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Media Multitasking and the Role of Task Relevance in Background Advertising Processing

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1 Introduction

People are increasingly combining multiple media simultaneously (e.g., checking Facebook while watching television, listening to the radio while reading). Simultaneously using multiple media with different screens, audio sources, and content is referred to as media multitasking (Chinchanachokchai et al., 2015; Ophir et al., 2009; Voorveld, Segijn, Ketelaar, & Smit, 2014; Voorveld & van der Goot, 2013). During media multitasking, different media and different messages compete for attention, which may result in cognitive overload. For this reason, people often focus their attention on one medium rather than on the other medium (the background medium) while media multitasking (Brasel & Gips, 2011; Enoch & Johnson, 2010; Jeong & Fishbein, 2007; Jeong & Hwang, 2012). Would an advertising message still be able to influence consumers when they are focusing on content in a different medium? The present research addresses this question.

Research on *background* advertising processing while media multitasking is scarce. A thorough overview of recent media multitasking research (Yeykelis et al., 2014) shows that none of the 54 included studies addresses the effects of the background medium while simultaneously using another medium. Our research aims to investigate the effects of hearing background radio commercials while using the Internet and, in doing so, contributes to the literature in two important ways. First, it not only replicates previous findings by confirming that media multitasking affects advertising processing but also generalizes these findings to background advertising processing. Second, it extends the literature by showing that not all multitasking effects are detrimental; in fact, the relatedness with the primary task can actually enhance the memory and evaluation of background messages.

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2 Theoretical Framework

2.1 Consequences of Media Multitasking for Advertising Processing

Most media multitasking literature has emphasized the consequences of dual tasking and concurrent device usage in terms of the limited capacity of attention (Jeong & Hwang, 2016; Yeykelis et al., 2014), as described, for instance, in limited-capacity models of information processing (Kahneman, 2011; Lang, 2000). Because people have a finite amount of processing resources, they must divide their attention among different tasks. When someone is engaged in one activity that requires a substantial amount of cognitive capacity (i.e., searching on the Internet), it is likely that this activity occurs at the expense of the processing of information required for a second activity (i.e., listening to radio commercials).

The main perspective taken in early studies regarding the effects of multitasking has focused on the effects of the primary task or medium while using another medium in the background (i.e., the secondary medium). Overall, research has shown a negative effect of multitasking on ad/brand memory of the primary task (e.g., Duff & Sar, 2014, Kazakova et al., 2016, Voorveld, 2011). For example, in study 1 of Kazakova et al. (2016) it was found that cognitive outcomes (i.e., recognition and recall) were lower when multitasking than single tasking. Furthermore, research has shown positive effects of multitasking on evaluation (e.g., brand attitude) of the primary task (e.g., Chinchanachokchai et al., 2015, Kazakova et al., 2016, Voorveld, 2011). An explanation for this positive effect is that people have more difficulty to resist a persuasive message while multitasking because of a limited amount of cognitive resources (Jeong & Hwang, 2012, Segijn, Voorveld, & Smit, 2016).

An alternative perspective in studying media multitasking involves assessing how the secondary medium content is processed. How do people process information that is provided through a medium that is not the focus of attention? This perspective has been examined several times in an industry setting, although those studies considered multitasking with one medium (radio) rather than specifically addressing media multitasking. For instance, the classic "iron board study" tested 300 housewives' recall of radio commercials that played while the women were ironing (Gould, 1996). Although the women did not listen attentively to the commercials, they apparently processed the messages and were able to recall them. It is unknown, however, to what extent they would have recalled the radio commercials if their attention had not been divided. The study of Jeong and Hwang (2012) described this primary-secondary aspect of media multitasking. These researchers showed that media multitasking (combining print and video) reduces comprehension of a persuasive text compared with a single me-

dium situation, but this difference was greater between the two media multitasking groups (print as primary and print as secondary medium). Thus, the comprehension of the primary medium (a printed text) was particularly hindered when attention had to be divided between this medium and the secondary medium (i.e., a four-minute movie) but not when attention was solely focused on the primary medium.

To the best of our knowledge, no published study focuses on background advertising effects while media multitasking. Based on the insights of media multitasking advertising effects of the primary medium, we expect the following:

H1: Media multitasking will have (a) a negative effect on the memory of background advertising and (b) a positive effect on the evaluation of background advertising when simultaneously using another medium (i.e., performing an Internet search task).

2.2 The Role of Task Relevance

An interesting characteristic in relation to media multitasking is whether the content of the one medium corresponds to the content of the other medium. The different messages processed during media multitasking can have higher or lower degrees of relatedness. It can be expected that task performance will be improved when multiple tasks serve related goals (i.e., task relevance; Wang et al., 2015). The Theory of Threaded Cognition (Salvucci & Taatgen, 2008) states that people have different cognitive threads and each thread serves a different goal. When people combine multiple tasks with different goals the cognitive demand increases. However, tasks with similar or overarching goals will be processed through the same thread and do not have to compete for cognitive resources. As a result, the tasks with an overarching goal require fewer resoures and will be more efficiently processed. Indeed, a meta-analysis showed that the negative effect of multitasking on memory was stronger when tasks were unrelated (Jeong & Hwang, 2016).

Recently, researchers started to study task relevance in relation to media multitasking. A study into second-screen effects showed that simultaneous use of media that are complementary to each other in terms of topic or content has a positive influence on learning (Nee & Dozier, 2015). Van Cauwenberge et al. (2014) examined watching the news in combination with a related or unrelated search task. In this case, the results showed no difference in comprehension of the news item in the two multitasking groups. However, these studies did not focus on advertising. The next two studies did. Cauberghe et al. (2010, experiment 2) used a specific task instruction to manipulate cognitive load during exposure (goal-directed search versus experiential web use). The participants were simultaneously exposed to a clickable interactive ad embedded in a media-

rich website containing a video that was either related or unrelated to the topic of the ad. The results revealed the expected interaction: more attention was devoted to the ad when embedded in a related video, but only when the participants were triggered to search for answers to questions related to the interactive ad (i.e., when their cognitive load was high). Finally, the study of Angell et al. (2016) examined memory of advertising billboards in a soccer game after watching and sending or reading (un)related tweets or text messages. The results of this study showed that people remembered more ads when they actively send tweets or text messages *related* to the television show.

We have added task relevance to our design to assess whether media multitasking advertising processing effects differ in a related versus unrelated situation. Based on the previously described studies, we expect:

H2: Related background radio commercials will be (a) better memorized, and (b) more positively evaluated than background commercials that are not related to the Internet task being performed.

3 Study 1

3.1 Participants and Design

The fieldwork was conducted by research company GfK, which used their consumer panel representative of Dutch radio listeners. A total of 158 respondents ranging from 13 to 73 years old (M = 49, SD = 14) participated (50% were female, and 28% had completed a professional or university education). The study employed a 2 x 2 mixed design with media multitasking serving as a between-subjects factor and with task relevance serving as a within-subjects factor. The participants in the two groups did not differ significantly in terms of their age, sex, education, radio listening, or Internet use.

3.2 Procedure

The respondents were selected and invited by GfK and were not aware of the actual purpose of the experiment. Half of the respondents (n = 79) were asked to perform two Internet search tasks (see Appendix). The participants were seated in a room in groups of 15 to 20 and performed the Internet search tasks on separate computers with the radio tuned to the cooperating radio station broadcasting its regular programmes. After two songs, the participants were exposed to eight commercials in one commercial block (random order), followed by more music. After performing the Internet search tasks, the respondents were asked to put on their headphones and complete the questionnaire. The other half of the respondents (n = 79) did not perform the Internet search task. The participants began the

experiment by putting on the headphones, through which they were exposed to the radio broadcasting. Subsequently, all respondents received credit points to spend in an online shop affiliated with the research company.

3.3 Manipulations

Media multitasking served as a between-subjects factor. The respondents of the media multitasking condition performed two Internet search tasks. During these tasks, the radio station played popular music and a commercial block with several commercials in random order. Task relevance was measured as a within-subjects factor. Of the eight commercials that were broadcasted, two related to the tasks, whereas six did not relate to the content of either task (see Appendix).

3.4 Measures

Two processing effect variables are included: ad memory and ad evaluation. These processing effects reflect consumers' immediate responses to advertising (Percy & Rossiter, 1997; Moorman et al., 2002). The participants' memory of radio commercials was measured by means of free recall and recognition of the eight commercials, two standard measures used to measure advertising memory (Singh & Rothschild, 1983; Smit & Neijens, 2011; Starch, 1966; Wells, 2000).

Free recall was measured using the following question: "What radio commercials do you remember hearing?" The question was formulated in an open text format, and the participants were asked to write down the commercials that they recalled. The answers were coded for each commercial by assigning a "0" if the participant did not write down the brand name and assigning a "1" if the participant did write down the brand name or a correct description of the commercial. The average free recall over the eight commercials varied from "0" (none of the commercials were recalled correctly) to "1" (all were recalled correctly), with an average recall score of .13 (*SD* = .13) (meaning that one of eight commercials was recalled correctly).

Recognition was measured by presenting a link in the questionnaire to a radio commercial and asking the respondent to click on this link and then answer some questions about the commercial. Sixteen commercials were offered (audio) in random order, and eight of these commercials were those broadcasted during the experiment. The following recognition question was asked, with answer options including no ("0") and yes ("1"): "Did you hear this commercial in the past half hour?" Taking the mean of the scores for the eight broadcasted commercials showed a score varying from 0 (none recognized) to 1 (all recognized), with an average recognition score of .34 (*SD* = .38) – meaning almost three commercials recognized correctly, on average. Two commercials that were not

broadcast were included to check for false recognition. These two commercials were indeed not recalled or recognized.

After the recognition question, the respondents were asked to evaluate each particular commercial. *Evaluation* was measured as a grade (1 "very bad" and 10 "very good") and averaged over eight commercials (M = 5.48, SD = 1.36). This grading scale is commonly used in the Dutch school system, is often applied in advertising research (Yang & Roskos-Ewoldsen, 2007) and has a similar predictive validity as multi-item measures (Bergkvist & Rossiter, 2007).

3.5 Manipulation Checks

The respondents in the media multitasking condition were asked whether they noticed background sounds and whether they were distracted by these sounds. The participants were also asked to indicate how attentively they listened to the radio broadcasting and how attentively they performed the Internet search tasks, with both measured on a scale from ("1") no attention to ("5") full attention. More than half of the respondents in the media multitasking condition (66%) noticed the background sound, and the majority of these respondents did not feel distracted by the radio broadcasting (69%). Those respondents who noticed the radio reported that they did not listen attentively to the radio broadcasting (M = 2.81, SD = .82), which differed significantly from how much attention they paid to the Internet search tasks (M = 3.96, SD = .58; paired-samples t-test t (51) = 6.32, $p < .001$). In other words, the manipulation of media multitasking was successful; the respondents paid significantly more attention to the primary medium (Internet) than to the secondary medium (radio).

3.6 Results

The hypotheses were tested using a 2 x 2 repeated-measures GLM with media multitasking as a between-subjects factor and task relevance as a within-subjects factor (see Table 1 for the mean scores). The results show that the respondents who were exposed to the radio commercials while performing the Internet search tasks had a significantly lower recall of the radio commercials than the respondents who did not perform a task while being exposed to the radio commercials (F (1, 156) = 19.01, $p < .01$), confirming H1a for recall. The average recognition scores showed the same trend, but the main effect of media multitasking was not significant ($p > .10$). The results also support H1b: respondents in the MMT condition evaluated the commercials more positively than the respondents in the radio only condition (F (1, 156) = 14.48, $p < .01$).

The results in Table 1 support H2a and H2b: the related commercials had overall higher recall, recognition and evaluation scores than the unrelated commercials did (significant main effects of task relevance on all dependent varia-

bles; recall F (1, 156) = 76.49, $p < .01$, recognition F (1, 156) = 27. 76, $p < .01$, grade F (1, 55) = 41.58, $p < .01$), and this difference was even greater in the media multitasking condition (significant interaction effects for recognition and evaluation, F (1, 156) = 26.72, $p < .01$, F (1, 156) = 10.89, $p < .01$; recall shows the same trend, but the interaction effect is not significant, $p > .10$).

Overall, this first study confirmed both hypotheses in a non-student sample. To strengthen our conclusions, we aim to replicate the findings in a more controlled lab setting where we could observe the participants via a one-way mirror and where we measure task relevance with a between subjects design.

Table 1: Results study 1 (mixed design)

	MMT (n = 79)	Radio only (n = 79)	Total (n = 158)
Recall (0-1) *	**.13 b (.02)**	**.25 a (.02)**	
related	*.24 (.04)*	*.37 (.04)*	*.31 a (.03)*
unrelated	*.01 (.01)*	*.13 (.01)*	*.07 b (.01)*
Recognition (0-1) *	**.31 (.04)**	**.39 (.04)**	
related	*.42 a (.05)*	*.39 (.05)*	*.41 a (.04)*
unrelated	*.20 b (.04)*	*.39 (.04)*	*.29 b (.03)*
Grade (1-10) *	**6.02 a (.16)**	**5.19 b (.16)**	
related	*6.39 a (.18)*	*5.30 a (.18)*	*5.85 a (.13)*
unrelated	*5.65 b (.15)*	*5.07 a (.15)*	*5.36 b (.10)*

Note. Mean scores, Standard Error between brackets; * $p < .05$ based on GLM repeated measures with MMT as between factor and Task Relevance as within factor; different subscript indicates a significant difference, based on Bonferroni post-hoc tests (**between, bold**) or contrast groups (*within, italics*).

4 Study 2

4.1 Participants and Design

A total of 87 students (M_{age} = 21.87, SD = 2.67, 72% female) participated in the experiment at a large university in the Netherlands. The sample is representative of the discipline's student population. The study employs a between-subjects design with both media multitasking and task relevance as between-subjects factors. The design differs from the first study with respect to task relevance, which is now a between-subjects factor rather than a within-subjects factor. Although the respondents are exposed to the same commercials in all conditions, the tasks vary across conditions and are either related or unrelated to

the target commercial. The conditions did not differ significantly in terms of the participants' sex, age, education, radio and Internet use.

4.2 Procedure

The experiment was conducted at the university in a "living room" with a one-way mirror to observe what was occurring. This room mimicked the setting of an informal living room. The true goal of the experiment was not clarified to the participants. The participants were randomly assigned to one of the four conditions. Those assigned to the media multitasking conditions were asked to perform an Internet search task. When entering the living room, the radio was already broadcasting music. Through the one-way mirror, the research assistant could see that the participant had begun the task and ensured that the commercial block was aired, followed by more music throughout the experiment. The time spent listening to the radio while searching the Internet or waiting was the same in all conditions, namely, five minutes. All participants completed the questionnaire. Subsequently, they were thanked and offered a choice between course credits or a small amount of money.

4.3 Manipulations

Media multitasking served as a between-subjects factor with the following four groups: three groups performing one of the assigned Internet search tasks while listening to the radio and one group that waited while listening to background radio. Unlike the previous study, the respondents had to perform one search task that was either related or unrelated with one of the aired commercials. Tasks 1 and 2 were the same as the tasks used in the previous study. Task 3 was added to the design (see Appendix).

Task relevance was manipulated as a between-subjects factor. Task 1 was related to brand A, task 2 was related to brand B, and task 3 was not related to all advertised brands. The six commercials were the same as those used in study 1, but were now presented in two different orders (order I: filler, target A, filler, filler, target B, filler; order II: filler, target B, filler, filler, target A, filler). No significant order differences were found for any of the dependent variables ($p > .05$).

4.4 Measurements

The participants' *ad memory* was measured for each commercial by means of free recall and recognition (see Study 1). Total recall varied between 0 and .67 (none of the participants recalled all six commercials correctly), with a mean recall of .13 ($SD = .17$; slightly skewed distribution of 1.44, $SE = .26$). The recall for commercial brand A (% correct) was 30%, and the recall for commercial

brand B was 18%. Total recognition (range 0 to 1) had an average score of .29 (*SD* = .29). The recognition score for commercial brand A (% correct) was 41%, and the recognition score for commercial brand B was 30%.

Evaluation was measured using two measures: grade (1-10, with 10 indicating "very good" – see Study 1) and a five-point semantic differential Attitude towards the Ad scale (A_{ad}) (ranging from 1 "negative" to 5 "positive") with four items per radio commercial: pleasant-unpleasant, interesting-not interesting, good-bad, and attractive-unattractive (based on MacKenzie and Lutz 1989; Zhang 1996). The scale had good internal reliability for each commercial ($\alpha >$ .80). We used the total evaluation scores averaged over six commercials (M_{grade} = 5.78, SD_{grade} = 1.06; MA_{ad} = 2.90, *SD* = .52) as well as the scores for each target commercial (M_{grade} A = 6.37, *SD* = 1.26; M_{grade} B = 5.97, *SD* = 1.43; MA_{ad} A = 3.31, *SD* = .73, α = .87; MA_{ad} B = 3.01, *SD* = .85, α = .88).

4.5 Manipulation Checks

The results revealed that 84% of the respondents recalled having heard something in the background. Although the participants in the media multitasking groups claimed to have heard something in the background significantly more often than those in the radio-only condition (background noise awareness 100%, 95%, 90% versus 59%, respectively, Chi^2 (3) = 18.44, $p < .001$), they did not feel distracted by the radio while performing the search task (five-point scale, *M* = 2.28, *SD* = 1.11; *F* (2, 54) = 2.67, *p* = .08), and they did not pay more attention to the radio than the others (*F* (2, 54) = 1.27, *p* = .29; *M* = 2.61, *SD* = .84, five-point scale, "1" = no attention at all, "5" = full attention). The attention that the participants paid to the background radio sound was significantly lower than the attention devoted to the task, *t* (59) = -10.86, $p < .01$ (*M* = 4.12, *SD* = .76). The tasks were not perceived as very difficult (*M* = 2.57; *SD* = 1.16; Question "How difficult was the Internet search task?" on a five-point Likert scale ranging from "1" "very easy" to "5" "very difficult"), *F* (2, 57) = 2.56, *p* = .09). The manipulation of MMT was successful. Only background noise awareness needed to be included as a covariate in further analyses.

The results confirmed that the respondents performing the search task related to the target commercial (Task 1, brand A) perceived this commercial as sharing the same subject (95%), whereas only a small percentage of the respondents with one of the other search tasks falsely indicated that they shared the same subject (0% task 2, 5% task 3; Chi^2 (2) = 54.87, $p < .001$). This commercial was also perceived as fitting the task significantly more often when performing Task 1 (95% versus 0% and 5%; Chi^2 (2) = 50.53, $p < .001$). The same results were found for the other target commercial B being related to Task 2 and not related to the other tasks (sharing the subject: 87% versus 4% task 1, 9% task 3; Chi^2 (2)

= 48.40, $p < .001$; fitting the task: 87% versus 9%, 4%, Chi^2 (2) = 48.34, $p < .001$). Thus, the manipulation of task relevance was also successful.

4.6 Results

ANCOVAs with Bonferroni post hoc tests were used to test the first hypothesis. The results support H1a regarding the negative effect of media multitasking on memory: the participants who did not perform an Internet search task and who were exposed only to the background radio broadcasting recalled and recognized significantly more radio commercials than the other participants did (F_{recall} (3, 82) = 3.94, $p < .05$; $F_{recognition}$ (3, 101) = 6.61, $p < .001$). The average recall was .18, and the average recognition was .47 – which indicates an average of one commercial recalled and almost three commercials recognized out of six commercials when not using the Internet simultaneously (see Table 2 for the scores for each task group). The results did not confirm H1b: the conditions did not significantly differ in terms of commercial evaluations.

Table 2: Results study 2 (between design)

	Task 1 Related A (n=21)	Task 2 Related B (n=20)	Task 3 Not related (n=19)	Radio-only (n=27)
Recall* (0-1)	$.17_a$ (.15)	$.11_a$ (.14)	$.03_b$ (.08)	$.18_a$ (.22)
Recall* A (%)	71	5	5	33.
Recall* B (%)	0	45	5	22
Recognition* (0-1)	$.30_{ab}$ (.19)	$.18_b$ (.27)	$.14_b$ (.22)	$.47_a$ (.31)
Recognition A* (%)	67	25	16	52
Recognition B† (%)	24	30	16	44
A_{ad} A (1-5)	3.51 (.57)	3.11 (.83)	3.11 (.90)	3.44 (.59)
A_{ad} B (1-5)	3.15 (.71)	3.01 (.97)	2.93 (.91)	2.94 (.87)
Grade A (1-10)	6.65 (.99)	6.20 (1.44)	6.05 (1.55)	6.53 (1.05)
Grade B (1-10)	6.29 (1.31)	6.00 (1.30)	5.63 (1.80)	5.93 (1.36)

Note. Mean scores, standard deviation between brackets; * $p < .05$, † $p < .10$ based on ANCOVA (or Chi^2) with background noise awareness as covariate (only named in text when $p < .05$) and Bonferroni post hoc tests (different subscripts $p < .05$).

The results also support the first part of the second hypothesis (H2a), namely, that task relevance facilitates processing and increase the memory of the target commercials (i.e., commercial A while performing task 1 and commercial B while performing task 2). The Chi^2 test was used to determine the differences between the percentages correctly recalled or recognized. Table 2 shows that commercial A was more often recalled and recognized when performing task 1 compared with the unrelated tasks 2 and 3 (Chi^2_{recall} (3) = 28.86, $p < .001$;

$Chi^2_{recognition}$ (3) = 14.10, $p < .01$). The same effect was found for commercial B, which was related to task 2 and not related to tasks 1 and 3 (Chi^2_{recall} (3) = 16.61, $p < .01$; $Chi^2_{recognition}$ (3) = 6.79, $p < .10$, only significant when background noise awareness was included as covariate).

An ANCOVA with Bonferroni post hoc tests was used to test the second part of the hypothesis (H2b) regarding the differences in evaluation scores. The evaluation scores for commercial A in terms of A_{ad} and grade show the expected pattern, namely, a more positive evaluation is given when the radio commercial is related to the Internet search task. However, the differences are not significant ($p > .10$), and the differences between the evaluation scores for commercial B were also not significant.

5 General Discussion

This study examined the effect of media multitasking on the memory of several background radio commercials that were either related or unrelated with an Internet search task. Overall, the findings show that media multitasking has detrimental effects on the memory of messages from the background medium, whereas relatedness between different media has positive effects. These findings suggest that relatedness between media messages may dissolve the detrimental effects of media multitasking.

The results showed strong evidence for the hypothesized task relevance effect in both a within-subjects and a between-subjects design. Both designs showed a clear memory benefit of radio messages that were related (rather than unrelated) with a primary Internet search task. The study results thus extend prior findings of the beneficial effects of task relevance on memory in the media multitasking domain. However, the expected positive effect of task relevance on affective reactions to radio messages was obtained only in study 1 (with a within-subjects design) but not in study 2 (with a between-subjects design). Given the difference in designs, this result could indicate that the influence of task relevance is subtle. It is possible that the error variance in the between-subjects design is bigger than the effect of task relevance. This might explain the null finding in the between-subjects design and the significant difference found in the within-subjects design.

Investigating how media multitasking influences information processing is of the utmost importance, given the prevalence of this behavior in people's living rooms (Jayasinghe & Ritson, 2013). Such an examination is, however, highly complex, and we must consider some of the limitations of the present study. First, it was challenging to simulate natural media use. Future studies might therefore attempt to observe people's media multitasking in a natural environment without providing any instructions. Eye tracking may be a relevant measure to observe precisely how people switch their attention between media and to

detect which medium is the primary medium and which is the background medium. Brasel and Gips (2011) for instance, used a camera to measure divided attention to computer and television screens and showed that people switched between media at an extreme rate, averaging more than 4 switches per minute.

Second, the current study showed that media multitasking effects depend on the messages that are processed, but the study only investigated the difference between related and unrelated commercials. Future research should place more emphasis on the possible influence of other message characteristics, such as jingles, or emotion evocation. It would also interesting to investigate other types of media combinations in which task relevance might play a role, for example second screen media (e.g. Nee & Dozier, 2015). We believe second screen technologies deserve much more attention in the media multitasking literature because in these media messages also compete for visual attention, which might strongly influence consumer responses in terms of memory and evaluation.

How can background radio advertising be useful in a world that increasingly demands consumers' cognitive resources through various types of media? The current findings suggest that background advertising may achieve optimal effectiveness by aligning its content with that of the primary medium. Because relatedness between multitasked messages appears to have a positive influence on background advertising processing, one could suggest that it is important to broadcast a commercial that is relevant to or has a similar topic as the subject with which people are personally involved *at that moment*. Although it may seem difficult to operationalize such task relevance between primary and background media, it is not inconceivable that in the current converging media landscape methods of tracking browsing behavior on the Internet (targeting specific ads or even products towards users with a known history of viewing those products) could easily be adapted to radio broadcasts that are streamed over the Internet. This approach may provide an online application for presenting related background messages during Internet use.

In conclusion, our study contributes to the previous literature on media multitasking by convincingly demonstrating the positive effects of relatedness between two media messages while media multitasking. We can conclude that task relevance is an important aspect of overcoming capacity limitations arising from media multitasking and that radio is a powerful medium for creating advertising processing effects, regardless of whether listeners are actively paying attention.

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Appendix: Internet search tasks and radio commercials

Task 1	Search the Internet for a cheap flight to four different travel destinations outside of Europe. You have four minutes to complete the task. Write down below which websites you used and what the best solution is, in your opinion.
Task 2	Search the Internet for four saving accounts with a high interest rate. You have four minutes to complete the task. Write down below which websites you used and what the best solution is, in your opinion.
Task 3[1]	Search the Internet for four English children's books. You have four minutes to complete the task. Write down below which websites you used and what the best solution is, in your opinion.
Cheaptickets (related task 1)	The commercial promotes the city of New York as a travel destination and encourages the listener to order a flight ticket to New York on Cheaptickets.nl.
ING (related task 2)	The commercial promotes the ING "interest rate alarm clock", which automatically warns ING customers before their interest rate changes.
Renault (unrelated)	The commercial promotes the ABC benefit of Renault: customers can buy a fuel-efficient Renault, finance it with an attractive interest rate of 0% and obtain 2,500 additional euros for their old car.
Struik (unrelated)	The commercial recommends eating Struik hotdogs today.
Becel (unrelated)	The commercial introduces the "heart lifetime coach", a website that gives advice on how to keep one's heart healthy.
Phonehouse (unrelated)	The commercial promotes the "Phonehouse favourite of the week": the newest iPhone available in all Phonehouse stores from different network providers.
Mosselen[2] (unrelated)	The commercial promotes Zealandic mussels.
Electroworld[2] (unrelated)	The commercial promotes high-quality Philips products that are available at Electroworld, the best electronic service provider according to the Dutch consumers' association.

[1] *only in study 2;* [2] *not in study 2*