Can We Turn Shirkers into Workers?

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July 7, 2014
Survey researchers increasingly employ attention checks to identify inattentive respondents and reduce noise. Once inattentive respondents are identified, however, researchers must decide whether to drop such respondents, thus threatening external validity, or keep such respondents, thus threatening internal validity. In this article, we ask whether there is a third way: can inattentive respondents be induced to pay attention? Using three different strategies across three studies, we show that while such inducements increase attention check passage, they do not reduce noise in descriptive or experimental survey items. In addition, the inducements cause some respondents to drop out of the survey. Inattentive respondents present researchers with a tradeoff between internal and external validity that is not easily avoided.

Key Words: attention checks; surveys; validity; screener; noise
For surveys and experiments to generate useful knowledge, subjects need to pay attention to the written material. When they do not, their responses add noise to the data which weaken correlations across related questions and diminish experimental treatment effects. Such concerns have become especially important in recent years, as researchers move from using undergraduate samples to collecting more diverse samples outside the lab. On one hand, traditional undergraduate samples are thought to be quite diligent survey takers, but very limited in terms of representativeness. On the other hand, self-administered online surveys offer a relatively inexpensive and easy way to access a sample that is diverse, but potentially less attentive to the task at hand. This presents an opportunity, but also highlights a fundamental tension between internal and external validity.

Increasingly, scholars have employed Instructional Manipulation Checks (IMCs) or Screeners to identify inattentive respondents (Berinsky, Margolis, and Sances 2014; Meade and Craig 2012; Nelson and Simmons 2007; Oppenheimer, Meyvis, and Davidenko 2009). Examples of Screener questions are available in the Appendix. By instructing respondents to follow a specific set of instructions to demonstrate that they are paying attention to particular questions, researchers can differentiate between attentive “worker” and inattentive “shirker” respondents. Past research has found that passing a Screener is associated with considerable noise reduction, both in terms of experimental treatment effects (Berinsky, Margolis, and Sances 2014; Oppenheimer, Meyvis, and Davidenko 2009) and construct validity (Berinsky, Margolis, and Sances 2014).

After Screeners successfully identify inattentive respondents, however, researchers face a choice. They must either keep the inattentive respondents in the
sample, thereby weakening the results, or drop the inattentive respondents from the sample, thereby decreasing sample size and altering its composition. Because neither of these options is ideal, researchers might be tempted to pursue a third strategy: make otherwise inattentive respondents act as if they are attentive. For example, researchers might prevent respondents from proceeding in the survey until they pass the attention check (Oppenheimer, Meyvis, and Davidenko 2009), or warn respondents at the beginning of the survey that their responses will be checked in order to ensure their attention (Berinsky, Margolis and Sances 2014).

In this article, we argue that such strategies have potential costs, and that turning shirkers into workers is a difficult – and maybe even impossible – task. We describe four strategies to encourage attention in online surveys. Although three of the four strategies can improve passage rates on Screener questions, this increased passage does not carry over to increased attentiveness on the rest of the survey. Thus, while we can induce respondents to pass Screeners, the strategies do not improve the overall data quality. Further, we find that “training” respondents—by preventing them from continuing the survey until passage—comes with costs. Specifically, training causes many respondents to drop out of survey, and makes it less likely that respondents will participate in a follow-up study.

We conclude that respondents cannot be made to attend to surveys and experimental stimuli. Practically speaking, researchers face an uphill battle in the struggle for high-quality data. The tradeoffs between quality data and representativeness that confront researchers using Screeners are not as easily avoided as previously thought.
In the next section, we describe the data collection process for each of our studies, including the manipulations we used to increase attention. We then present our results, including the effect of our manipulations on attention check passage, validity, and survey dropout. We conclude by discussing the practical implications of our results.

Data collection

Between June 2011 and October 2012, we conducted three Internet studies. Study 1 consisted of a two-wave panel in June-July 2011, with about two weeks between waves using sample collected by Survey Sampling International (SSI).¹ In this study, we built on Oppenheimer, Meyvis, and Davidenko (2009) who “trained” respondents to pay attention by not allowing participants who failed the IMC question at the beginning of the survey to continue until they passed the IMC. To directly test the effect of training respondents, we randomly assigned half the respondents to a training condition at the outset of each survey wave. Those in the training treatment who failed the initial Screener received the following message: “There was a problem with your response. Please try again” and were re-asked the Screener until they passed. In addition to the initial Screener and training, we asked respondents three additional Screener questions spaced evenly throughout the survey.² To measure noise reduction, we also replicated Tversky and Kahneman’s (1981) “Asian Disease Problem” framing experiment and asked a battery of economic liberalism questions from the American National Election

¹ SSI recruits participants through various online communities, social networks, and website ads. SSI makes efforts to recruit hard-to-reach groups, such as ethnic minorities and seniors. These potential participants are then screened and invited into the panel. When deploying a particular survey, SSI randomly selects panel participants for survey invitations. We did not employ quotas but asked SSI to recruit a target population that matched the (18 and over) census population on education, gender, age, geography, and income (based on premeasured profile characteristics of the respondents). The resulting sample is not a probability sample, but is a diverse national sample.

² The Screeners are described in full in the Appendix.
Study (ANES). Both will be described in detail in the sections below.

Study 2 consisted of a two-wave study in October 2012, with about two weeks between waves using sample collected by SSI. The purpose of the study was to test multiple different strategies for inducing attention: training, warning, and thanking. In the training condition, respondents were given the same training task described in Study 1. Respondents in the warning condition were warned at the beginning of the survey that the researchers check responses carefully to make sure they read the instructions and responded carefully. The warning condition also made note that only attentive participants’ responses would be used in the analysis. Respondents in the thanking condition received a gentler introduction which thanked respondents for their time and close attention. The full wordings for the warning and thanking conditions are available in the Appendix. Respondents in a control condition did not receive any of the interventions. All respondents answered four Screener questions evenly spaced throughout the survey as well as the same “Asian Disease Experiment” and the ANES economic liberalism questions from Study 1.

Study 3 consisted of a single-wave study in September 2012, using an online convenience sample. The purpose of the study was to test whether we could induce attention by making the survey more interesting to respondents. At the outset of the

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3 The three intervention conditions were also fully crossed with each other producing 7 treatment conditions: training, warning, thanking, training and warning, training and thanking, warning and thanking, training and warning and thanking. We present the results for the individual interventions against the global control condition in the paper, and the crossed results are available on request. The strategy is appropriate because we randomized the different treatments (thanking, warning, and training) in an orthogonal manner.

4 Subjects for Study 3 were recruited through Amazon Mechanical Turk (Buhrmester, Kwang, and Gosling 2011; Paolacci, Chandler, and Ipeirotis 2010). Although online convenience samples are a relatively new resource, Berinsky, Huber, and Lenz (2012) successfully replicate the results of several significant social science experiments—including the Asian Disease Problem experiment—with subjects recruited this way.
survey, we randomly assigned respondents to an “interests and hobbies” condition. Respondents in this condition were asked about their interests and hobbies at the beginning of the survey and then received a series of question pertaining to their reported interest directly before answering a Screener question. The design tests the hypothesis that engaging respondents will increase attention in the survey as a whole. A more complete description of the experimental setup is presented in the Appendix. All respondents answered two Screener questions, one at the beginning of the study and one toward the end of the survey.

Manipulations increase Screener passage

We begin by testing whether we can increase respondents’ passage rates on Screener questions. Figure 1 plots the total proportion of correct Screeners on the y-axis. The x-axis identifies whether respondents were assigned to the training condition. In three separate trials, respondents assigned to the training condition performed better on subsequent Screeners than respondents assigned to the control condition. (Study 1, Wave 1 M = 0.85, SD = 0.28 and M = 0.76, SD = 0.35, respectively, t(1193) = 4.59, p < 0.01. Study 1, Wave 2 M = 0.86, SD = 0.26 and M = 0.82, SD = 0.31, respectively, t(722) = 1.70, p = 0.09. Study 3, M = 0.75, SD = 0.32 and M = 0.62, SD = 0.38, respectively, t(682) = 4.88, p < 0.01.)

Other strategies have more mixed success. In addition to training respondents, we also tried to increase attention in Study 2 by warning and thanking respondents at the outset of the survey. The first two panels of Figure 2 show both strategies improved

Studies 1 and 2 use 3 Screener questions to create the proportions presented in Figure 1, while Study 3 uses a single question.
passage rates compare to respondents who went throughout the survey without an intervention to increase attention (Warning: M = 0.69, SD = 0.37 and M = 0.61, SD = 0.38, respectively, t(784) = 2.46, p < 0.05. Thanking: M = 0.67, SD = 0.36 and M = 0.62, SD = 0.38, respectively, t(788) = 1.90, p < 0.10). In Study 3, we also attempted to induce attention by making the survey more interesting. As shown in the right panel of Figure 2, this strategy had a positive but insignificant effect on passage (M = 0.8, SD = 0.40 and M = 0.77, SD = 0.42, respectively, t(1000) = 1.29, p = 0.20).

Across these studies, we find evidence that researchers can induce attention by training respondents who initially fail a Screener, warning respondents that the
researchers pay close attention to the responses, and thanking respondents for their time and thoughtful responses. Of the three strategies that actually affected passage, training appears to produce the strongest effects.

**Manipulations do not reduce noise**

While increasing passage appears to be a positive result, the intent of Screeners is to reduce noise on other questions. Prior research has found that Screeners do serve this purpose: when researchers drop respondents who fail Screeners, measurement error is reduced and experimental effects become larger and more precise (Berinsky, Margolis,
and Sances 2014; Oppenheimer, Meyvis, and Davidenko 2009). Indeed, the larger purpose of these manipulations is to induce a general increase in attentiveness across the survey; those who propose training as a strategy also cite evidence that training respondents produces less noisy results (Oppenheimer, Meyvis, and Davidenko 2009).

We tested whether our interventions actually resulted in noise reduction. In Studies 1 and 2, we replicate a well-known framing experiment of Tversky and Kahneman (1981). In this experiment, all respondents are initially given the following scenario:

Imagine that your country is preparing for the outbreak of an unusual disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:

Subjects are then randomly assigned to one of the two following conditions:

Condition 1, Lives Saved Frame: “If Program A is adopted, 200 people will be saved. If Program B is adopted, there is a 1/3 probability that 600 people will be saved, and a 2/3 probability that no people will be saved.”

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6 We replicate these results in the Appendix, showing that in our studies, Screener passage is associated with large reductions in measurement error.
Condition 2, Mortality Frame: “If Program A is adopted, 400 people will die. If Program B is adopted there is a 1/3 probability that nobody will die, and 2/3 probability that 600 people will die.”

The scenarios in both conditions are the same, but the conditions differ in their framing of the alternatives. Tversky and Kahneman (1981) report that when the problem was framed in terms of “lives saved,” respondents were more likely to pick the certain choice. When it was framed in terms of lives lost, as in the “mortality frame,” respondents were more likely to pick the risky choice.

We further test whether training respondents improves the quality of nonexperimental data when question wordings require close reading. For the last four decades, the American National Election Studies have asked a series of three questions on economic liberalism. As an example, one of the questions asks about the trade-off between government spending and services:

Some people think the government should provide fewer services, even in areas such as healthcare and education, in order to reduce spending. Suppose these people are on one end of the scale, at point 1. Other people feel that it is important for the government to provide many more services even if it means an increase in spending. Support these people are at the other end, at point 7. And, of course, some other people have opinions somewhere in between. Where do you place YOURSELF on this scale?
While these three questions tap into the same underlying set of beliefs—support for social welfare programs—the response options differ in subtle ways. For two of the questions, a low response (1) represents a conservative position while a higher response indicates a liberal position. On the third question the scale is reversed; the highest response (7) is a conservative position, and the lowest response (1) is a liberal position. By varying the response options on similar questions, researchers can detect satisficing behavior by comparing the correlation of the questions with reversed scales. All variables have been recoded so that higher numbers indicate more conservative responses.

Figure 3 shows that although our training increased Screener passage rates, contrary to the findings of Oppenheimer, Meyvis, and Davidenko, we do not find any difference in the quality of our experimental or nonexperimental data. In the top row of the figure, we plot along the y-axis the difference in means between being assigned to the “mortality frame” (1) rather than the “save frame” (0) and choosing the probabilistic outcome (1) rather than the certain outcome (0). Despite uncovering treatment effects consistent with the original results, the training interventions did not increase the magnitude of these experimental effects. (Study 1: effect = 0.23, SE = 0.05 and effect = 0.23, SE = 0.05, respectively, difference = 0.00, SE = 0.07, t(738) = 0.02, p = 0.987. Study 2: effect = 0.32, SE = 0.05 and effect = 0.34, SE = 0.05, respectively, difference = -0.2, SE = 0.07, t(708) = 0.21, p = 0.832.)
The second row of Figure 3 plots the relationship between the two same-scale ANES questions and the third ANES question with the reversed scale. In each of the different conditions the relationships between the two same-scale questions range from 0.52 to 0.59. These strong associations are unsurprising given that the questions tap into the same underlying preference. If respondents read the third question carefully, we would expect a similarly strong relationship. In the various control conditions, the relationship between the reverse item and the averaged same-item scale ranged between 0.25 and 0.35, which is far below the same-item relationship, and the training does not increase the association (Study 1: effect = 0.36, SE = 0.04 and effect = 0.35, SE = 0.04.

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7 We construct this measure by regressing the average of the two same-scale items on the reverse-scale item, then taking the coefficient on the reverse-scale item.
respectively, difference = 0.01, SE = 0.06, t(1247) = 0.25, p = 0.802. Study 3: effect = 0.34, SE = 0.06 and effect = 0.26, SE = 0.05, respectively, difference = 0.08, SE = 0.08, t(771) = 1.01, p = 0.313.) Figure 4 replicates the results for the warning and thanking conditions from Study 2. Neither intervention changed the Tversky and Kahneman experiment treatment effect. (Warning: effect = 0.36, SE = 0.05 and effect = 0.34, SE = 0.05, respectively, difference = 0.02, SE = 0.07, t(813) = 0.31, p = 0.754. Thanking: effect = 0.33, SE = 0.05 and effect = 0.34, SE = 0.05, respectively, difference = 0.00, SE = 0.07, t(833) = 0.09, p = 0.931) or the ANES reverse-item correlation (Warning: effect = 0.32, SE = 0.05 and effect = 0.26, SE = 0.05, respectively, difference = 0.06, SE = 0.07, t(885) = 0.89, p = 0.375. Thanking: effect = 0.26, SE = 0.05 and effect = 0.26, SE = 0.05,
respectively, difference = 0.009, SE = 0.07, t(902) = 0.13, p = 0.897). In sum, although we were able to successfully train and encourage respondents to pass Screener questions, these strategies do not improve the quality of our data; we were unable to turn shirkers into workers.
The costs of training

Training is not only ineffective; it also comes with a cost. In both studies 1 and 2, we find that training respondents produces higher levels of respondent drop-out rates. We show these results in the top panel of Figure 5. In Study 1, 73% of respondents assigned to the training condition at the survey’s outset completed the survey, while 83% of respondents who were not assigned to the training condition completed the survey ($t(1541) = 4.58, p < 0.01$). The higher attrition rate may be because of the fact that respondents think the survey is broken or that respondents do not like being corrected. Study 2 similarly finds higher drop-out rates because of training ($M = 0.49, SD = 0.50$)

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8 When comparing respondents who failed the initial Screener, 52% in the training condition went on to complete the survey while 77% in the control condition did so ($t(618) = 6.55, p < 0.01$).
and $M = 0.63$, $SD = 0.48$ respectively, $t(1175) = 4.86$, $p < 0.01$). In contrast, warning and thanking respondents actually increases respondents likelihood of continuing with the survey (Warning: $M = 0.69$, $SD = 0.46$ and $M = 0.63$, $SD = 0.48$ respectively, $t(1151) = 2.31$, $p < 0.05$. Thanking: $M = 0.71$, $SD = 0.45$ and $M = 0.63$, $SD = 0.48$ respectively, $t(1144) = 2.97$, $p < 0.01$).

We also found that training leads to higher attrition between survey waves in our multi-wave studies, and we show these results in the bottom half of Figure 5. Fifty-six percent of respondents assigned to the control condition in the first wave of Study 1 took part in the second wave of the study two weeks later, while only 46% of respondents assigned to the training condition did ($t(1537) = 3.92$, $p < 0.01$). The same trend appears in Study 2 ($M = 0.31$, $SD = 0.46$ and $M = 0.31$, $SD = 0.50$, respectively, $t(1034) = 5.02$, $p < 0.01$). In contrast, there are no differences between the thanking and warning conditions on continuation into the second wave (Thanking: $M = 0.50$, $SD = 0.50$ and $M = 0.46$, $SD = 0.50$, respectively, $t(1030) = 0.97$, $p = 0.33$. Warning: $M = 0.46$, $SD = 0.50$ and $M = 0.46$, $SD = 0.50$, respectively, $t(1052)$, $p = 1.00$).

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9 When comparing respondents who failed the initial Screener, 35% in the training condition who completed the first survey took part in the second wave, while 40% in the control condition did so ($t(615) = 3.66$, $p < 0.01$).
Figure 5: The costs of Screener conversion attempts.

Completion of Survey

Study 1: Trained

Study 2: Trained

Study 2: Warned

Study 2: Thanked

Continuation to Second Wave

Study 1: Trained

Study 2: Trained

Study 2: Thanked

Study 2: Warned
Discussion

The goal of our paper was to test whether we can increase respondent attention on self-administered surveys and experiments. Though being able to identify inattentive respondents marks an improvement in survey research, it would be even better to avoid difficult tradeoffs between to high-quality data and an unrepresentative sample. Using different interventions, we are able to increase Screener passage rates, but these increases did not translate into higher-quality data. Put another way, while we were able to make shirker respondents look like workers in a superficial sense, these behaviors did not carry over into increased attention on substantive questions we care about. Even worse, we found that training can reduce survey completion rates.

Most notably, we were unable to replicate Oppenheimer, Meyvis, and Davidenko’s (2009) findings that respondents who fail a Screener can be trained to pay attention. The differences in our samples and mode of data collection may contribute to the different results. Although all the studies were self-administered, Oppenheimer, Meyvis, and Davidenko ran their study on college students in a lab. In contrast, our studies were done on diverse national samples over the Internet. The difference in results may indicate that training respondents is a useful strategy in the lab—where respondents can ask for assistance—while the same strategy over the Internet—where there is no oversight—proves ineffective.

This result leads to a larger point about data collection. Internet samples make it easy to collect a large sample, but difficult to control whether respondents pay attention.
Though we used several different strategies to increase attention, we were unable to do so. Our failure to convert shirkers in this manner strongly suggests that attentiveness to surveys may be outside the realm of factors that researchers can control. Practically speaking, researchers should employ Screener questions to distinguish between shirkers and workers rather than to try to turn the former into the latter.
References


Author Contributions
A. J. Berinsky developed the study concept. All authors contributed to the study design. Testing and data collection were performed by M. F. Margolis and M. W. Sances. M. F. Margolis and M. W. Sances performed the data analysis and interpretation under the supervision of A. J. Berinsky. M. F. Margolis and M. W. Sances drafted the manuscript, and A. J. Berinsky provided critical revisions. All authors approved the final version of the manuscript for submission.
Appendix

Screener questions

In Studies 1 and 2, respondents answered four Screeners ostensibly asking about how they were currently feeling, websites they visit, their favorite color, and their interest in politics in current events. The four Screeners were presented in a random order for each subject and were evenly spaced throughout the survey. Respondents assigned to a training condition were trained if they failed their first Screener question. Further, those trained were only trained on the first Screener question.

In Study 3, respondents answered two Screeners questions. First, respondents received the website Screener at the survey’s outset. Respondents then answered a second Screener in the middle of the survey which ostensibly asked about what newspaper sections the respondents read.

We show screen shots of each Screener question used in Figures A1 through A4.
Figure A1: “Color” Screener.

We would like to get a sense of your general preferences.

Most modern theories of decision making recognize that decisions do not take place in a vacuum. Individual preferences and knowledge, along with situational variables can greatly impact the decision process. To demonstrate that you’ve read this much, just go ahead and select both red and green among the alternatives below, no matter what your favorite color is. Yes, ignore the question below and select both of those options.

What is your favorite color?
☐ White       ☐ Pink
☐ Black       ☐ Green
☐ Red         ☐ Blue

Figure A2: “Feeling” Screener.

Before we proceed, we have a question about how you’re feeling.

Recent research on decision making shows that choices are affected by context. Differences in how people feel, their previous knowledge and experience, and their environment can affect choices. To help us understand how people make decisions, we are interested in information about you. Specifically, we are interested in whether you actually take the time to read the directions; if not, some results may not tell us very much about decision making in the real world. To show that you have read the instructions, please ignore the question below about how you are feeling and instead check only the “none of the above” option as your answer. Thank you very much.

Please check all words that describe how you are currently feeling.
☐ Interested       ☐ Hostile       ☐ Nervous
☐ Distressed       ☐ Enthusiastic  ☐ Determined
☐ Excited          ☐ Proud          ☐ Attentive
☐ Upset            ☐ Irritable      ☐ Jittery
☐ Strong           ☐ Alert          ☐ Active
☐ Guilty           ☐ Ashamed        ☐ Afraid
☐ Scared           ☐ Inspired       ☐ None of the above
Figure A3: “Newspaper” Screener.

We are also interested in what sections people like to read in the newspaper. What people read in the paper might affect their opinions on current events. We also want to see if people are reading the questions carefully. To show that you’ve read this much, please mark both the classified and none of the above boxes below. That’s right, just select these two options only.

Regardless of how frequently you read the newspaper, what would you say are your favorite newspaper sections to read? (please check all that apply)

- National
- Local
- Real Estate
- Comics
- Classified
- Style
- Sports
- Business
- Science and Technology
- Opinion
- None of the above
- All of the above

Figure A4: “Web site” Screener.

When a big news story breaks people often go online to get up-to-the-minute details on what is going on. We want to know which websites people trust to get this information. We also want to know if people are paying attention to the question. To show that you’ve read this much, please ignore the question and select ABC News and The Drudge Report as your two answers.

When there is a big news story, which is the one news website would you visit first? (Please only choose one)

- New York Times website
- Huffington Post
- Washington Post website
- CNN.com
- FoxNews.com
- MSNBC.com
- The Drudge Report
- Google News
- ABC News website
- CBS News website
- NBC News website
- Yahoo! News
- The Associated Press (AP) website
- Reuters website
- National Public Radio (NPR) website
- USA Today website
- New York Post Online
- None of these websites
Study 2 design

Respondents in the warning condition received the following welcome screen:

It is essential that you pay attention over the course of the survey. **We will check each of your responses closely in order to make sure that you have read the instructions for the task and responded carefully.** We will only accept your responses if you clearly demonstrate that you have read and understood the survey. Again, there will be questions that test whether you are reading the instructions.

Respondents in the thanking condition received the following welcome screen:

Thank you very much for participating in our study. We hope that you will pay close attention to the questions on our survey. The thoughtful responses you provide to our questions are essential to advancing our scientific research, and all respondents can help us reach our goal. We would not be able to conduct our research without your thoughtful and careful answers to our questions. We know you are busy and greatly appreciate your time.
Respondents in the training condition were trained on the first Screener question. If respondents in the training condition failed the first Screener, they received the message, “There was a problem with your response. Please try again,” and could not continue with the survey until they passed the Screener.

For those in conditions that received both the thanking and warning screens, the order in which the two screens were presented was randomized.

**Study 3 design**

The purpose of the experiment was to encourage attention by asking questions about which the respondents care. If respondents were excited by the questions asked in the survey, they might pay closer attention to other questions on the survey as well.

Respondents in the “interests and hobbies” condition were asked: “We are interested in learning more about your hobbies and interests. Which one of the following categories interests you most?” The response options included: Sports, fashion, movies, cars, video games, music, and food. In the middle of the survey, respondents in the “interests and hobbies” condition then answered a series of questions related to these interests.

Those who reported that they were interested in sports were asked which sport they most enjoy, to rank players within that sport, and where respondents receive their sports scores. Those who reported that they were interested in fashion were asked to rate various current fashions and to identify everyday fashion items that they both liked and disliked. Those who reported they were interested in movies were asked to mark their favorite genre, all movies they enjoy from that genre, and actors and actresses they particularly liked and did not like. Those who reported that they were interested in cars
were asked to identify what car they would ideally drive, what manufacturer makes cars they like the most, and which recent model they ideally want to own. Those who marked they were interested in video games were asked which genre they like most, to rank popular video games within the genre, and whether they prefer single or multiplayer games. Those who reported that they were interested in music where asked what genre they enjoy most, which artists they enjoy, and to create their ideal concert line up. And those who reported that they were interested in food were asked why genre they enjoy the most, what types of food they enjoy, and to create their ideal menu.
Screener passage is associations with noise reduction

Figure A5: Screener passage reduces noise.