# How did you not see that? The relationship between change blindness and personality[1]

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Change blindness is the failure of an individual to detect changes in an environment. The present study examines whether aspects of personality are related to susceptibility to change blindness. Participants in the study completed a short personality test and then were asked to watch a video showing them how to spot a liar. At least five changes took place during the video but participants were not told about the changes. After watching the video, the participants filled out a survey that consisted of demographic information as well as questions about the changes that took place in the video. The personality type and survey results were compared to determine whether introversion and extraversion were related to susceptibility to change blindness.

## Introduction

Changes in an environment take place every day. Whether it is a flower blooming or a different flag at a neighbor's house, it is difficult to notice everything in an environment. Change blindness is defined as a person's inability to identify when something changes in an object or scene, even if it looks obvious (Matlin, 2005). Change blindness can result from lack of attention to the outside world. Change blindness occurs when people miss changes in a scene because they are not expecting the changes to occur. If people noticed everything about a scene, their visual system would be overloaded (Matlin).

People are surprisingly poor at detecting big changes to objects and scenes according to Simons (2000). Something as obvious as a different face can be missed in a scene if a person does not know to look for it. Memory for visual and verbal information is weak and people often do not remember details from one moment to the next (Simons). If an object is not encoded into memory an individual will not remember it in any detail (Simons). They do not remember exact details about an environment that do not relate to their interests. An individual is also more likely to notice changes if they occur in the center of interest or focus of the scene (Simons).

Attention is also needed in order to see changes. Attention can only be given to 4-5 items at one time, so it is extremely hard for a person to pay attention to every object in a scene (Simons & Rensink, 2005). Individuals may also miss changes that occur during an eye movement because they were not watching as an item changed (Simons & Rensink). Some people may notice changes but they might not register the changes that occurred. This is called "mindsight" or having a gut feeling that something is different about a scene (Simons & Rensink). They feel that something is different usually before they realize what the change is.

Those are some of the examples of change blindness, but in order to detect a change in an environment the individual needs to remember specific information about the scene. There are five causes of change blindness according to Simons (2000). The first cause is overwriting. Overwriting is when information from a previous scene is simply replaced by new information (Simons). When overwriting takes place the individual does not have any visual representation of how the scene was at the beginning. The second cause is first impressions. This takes place when the information in the initial scene is encoded but the scene is not re-examined as long as the meaning in the scene is consistent (Simons). The third cause is that nothing is stored. The individuals do not notice changes because they have not encoded or compared the scenes. The fourth cause is that everything is stored by not compared. This means

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that individuals encoded the first scene and the second scene but did not realize that they contradicted each other. According to research, individuals can hold two beliefs about a scene without realizing that the scenes do not match each other (Simons). The last cause is feature combination. In feature combination, individuals remember some features from the first scene and different features from the second scene which makes the scene the individuals remember not accurately represent either of the scenes (Simons).

Change detection happens when people correctly identify objects that change in a given scene. Change detection tasks have been studied to determine the quality and detail of representations that people have (Mitroff, Simons, & Levin, 2004). Mitroff et al. tested whether observers could retain representations of a pre- and post-change scene even when they did not detect the change. The observers were asked to answer questions to determine whether they could successfully pick the right answers even without noticing changes. The results of the experiment were that observers reported 65.88% of changes and falsely reported 18.54% of changes. The observers detected changes more accurately when they were aware of changes than when they were unaware.

An experiment by Angelone, Levine, and Simons (2003) dealt with changes that occurred over a camera cut. Participants are less likely to notice such changes but are often able to select pre-change object out of a photograph (Angelone et al.). This suggests that people are able to keep representations of scenes in their minds unconsciously. This is also consistent with the stored but not compared explanation because they are able to select the correct answer but still do not realize that any changes happened.

Every moment of every day, people receive sensory input from their eyes, ears, and skin but only part of this information is ever noticed or stored (Smith & Schenk, 2008). Top-down processing or using previous knowledge about the world, is often used in change blindness (Matlin, 2005). Top-down processing shows that people cannot pay attention to everything in the environment, and the blanks are filled using previous knowledge. When something is unfamiliar in an environment, people see the

context before making a decision about the object. In the environment, there are items processed using outside factors instead of previous knowledge. People also notice changes in an environment that disappear rather than appear. Although both cause a change in the scene, objects disappearing seem to catch people's eye more frequently (Cole, Kuhn, & Liversedege, 2007). If it is in the individual's visual scene then it will be noticed but if the appearance is outside the focus a person is more susceptible to change blindness than if the object disappeared.

There are two hypotheses that help to explain how people interpret different scenes. The first is the Volatile Visual Representation (VVR) Hypothesis. According to this hypothesis, when people see a scene they create two representations of what happened in the scene (Becker & Pashler, 2002). The first is the meaning of the scene and the second is the visual details of the scene. The visual details are thought to be more volatile or less stable because of the nature of the material that is collected (Becker & Pashler). With the material being volatile, it is less likely that individuals will remember the visual parts of the scene more than the meaning. The CR Hypothesis is the second hypothesis that relates to change blindness. This hypothesis states that people can have a cumulative record of objects in a scene that have been attended to but will not remember objects that were not attended to (Becker & Pashler). This is consistent with change blindness because if a person is not attending to a changing object they will not noticed that it changed. Change blindness is very common because people pay attention to the conversations and interactions in a scene more than the objects in the background.

In order to detect changes an individual has to keep their full attention on a scene. When a change happens during another perceptual event people are less likely to notice the changes (Smith & Schenk, 2008). Other perceptual events that interrupt seeing changes are blank screens, blinks, or saccades because people do not see the objects change; they have to rely on their memory to remember what was in the scene before. Memory is not reliable because it only holds three to five items in enough detail to see changes (Becker & Pashler, 2002). Smith and Schenk (2008) examined the

relationship between covert attention and cues to test whether participants noticed changes. The authors concluded that covert attention makes change detection easier and that attention is necessary for visual awareness.

Personality determines how one interacts with and experiences the environment. One of the aspects of personality that seems to be related to noticing changes in an environment is the introversion/extraversion personality type. Introversion/extraversion is one aspect of Jung's Theory of Psychological Types that seems to direct where a person pays attention. Whether a person is an introvert or an extravert is assessed by the quantity and intensity of interpersonal interaction, activity level, need for stimulation, and capacity of joy (Pervin, Cervone, & John, 2005).

Introverts and extraverts focus their attention in different ways. Introverts tend to be more internally focused and interested in their own thoughts and feelings. They are also quiet and like to work alone on things. Introverts tend to focus more on concepts and ideas, while extraverts focus more on people and objects (McCaulley, 1998). Introverts also respond faster to external stimulation than extraverts (Carducci, 2009).

Unlike introverts, extraverts are very interested in what is happening around them. Extraverts find it more rewarding to experience situations with other people (Carducci, 2009). They are very talkative and say what they think. Extraverts work better with excitement and are more suggestible than introverts (Pervin, et al., 2005). Women are perceived to be moderately more extraverted than men (Carducci). Although people may be labeled an introvert or an extravert, they often use both poles when interacting but respond most often with the labeled pole and its attributes (McCaulley, 1998).

A direct comparison of change blindness susceptibility and personality traits has not been fully examined in the literature. However, because change blindness occurs when a person fails to adequately search their environment for differences, a relationship between this phenomenon and personality may be made. If introverts and extraverts differ in the degree to which they focus on aspects of the environment, it may be that their susceptibility to change blindness would be related to this dimension.

The prediction for the present experiment is that extraverts will be more likely to notice changes in their environment because they tend to be more externally focused. They pay more attention to interactions with people and the objects around them. Introverts, on the other hand, tend to become fatigued more easily and are more task-oriented (Pervin, et al., 2005). This suggests that they might be less likely to notice things they are not explicitly directed to attend to. The current experiment tested whether a more introverted or extraverted person will notice more changes in the environment.

## Method

### Participants

The participants in the study were 123 undergraduates from four different Introductory Psychology classes at Robert Morris University. The course instructors asked their students to participate in the study and some offered extra credit for participation. The students were primarily freshmen and sophomores and there were approximately equal numbers of males and females.

### Design & Materials

The present design examined introverts and extraverts in terms of their susceptibility to change blindness. Introversion/extraversion was determined by a short personality test that the students completed. The test consisted of 15 questions taken from the Jung Type Indicator. To measure change blindness, a short (90 second) video clip was created that contained six deliberate changes. The video was presented as a short tutorial on signs to look for when detecting a liar and contained two female actors who portrayed roommates discussing an event that occurred over the weekend. One of the roommates was portraying a liar and the six deliberate changes occurred in the video across brief cuts. The changes included: a flower (decoration) change, the actors switched pillows from their laps, one actor's shirt was changed, the door behind the actors was closed, the second actor's shirt was changed, and a red blanket was suddenly introduced into the frame. After watching the short

video, participants completed a survey which included demographic questions as well as a question designed to measure any changes noticed in the clip (see appendix). The dependent variable was the number of changes identified in the video.

## Procedure

First, the instructor told the students that an experiment was taking place and asked that they participate in it. After the students agreed, the experimenter handed a personality test and information sheet about the video to each student. The students were asked to provide "secret codes" rather than identifying information on all of their forms so that the forms could later be paired together and scored without revealing the students' identities to the researcher. The experimenter emphasized how important it was for everyone to be quiet and not to share answers throughout the study.

Once the personality tests were completed, students were told to watch a short video very carefully. After the video was played, the experimenter distributed the survey. On the top of the survey the participants wrote their secret code. When everyone completed the experiment the papers were collected and the participants were debriefed. They were shown the video again and the changes were explicitly identified. The participants were given an opportunity to ask questions and were also encouraged not to share information about the experiment with others to avoid contaminating responses in later tests.

## Results

Data were first sorted by the participants' Introversion/Extraversion scores and the highest and lowest 20% of the scores were used to represent "introverts" (i.e., the lowest 20%) and "extraverts" (i.e., the highest 20%). A one-way independent groups analysis of variance (ANOVA) was performed on the number of changes identified by these participants.

Results indicated a marginally significant main effect, $F(1, 50) = 3.46$, $p < .07$, in which introverts noticed fewer changes (mean = 0.65, SD = 0.84) than extraverts (mean = 1.23, SD = 1.34).

## Discussion

The present study examined whether "introverts" or "extraverts" were more likely to notice changes in the environment. The results of the study were consistent with my hypothesis. Extraverted individuals noticed more changes that occurred during the video than introverted individuals did. There are many reasons why this might have occurred. "Extraverts" like being around other people and are more externally focused than "introverts." Being externally focused, these individuals pay more attention to the world around them and the interactions between people. The changes that were recognized more readily were located in the center of attention. The actors' shirt color was the change people saw the most because they were watching the interaction between the actors. The environment around the actors changed but it was not important enough to cause people to search for changes.

Over half of the participants in the study were not aware of the term change blindness. People are aware that changes happen in the environment but they do not realize how "blind" they can be to big changes. It is also interesting that almost half of the 123 participants did not recognize any changes at all. After watching the video again, and once the changes are pointed out, it is difficult not to see the differences that occurred.

Change blindness has provided an interesting means by which to explore individual differences. Future research into change blindness and personality might examine possible sex differences. Women tend to be more extraverted than males (Carducci, 2009). Therefore, it might be likely that sex differences in change blindness might be due to the introversion/extraversion correlation with sex. That is, males might be more prone to change blindness than females due to the direction of their focus of attention (external rather than internal). A specific approach, then, would be for future studies to determine whether extraverted or introverted males or females are more likely to notice changes.

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Appendix
**How to Spot a Liar Questionnaire**

After viewing the How to Spot a Liar video, please answer the following questions. Be as truthful as possible, the answers are for research purposes only and will not be shared.

1. **What is your age?** _____
2. **What is your grade level?**
   Freshman          Sophomore          Junior          Senior          Other
3. **What is your gender?**          Male          Female
4. **What is your major (and minor)?** _____
5. **How informational was the video?**
   1          2          3          4          5
   Very Uninformative          Neither          Very Informative
6. **Have you ever heard of the term change blindness?**
   Yes          No
7. **Did you notice any changes (in color or item placement) during the video?**
   Yes          No
8. **If answered yes to #7, how many did you see and list them in the space provided?**
   _____
   _____
   _____
9. **Did #8 make you want to watch the video again to look for changes?**
   Yes          No
10. **Did you pay more attention to:**
   a. The interaction between the roommates          c. Neither
   b. The environment          d. Both