrequent radio listeners, and of respondents with a positive, ambivalent or negative opinion about commercials. The second and third parts contained comparable questions to assess the various aspects of interest of the two radio commercials. Table 1 provides an overview of the various aspects in various domains that were assessed, with key characteristics used in the questions.

Table 1. *Organization of questionnaire*

| Domain | Aspect | Characteristic |
|---------------------|------------|----------------------------------|
| Evaluation: speaker | Rate | <i>pleasant</i> |
| | Voice | <i>pleasant</i> |
| | Style | <i>composed</i> |
| | Character | <i>sincere</i> |
| Evaluation: message | Clarity | <i>clear</i> |
| | Attention | <i>interesting</i> |
| | Affect | <i>reassuring</i> |
| Cognition | Recall | <i>correct</i> |
| | Recall | <i>certain</i> |
| Persuasion | Beliefs | <i>will benefit from product</i> |
| | Attitudes | <i>is good product</i> |
| | Intentions | <i>will buy product</i> |

The first two evaluative aspects, Rate and Voice, were each assessed by means of a single question using a 7-point scale. All other aspects of evaluation were assessed by means of four questions on a 7-point *disagree/agree*-scale. Cognition was assessed by means of four 4-choice recall questions; for each of these questions the level of certainty of the answer was also scored using a 2-point scale (*certain/guessed*). Persuasion was assessed by two questions measuring beliefs (using a 7-point *disagree/agree*-scale), two questions measuring attitudes (*idem*) and four *yes/no* questions measuring intentions. Recall questions and belief questions were of course specific to each commercial.

2.4. Participants

Two hundred and sixty-one listeners participated in the experiment, 131 young adults between 19 and 30 years old (mean age: 22.7, s.d.: 2.65) and 130 elderly adults between 64 and 76 years old (mean age: 69.6, s.d.: 3.35). Gender was distributed more or less evenly (young: 60 male, 71 female; elderly: 58 male, 72 female). Participants lived in various regions of the Netherlands and were recruited by 11 students in Communication and Information Sciences at Utrecht University, as partial fulfilment of course obligations. Young adults were better educated than the elderly adults (for historical reasons). Of all participants, 160 subjects were frequent listeners, 101 were infrequent listeners. Elderly listeners were more often frequent listeners than young listeners were ($\chi^2(1)=6.86, p<.025$). Of all participants, 98 had a negative opinion, 76 had a positive opinion and 87 were ambivalent towards radio commercials. Relatively more young listeners had a negative opinion, and relatively more elderly listeners had an ambivalent opinion ($\chi^2(2)=14.46, p<.01$).

2.5. Procedure

Each session was run individually at a quiet spot in the participant's home. The questionnaire was the same for each participant. Participants were told explicitly that they could not give wrong answers. They were asked to listen carefully to each radio commercial and then to fill in the corresponding part of the questionnaire after each commercial. The audio commercials were played by means of a laptop using built-in speakers. The time required to listen to the commercials and fill in the questionnaires ranged from 15 to 50 minutes.

2.6. Statistical analyses

For all aspects (cf. Table 1) assessed with more than one question, the reliability of this aspect was assessed with a

principal component analysis (PCA) and with Cronbach's alpha. Results were satisfactory, with the PCAs yielding a single factor with eigenvalue >1 , and with Cronbach's alpha values between .58 and .79.

For each aspect in Table 1, summed scores were evaluated with an analysis of variance for repeated measures (RM-ANOVA). Main fixed factors were Topic (lung test, smoke detector) as within-subjects factor, and Tempo (slow, normal, fast), Age (young, elderly), Habit of listening (frequent, infrequent) and Opinion about commercials (negative, ambivalent, positive), as four between-subjects factors. For clarity we will only report results regarding the main effects of Tempo and Age, and the interactions of Tempo with the moderator factors Age, Habit and Opinion, and we will neither report other main effects nor interactions among moderator factors.

3. Results

3.1. Evaluation of the speaker

The four speaker aspects evaluated were rate, voice, style and character (cf. Table 1). The evaluation of rate shows a three-way interaction between Tempo, Age and Habit [F(2,224)=3.08, $p<.05, \eta_p^2=.03$]. Figure 1 shows that elderly frequent listeners found slow tempo most pleasant (and fast tempo least pleasant), whereas other listener groups found normal tempo more pleasant than both slow and fast tempo.

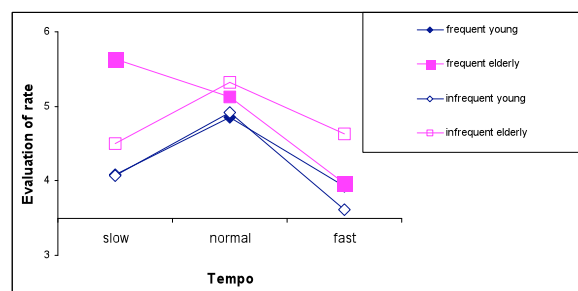


Figure 1: *Evaluation of rate in three tempo conditions, broken down by listeners' listening habit and age group.*

The main effect of Tempo on the evaluation of rate is significant [F(2,224)=11.79, $p<.001, \eta_p^2=.10$], with pairwise comparisons with Bonferroni correction showing that normal tempo was evaluated as more pleasant than fast tempo. Age also yielded a main effect [young: mean 4.24, elderly: 4.86; F(1,224)=12.98, $p<.001, \eta_p^2=.06$]. These evaluation scores thus indicate that our tempo manipulations were effective, and that Age and Habit do indeed modulate listeners' evaluation. Evaluation scores might also partly explain the cognitive and persuasive scores. If so, then the commercials at normal tempo should get higher scores than those at slow or fast tempo.

The other speaker aspects evaluated were voice, style and character. Voice is affected by the interaction between Tempo, Age and Habit [F(2,224)=3.22, $p<.05, \eta_p^2=.03$], showing the same pattern as in Figure 1: the elderly frequent listeners responded more positively to the slow version. All other groups responded most positively to the normal version. Tempo also yields a significant main effect [slow: 4.45, normal: 5.30, fast: 4.48; F(2,224)=12.67, $p<.001, \eta_p^2=.09$], with the normal tempo differing significantly from both slow and fast tempo. As before, Age also yields a main effect [young: 4.47, elderly: 5.01; F(1,224)=11.31, $p<.005, \eta_p^2=.05$].

A main effect of Tempo is found on speaker's style [slow: 5.45, normal: 5.56, fast: 4.91; $F(2,224)=8.82$, $p<.001$, $\eta_p^2=.07$]. Pairwise comparisons with Bonferroni correction show that the speaker's style in the commercials at slow and normal tempo is evaluated more positively than in the commercial at fast tempo.

The evaluation of the character of the speaker is only affected by Age [$F(1,224)=4.30$, $p<.05$, $\eta_p^2=.02$]. Elderly listeners evaluated speaker's character more positively (5.6) than young listeners did (5.3).

3.2. Evaluation of the message

The three message characteristics evaluated were the clarity of the message, the extent to which the message attracted attention, and the extent to which listeners were affected by the message. The first of these is not affected by Tempo [$F(2,225)=2.39$, $p=.09$], nor by Age, nor by any interaction.

The listeners' attention is modulated by main effects of Tempo and Age. Commercials at slow tempo attracted less attention than commercials at normal and fast tempo [slow: 4.95, normal: 5.27, fast: 5.00; ($F(2,225)=3.56$, $p<.001$, $\eta_p^2=.03$)]. Elderly listeners were more attracted to the message than young listeners [young: 4.79, elderly: 5.35; $F(1,225)=26.88$, $p<.001$, $\eta_p^2=.11$].

The listeners' affect is modulated by a three-way interaction between Tempo, Age and Habit [$F(1,224)=4.32$, $p<.025$, $\eta_p^2=.04$]. Figure 2 shows that elderly frequent listeners were slightly more positively affected by the slow version than by the other versions; for other listener groups there are no differences. There is also a main effect of Age: elderly listeners were more positively affected than young listeners [4.7 vs 4.1, $F(2,224)=27.73$, $p<.001$, $\eta_p^2=.11$].

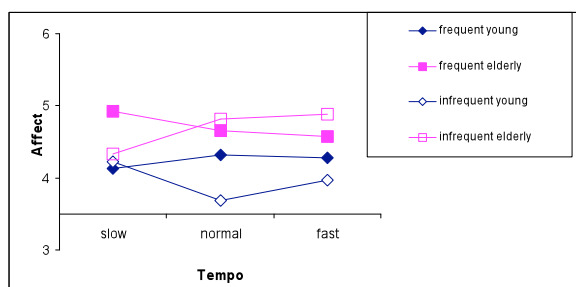


Figure 2: Listeners' affect ratings in three tempo conditions, broken down by listeners' listening habit and age group.

3.3. Cognition

The cognition scores were determined both by the numbers of correct answers and by the certainty of the answers. These scores are kept separately because of confounding effects, i.e., participants could be certain about wrong answers. Tempo did not affect accuracy [$F(2,225)=2.03$, $p=.13$] nor certainty [$F(2,225)<1$]. Both measures differ for Age only: young listeners had more correct answers than elderly listeners [proportions correct were .80 vs .66; $F(1,225)=43.07$, $p<.001$, $\eta_p^2=.16$]. Young listeners were also more often certain about their answers than elderly listeners [.58 vs .44; $F(1,224)=21.49$, $p<.001$, $\eta_p^2=.09$].

3.4. Persuasion

Beliefs were analyzed separately for the two commercials because of the different contents of the message. The beliefs resulting from the message about lung test were affected by the interaction between Tempo and Opinion [$F(4,224)=2.44$, $P<.05$, $\eta_p^2=.04$]. Listeners with a negative opinion held

stronger beliefs after listening to the fast version, whereas listeners with an ambivalent or positive opinion held stronger beliefs after listening to the slow version, as shown in Table 2.

Table 2. Average scores on questions assessing belief about lung test, broken down by Tempo and Opinion.

| | Tempo | | |
|------------|-------|--------|------|
| | slow | normal | fast |
| negative | 4.93 | 5.34 | 5.61 |
| ambivalent | 5.18 | 4.61 | 4.38 |
| positive | 5.21 | 5.22 | 4.86 |

Beliefs about the lung test are also affected by Age (young: 4.59, elderly: 5.49), yielding a significant main effect of Age [$F(1,224)=26.69$, $p<.001$, $\eta_p^2=.11$].

The beliefs resulting from the message about smoke detectors is affected by the interaction between Tempo and Habit [$F(2,225)=3.39$, $p<.05$, $\eta_p^2=.03$]. Infrequent listeners held stronger beliefs after listening to the fast commercial (compared to the normal and slow version), whereas the beliefs of the frequent listeners were slightly stronger for both the slow and fast version. In Table 3 the scores are presented.

Table 3. Average scores on questions assessing beliefs about smoke detectors, broken down by Tempo and Habit.

| | slow | normal | fast |
|------------|------|--------|------|
| frequent | 4.57 | 4.22 | 4.45 |
| infrequent | 3.66 | 4.18 | 4.67 |

Beliefs about smoke detectors are also affected by Age [young: 3.51, elderly: 5.01; $F(1,225)=70.28$, $p<.001$, $\eta_p^2=.24$]. Attitude was analyzed for both topics simultaneously. Attitude was affected by the three-way interaction between Tempo, Commercial and Opinion [$F(4,224)=3.68$, $p<.01$, $\eta_p^2=.06$], as shown in Table 4.

Table 4. Average scores on questions assessing attitude, broken down by Tempo, Topic and Opinion.

| | Lung test | | | Smoke detectors | | |
|------------|-----------|------|------|-----------------|------|------|
| | slow | nrml | fast | slow | nrml | fast |
| negative | 4.84 | 5.45 | 5.66 | 6.04 | 6.25 | 5.90 |
| ambivalent | 5.42 | 5.07 | 5.56 | 6.09 | 6.11 | 6.33 |
| positive | 5.89 | 5.47 | 5.25 | 5.57 | 5.84 | 6.01 |

After listening to the fast version, listeners with a negative opinion about commercials have the most positive attitude towards the lung test (5.66) and the most negative attitude towards smoke detectors (5.90). By contrast, listeners with a positive opinion about commercials have the most negative attitude towards the lung test (5.25) and the most positive attitude towards smoke detectors (6.01) after listening to the fast condition. In addition, attitudes towards the advertized products are also affected by a main effect of Age [young: 5.55, elderly: 5.86; $F(1,224)=8.02$, $p<.025$, $\eta_p^2=.04$].

No effects of Tempo on listeners' intentions were found [$F(2,225)=1.59$, $p=.21$]. Intentions were modulated by Age [young: .09, elderly: .25; $F(1,225)=26.73$, $p<.001$, $\eta_p^2=.11$].

4. Discussion and conclusions

The study shows several interesting results. First, elderly listeners evaluate the slow version of commercials as most pleasant, but this evaluation profile is found only for frequent

listeners. All young listeners and the infrequent elderly listeners evaluated the normal version as most pleasant (Fig.1). This suggests that evaluation profiles may indeed vary over the life span, and that these may vary with listening habits.

Secondly, the tempo manipulations generally yield effects on the 'softer' evaluation measures, but not on the 'harder' performance measures related to cognition (recall) and persuasion (beliefs, attitudes and intentions). In other words, a slower tempo may be more pleasant (for elderly frequent listeners, at least) but it does not necessarily lead to better recall or stronger persuasions. This suggests that listeners' cognitive and persuasive domains do not depend entirely on listeners' evaluation: a radio commercial can be unpleasant and yet be recalled accurately.

Third, we see that the listeners' general disposition towards radio and radio commercials, as expressed in their opinion about radio commercials and in their listening habits, constitutes an important moderating factor. For listeners with a positive general disposition (positive opinion and/or frequent listener), the slow version works best (Tables 3 and 4). By contrast, the fast version works best for listeners with a negative general disposition (negative opinion and/or infrequent listener), probably because these ads are more interesting and less of a nuisance to listen to. This suggests that time compression may *not* be beneficial to the *target* audience of radio advertisers, but that new (non-targeted) listeners may be informed or convinced more easily with time-compressed commercials.

In our results, tempo manipulation does not yield effects on listeners' recall nor on their beliefs, attitudes or intentions. This indicates that time compression (at least in the compression ratios used in this study) does not jeopardize the main objectives of the advertisers, viz. cognition and persuasion. Does this mean that all commercials can be time-compressed? Not necessarily: our results show that listeners' responses are modulated by the listeners' general disposition and by the listeners' age; this implies that time compression may work out differently for different groups of listeners.

In sum, the results of the present questionnaire study indicate that tempo manipulation do affect listeners' subjective evaluation of radio commercial messages, but not listeners' cognition or persuasion. Contrary to our expectations, this pattern of results was not modulated by listeners' age, as witnessed by the absence of crucial Age-by-Tempo interactions. This suggests that the balance of conflicting constraints on speech tempo does not depend solely on the listeners' age, although listeners' age does in turn modulate other interactions. Instead, our results indicate that the balance of constraints depends rather on the listeners' general disposition towards radio and radio commercials, with different patterns of results for 'positive' and 'negative' listeners.

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