# How stable is perception in #TheDress and #TheShoe?

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## Abstract

#TheDress is perceived by some people as black and blue while others perceive it as white and gold. We have previously shown that the first encounter with #TheDress strongly biases its perception. This percept remained stable during the experiment, suggesting a role of one-shot learning. #TheShoe is another image that elicits similar bimodal color percepts. Here, we investigated how percepts change over time in both #TheShoe and #TheDress. First, we show that the important role of one-shot learning, which we found for #TheDress extends to #TheShoe. Similarly to our previous results with the dress, hiding large parts of the image with occluders biased the percept of the shoe. The percept did not change for the majority of observers when the occluders were removed. Second, we investigated if and how percepts switch over a time course of 14 days. We found that although some observers experienced percept switches, the percept was largely stable for most observers.

Keywords: #TheDress, #TheShoe, Contextual processing, One-shot learning, Perceptual dynamics

## Introduction

In #TheDress, some people perceive the dress as white and gold, whereas others perceive it as black and blue. Although color illusions are common, we usually all perceive the illusion with the same colors, i.e., we are "fooled" in the same way. Hence, what fascinates the public and vision scientists about #TheDress is not so much the illusory aspects rather than the inter-individual variability of the perceived colors. It is noteworthy that some people describe the dress with other colors, for example "brown and blue", but the fact remains that the percepts are bimodally distributed to a very good approximation (Lafer-Sousa & Conway, 2017). Another image, which we call #TheShoe, also shows a bimodal distribution of its perceived colors. Some observers perceive the shoe as pink, and the laces and sole as white. The other percept is grey (shoe) and turquoise (laces and sole). Werner, Fuchs, Kersten, & Salinas (2018) showed that, similarly to #TheDress, the bimodal distribution is a perceptual effect rather than a bias in color naming.

There are three important aspects to why percepts are bimodally distributed. First, why are there two possible percepts? For example, the illumination of a scene must be estimated and discounted for. Different explanations were proposed how such mechanisms determine the perceived colors in #TheDress (Brainard & Hurlbert, 2015; Gegenfurtner et al., 2015; Hesslinger & Carbon, 2016; Lafer-Sousa et al., 2015; Wallisch, 2017; Witzel et al., 2017). Here, we will not address this aspect.

Second, we found that the first encounter with #TheDress strongly determines the colors that are perceived in the future, i.e., a one-shot learning, imprinting-like mechanism is at play (Drissi Daoudi et al., 2017). We used occluders to hide the background and large parts of the dress. With white occluders, the majority of *naïve* observers perceived the dress as black and blue. With black occluders, most naïve observers became white and gold perceivers. Thus, we were able to bias the percept of naïve observers towards one or the other percept. The percept did not change for the majority of observers when the occluders were removed. This suggests that the first encounter with the image has a very strong influence on the percept.

A third aspect concerns the stability of the percepts. As mentioned, we previously showed that the percept was stable in the minutes following the removal of the occluders. Lafer-Sousa and Conway (2017) argued that #TheDress is bistable, with percept switches occurring on longer

timescales, from minutes to days. They found that about 50% of observers reported a switch of percept at least once since their first viewing, and about 12% reported frequent switches. They tested several factors known to influence multistability - prior knowledge about the stimulus, exposure to disambiguated versions, low-level stimulus properties, where observers look (or attend), priors encoded in genes or through lifetime experience - and found that they indeed modulated the percepts and increased the reversals.

Here, we investigated how the percept changes over time in both #TheShoe and #TheDress. First, we show that also the initial exposure to #TheShoe leads to one-shot learning. Next, we show to what extent percept switching occurs in these two images during a 14-days period.

# Methods

## Experiment 1: One-shot learning in #TheShoe

First, we investigated whether the role for one-shot learning that we found for #TheDress (Drissi Daoudi et al., 2017) also applies to #TheShoe.

### Experiment 1a

#### Observers

Forty-two observers (21 females, age 19-52 years), recruited from EPFL, took part. Participants signed informed consent, had normal or corrected-to-normal vision, and were paid 5 Swiss Francs for their participation.

#### Stimuli and apparatus

We presented the image of the dress and the image of the shoe on an LCD screen (ASUS VG248QE, Taipei, Taiwan; screen resolution 1920x1080 pixels) using Matlab. Participants were seated 60 cm from the computer screen. The images were presented in the center of the screen on a neutral grey background (38 cd/$m^2$). The image of the shoe was 516x499 pixels, and the image of the dress was 225x300 pixels.

#### Procedure

The images of the dress and the shoe were presented in random order. Observers were asked (1) whether they saw the image before and (2) to report the perceived colors. Then, (3), when looking at the image of the dress, participants were asked, in a binary task, to choose between black/blue and white/gold. When viewing the image of the shoe, observers had to choose between grey/turquoise and pink/white. If the participant was not naïve, she was asked to report (4) whether the perceived colors were the same as the colors she previously perceived.

### Experiment 1b

#### Observers

In Experiment 1b, we tested participants who had never seen the image of the shoe. The experiment was conducted in Georgia. Eighty observers took part in the experiment (50 females, age 17-75 years). All participants signed informed consent, had normal or corrected-to-normal vision, and were paid for their participation.

### Stimuli and apparatus

The stimuli were presented on an LCD screen (ASUS VG248QE, Taipei, Taiwan; screen resolution 1920x1080 pixels) using Matlab. Participants were seated 60 cm from the computer screen. Written instructions were presented in Georgian on the screen. We presented a small part of the image of the shoe using either red (CIExyY 0.643, 0.324, 17.2 cd/$m^2$), green (CIExyY 0.33, 0.653, 65.5 cd/$m^2$), yellow (CIExyY 0.434, 0.545, 86.7 cd/$m^2$) or blue (CIExyY 0.147, 0.038, 3.14 cd/$m^2$) occluders (Figure 1a). The visible part was 65 pixels wide. The total stimulus size was 400x400 pixels. The full image of the shoe was also 400x400 pixels. The stimuli were presented at the center of the screen on a neutral grey background (38 cd/$m^2$).

### Procedure

First, the occluded image was presented to 4x20 participants, one group for each color of the occluders. Then, observers were asked (1) whether they recognized the image, (2) to name the two colors of the non-occluded part of the image, and (3), to choose between grey/turquoise and pink/white in a binary task. The occluders were then removed, and the full image of the shoe was presented. Observers were asked (4) whether they had seen the image before, (5) to name the two colors of the shoe again, and (6) in a binary task to choose between grey/turquoise and pink/white. We cannot completely exclude an effect of consistency bias in color naming. However, since Werner et al. (2018) have shown that the reported colors are a perceptual effect, this is unlikely.

### Data analysis

Six observers were non-naïve, i.e., they had seen the image of the shoe before and were therefore excluded from the analysis (1, 2, 1 and 2 participants with red, green, yellow and blue occluders,

respectively). We performed $\chi^2$ tests to test if there was a significant difference in the propensity to see one or the other percept (i.e., pink/white or grey/turquoise) depending on the color of the occluders. P-values were Holm corrected.

## Experiment 2: Perceptual Switches

Second, we investigated the stability of the percepts on a 14 days period by asking participants to fill in the same questionnaire every day.

### Observers

Thirty-seven observers (20 females, age 23-84 years) participated. Participants signed informed consent and had normal or corrected-to-normal vision. Participants were not paid for their participation. All experiments were undertaken with the permission of the local ethics committee and in accordance with the Declaration of Helsinki.

### Stimuli and apparatus

The images of the dress and the shoe were printed in the center of a white sheet of paper. The image of the shoe was 103x103mm and the image of the dress was 58x72mm.

### Procedure

Each participant received an envelope containing a consent form, instructions, a questionnaire to be completed at the beginning of the experiment, the two images, a response sheet to be filled every day, and a questionnaire to be completed at the end of the experiment (Appendix).

In the instructions sheet, observers were informed of the two possible percepts of each image and of the real colors. They were first instructed to look at the images and complete the questionnaire. In the questionnaire we asked, for each image, questions about the perceived colors at the time of the experiment and on previous viewings, as well as questions related to percept switch. Observers were asked how often did their percept switched (if they experienced any switch), whether the change occurred during the same viewing (within seconds), or between viewings, and the duration of each percept.

Then, observers were instructed to look at the images once a day at the same location and the same lighting conditions for 14 days, report the perceived colors on the response sheet, and report whether the colors changed while looking at the image. At the end of the 14 days, participants filled in a second questionnaire to assess whether and how they experienced percept switches, if any. All the instructions and the questionnaires can be found in Appendix A (A.1-A.4).

# Results

## Experiment 1: One-shot learning in #TheShoe

In experiment 1, we investigated the effect of the initial exposure to #TheShoe on the perceived colors of the image. First, in experiment 1a, 42 observers freely viewed the image. We found that 26.2% of observers reported that they perceived the shoe as pink and white and 73.8% reported that they perceived the shoe as turquoise and grey.

In experiment 1b, we presented only a small part of the image of the shoe by using red, green, yellow or blue occluders (Figure 1a). With green occluders, 72.2% of observers perceived the visible part of the shoe as pink and white, which is significantly higher than when viewed without occluders (experiment 1a, 26.2%; Figure 1b; $\chi^2(1) = 11.1$, $p_{Holm} = 0.003$). Red, yellow and blue occluders did not affect the percept: there was no significant difference with the colors reported in experiment 1a (red: $\chi^2(1) = 0.2$, $p_{Holm} = 0.66$; yellow: $\chi^2(1) = 1.91$, $p_{Holm} = 0.5$; blue: $\chi^2(1) = 1.94$, $p_{Holm} = 0.5$).

When the occluders were removed, 17.6% of the participants reported a percept change (Figure 1c). For 92.3% of these observers (12 out of 13), the switch was from grey/turquoise to pink/white (Figure 1d).

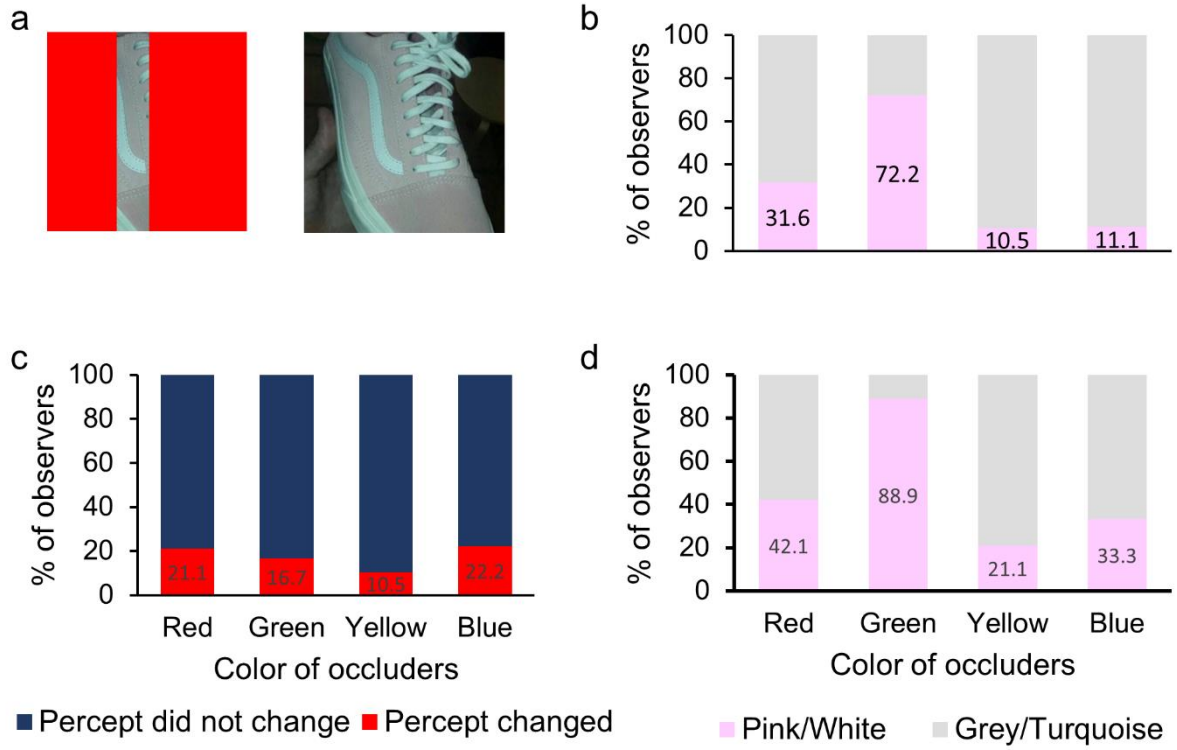


Figure 1: Experiment 1. a. Left: The image of the shoe was occluded by red, green, yellow or blue occluders (red occluders are shown). Right: full image of the shoe presented after the occluded image. b. The percentage of the colors of the shoe reported for the *occluded* image with either red, green, yellow or blue occluders. c. Proportions of observers for whom the percept did change when the occluders were removed. d. The colors of the shoe reported for the *full* image *after* the occluders were removed.

## Experiment 2: Perceptual switches

*Switches during the 14-days experiment*

In experiment 2, participants watched the images once a day for 14 days at a certain time. Only 2 (5.4%) and 3 (8.1%) out of 37 observers experienced a switch of percept for the dress and the shoe image, respectively. For the dress image, both observers reported a switch of percept while they were viewing the image. They reported that their main percept was white and gold but that they

were perceiving black and blue for a few seconds before the percept switched back to the dominant one. The switch occurred at each viewing for one participant, i.e., 14 times, and twice for the other.

For the shoe image, the "switchers" (3 out of 37 observers) reported that their dominant percept was pink and white, but they perceived grey and turquoise for a few seconds during the viewing of the image. The switch occurred 2, 7, or 9 times for each of the three observers. For one participant, the switch also occurred between viewings, i.e., the first percept was sometimes pink/white and sometimes grey/turquoise.

*Switches prior to the experiment*

We also asked the observers whether they ever experienced a switch of percept before the experiment, on their own viewings (questionnaire 1). Seven out of 37 observers (18.9%) reported having experienced at least one switch of percept for the dress image in their lifetime, before the experiment. Four of these 7 participants experienced a change during the same viewing and the percept returned to the initial one. For 2 others of these 7 observers, the switch occurred between viewings. One of these two observers usually perceived white/gold but perceived black/blue once in her lifetime. The other experienced both percepts in her lifetime but only one per viewing. The seventh of these observers reported experiencing both percepts but did not recall when and how it occurred.

For the shoe image, 4 out of 37 (10.8%) observers reported having experienced switches prior to the experiment. Three of these 4 had experienced switches during the same viewing. The percept returned to the initial one after a few seconds. The other observer experienced both percepts but only one per viewing. The responses of the switchers are provided in Appendix B (Tables B.1 – B.4).

## Discussion

We previously showed that the first encounter with # TheDress led to one-shot learning. The initial percept remained largely stable after the occluders were removed. However, we did not test for how long the percept remains stable afterwards. Lafer-Sousa and Conway (2017) proposed that #TheDress is a bistable image, where color switches spontaneously occur even over hours and days. Our main aim was to investigate how the percept changes over time in both #TheDress and #TheShoe.

First, we showed that the important role of one-shot learning, which we found for the dress' colors, also extends to #TheShoe. In Drissi Daoudi et al. (2017), crude black occluders biased the percept toward the brighter white and gold. White occluders biased the percept towards darker black and blue. For #TheShoe, Werner et al. (2018) showed that the pixels of the image are distributed along the L-M axis. This inspired us to investigate the effect of crude red and green occluders (as well as orthogonal blue and yellow occluders). We are not concerned with minute effects depending on the particular shade of red/green or the shape of the flankers. Instead, we wanted to know if occluders during the initial encounter with #TheShoe have any effect. We found that the green flankers had a strong effect and biased the percept towards pink and white. As with #TheDress, when the occluders were removed, the percept remained unchanged for the majority of observers. The red, blue and yellow occluders did not bias the percept. We expected the green flankers to bias the percept towards a "redder" pink and white, and the red occluders to bias the percept towards a "greener" turquoise and grey (we didn't expect the blue and yellow occluders to have any effect).

These results show that one-shot learning also plays a role with #TheShoe. Further work will investigate the mechanism determining the colors of the percept. One possibility is that the effect of the occluders is mediated by color constancy: a green illumination is estimated and discounted for, leading to a "redder" pink and white percept. However, this account cannot easily explain why the red occluders did not bias the percept. One possibility may be that the occluders we used were not optimal to bias percepts in #TheShoe. Alternatively, local simultaneous contrast or other mechanisms, such as illusory shifts in brightness (Hugrass et al., 2017), may play a role. Whatever

is the case, the conclusion remains that the green occluders during the first encounter of #TheShoe strongly biased the percept, which does not change when the occluders were removed.

Although our results suggest that differences during the first encounter with the dress and the shoe images play a crucial role in their colors' perception, other idiosyncratic factors may have an effect too. Indeed in 30% of observers, the occluders' color did not determine the percept of #TheShoe (20% for #TheDress, Drissi Daoudi et al., 2017). Mahroo et al. (2017) showed in a twin study that genetic factors account for 34% of the variance of observers' perception. Other studies investigated the role of age, gender or chronotype in determining which colors are perceived with mixed results (Chetverikov & Ivanchei, 2016; Drissi Daoudi et al., 2017; Jonauskaite et al., 2018; Lafer-Sousa et al., 2015; Wallisch, 2017).

Second, we investigated percept switches in #TheDress and #TheShoe. We asked observers to look at the images of the dress and the shoe every day for 14 days and to report the perceived colors. Less than 10% of observers experienced a change of percept during this period (5.4% and 8.1% for the dress and the shoe images, respectively). For all these observers, the change occurred briefly while looking at the image and switched back to the initial percept. Therefore, in line with Lafer-Sousa and Conway (2017), we also found that some observers experience switches, but the number of switchers was small and the percept quickly went back to the first perceived colors. Overall, the percept seems to be stable for the majority of the observers over a timescale of 14 days.

These numbers refer to switches for short timescales, while looking at the image. Before starting the 14 days exposure, participants were asked to report whether they had *ever* experienced a switch of percept. Around 27% and 36% of the observers reported having experienced a percept switch for the dress and the shoe image, respectively. Half of these observers only experienced a brief switch and then the usual, stable percept came back. Most of them reported not remembering the switch very clearly. Other studies found that 16-35% (Jonauskaite et al., 2018), 25% (Chetverikov & Ivanchei, 2016) and 50% (Lafer-Sousa & Conway, 2017) of observers reported experiencing at least one percept switch of the dress in their lifetime. The fact that we found fewer switchers during the experiment shows that the percept remains largely stable over this extended 14-days period of time.

What is the link between the one-shot learning phenomenon and the stability of the perceived colors in #TheDress and #TheShoe? One possibility is that these images are bistable and that one-shot learning during the first encounter induced a strong bias. Lafer-Sousa & Conway (2017) showed that #TheDress shows many characteristics associated with bistable stimuli. As mentioned, although we find that the percept is very stable, a small fraction of observers did experience switches. Some of the descriptions of these switches are compatible with bistability. For example, three observers reported "I see WG but if I concentrate I can see BB for a few seconds. I can't do it with the shoe", "I heard other people saw it white and gold so I concentrated to be able to see it for a few seconds" and "I experienced the color change after I focused on the hand in the picture". It has been shown that top-down effects, including prior knowledge (Rock & Mitchener, 1992), attention and volontary eye movements (Ellis & Stark, 1978; Kawabata et al., 1978; Kawabata & Mori, 1992) and volition (Pelton & Solley, 1968; Seth & Reddy, 1979), canmodulate switches in bistable stimuli (review: Scocchia et al., 2014). Once one-shot learning determined the initial percept, the remarkable subsequent stability of the percept may be explained by the naturalistic aspect of these images as they are photographs of real scenes (see also Witzel et al., 2017). Indeed, humans have strong priors that natural objects do not change color. In contrast, "classic" bistable stimuli associated with frequent switches, such as the Necker cube (Necker, 1832), are not found in nature and therefore may not be associated with such a strong stability prior.

The dress and the shoe images are not the only examples of ambiguous stimuli changing over long timescales. For example, Wexler, Duyck, and Mamassian (2015) used an ambiguous random dot kinetogram that could be perceived as moving in two different directions, and showed that each observer has an idiosyncratic bias that evolves slowly over time. Typically, models of perception are functions only of the sensory input and not of such slowly evolving internal states of the perceptual system. Hence, these experiments show that the assumption of stationarity in perception might be unwarranted. Both directly observable variables such as experimental stimuli and covert, persistent brain states influence perception. Contrary to the stimuli used in Wexler et al. who showed small changes only detectable through careful psychophysical experiments, the dress and the shoe are particularly vivid examples easily noticed in everyday life.

Taken together, our results suggest that very strong and stable perceptual biases can be elicited by one-shot learning in both #TheDress and #TheShoe. Once the first percept is fixed, it remains largely stable. Percept switches occur, but mostly over long timescales, or with a rapid return to the initial percept. Illusions that are very stable but unimodally distributed - such as the checkerboard illusion (Adelson, 1995) - and bistable stimuli that are bimodally distributed but switch frequently - such as the necker cube - do not provoke the same bewilderment as the #TheDress. It is the *combination* of the bimodal distribution and the remarkable stability of #TheDress and #TheShoe that makes them fascinating.

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# Appendix A

Instructions, questionnaire 1, response sheet and questionnaire 2 of experiment 1.

## Appendix A.1 – Instructions of experiment 1

### Instructions

First of all, thank you very much for taking part in this experiment and helping us in our research!

In this envelope, you will find an image of a dress and an image of a shoe. You may already know these images as they are popular on the internet.

Usually people see the dress as being either Black and Blue or White and Gold. The colors of the real dress are Black and Blue.
The shoe image is either perceived as White and Pink or Turquoise and Grey. The colors of the real shoe are White and Pink.

We would like to investigate if your percept of these colors is stable or if it switches between the two color percepts.

This experiment will last 14 days.
First, please read and sign the consent form, then fill in Questionnaire 1.
Then, you will need to look at the two pictures once a day, at the same location and with the same lighting conditions. Then fill the Response Sheet and put the images back in the envelope. Please repeat the next day, during 14 days.
If you are unable to do it one day, you can just indicate it in the column “Notes” in the response sheet.
At the end of the 14 days, please fill in Questionnaire 2.

Then, please send pictures or scans of the consent form, questionnaires, and response sheet to the following email address: leila.drissidaoudi@epfl.ch or to the person who asked you to take part in this experiment.

Thank you again for your valuable help!

## Appendix A.2 – Questionnaire 1 of experiment 1

# Questionnaire 1

Name:
Gender:
Date of birth:

1. On most days, at what time do you typically wake up?

2. On most days, at what time do you typically go to bed?

3. Please look at the image of the dress
    a. Please name the two colors of the dress that you see

    b. Please choose between Black/Blue and White/Gold in case you named different colors in a.
        - o Black/Blue
        - o White/Gold

    c. Have you seen the image before?
        - o Yes
        - o No

4. If you responded "yes" to the question #3c, please answer the following questions:
    a. Can you recall when you first saw this image?

    b. When you first saw the image, which colors did you see?

    c. Please choose between Black/Blue and White/Gold in case you named different colors in 4b.
        - o Black/Blue
        - o White/Gold

    d. Please estimate how many times you saw the image prior to this study

    e. In your viewings prior to this study, did the dress colors ever change?
        - o Yes
        - o No

5. If you responded "yes" to the question #4e, please answer the following questions:
    a. If you experienced color switches, how often did it change?

    b. Was the color change only a short temporal switch and then it quickly switched back?

    c. Did the change occur during the same viewing (within seconds) or between viewings?

    d. If the colors switched during the same viewing, is there a period of unclearness or did they switch instantly?

e. What is the percentage in the duration of White/Gold vs. Black/Blue percepts?
_____ : _____% (please add numbers summing up to 100%)

f. Please add any information on how you experience the color switches that is not covered by the questions above.

6. Please look at the image of the shoe
   a. Please name the two colors of the shoe that you see

   b. Please choose between Pink/White and Turquoise/Grey in case you named different colors in a.
      - o Pink/White
      - o Turquoise/Grey

   c. Have you seen the image before?
      - o Yes
      - o No

7. If you responded "yes" to the question #6c, please answer the following questions:
   a. Can you recall when you first saw this image?

   b. When you first saw the image, which colors did you see?

   c. Please choose between Pink/White and Turquoise/Grey in case you named different colors in 7b.
      - o Pink/White
      - o Turquoise/Grey

   d. Please estimate how many times you saw the image prior to this study

   e. In your viewings prior to this study, did the shoe colors ever change?
      - o Yes
      - o No

8. If you responded "yes" to the question #7e, please answer the following questions:
   a. If you experienced color switches, how often did it change?

   b. Was the color change only a short temporal switch and then it quickly switched back?

   c. Did the change occur during the same viewing (within seconds) or between viewings?

   d. If the colors switched during the same viewing, is there a period of unclearness or did they switch instantly?

   e. What is the percentage in the duration of Pink/White vs. Turquoise/Grey percepts?

      _____ : _____% (please add numbers summing up to 100%)

f. Please add any information on how you experience the color switches that is not covered by the questions above.

Appendix A.3 – Response sheet of experiment 1

# Response Sheet

Name :

| Day | Date | Hour | Dress image<br>What colors do you see? | Dress image<br>Choose between Black/Blue and White/Gold | Did the colors change during the time you were looking at the image? | Shoe image<br>What colors do you see? | Shoe image<br>Choose between Pink/White and Turquoise/Grey | Did the colors change during the time you were looking at the image? | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |
| 11 | | | | | | | | | |
| 12 | | | | | | | | | |
| 13 | | | | | | | | | |
| 14 | | | | | | | | | |

## Appendix A.4 – Questionnaire 2 of experiment 1

# Questionnaire 2
# To fill in at the end of the 14 days

Name:

9. If you experienced color switches for the dress image during this experiment, please answer the following questions:
    a. Was the color change only a short temporal switch and then it quickly switched back?

    b. If the colors switched during the same viewing, was there a period of unclearness or do they switch instantly?

    c. How long did each percept (i.e. Black/Blue or White/Gold) last?

    d. Do you feel like you have a percept (i.e. Black/Blue or White/Gold) that is dominant? If yes, which one (please, indicate the percentage)?

    e. Please add any information on how you experience the color switches that is not covered by the questions above.

10. If you experienced color switches for the shoe image during this experiment, please answer the following questions:
    a. Was the color change only a short temporal switch and then it quickly switched back?

    b. If the colors switched during the same viewing, was there a period of unclearness or do they switch instantly?

    c. How long did each percept (i.e. Pink/White or Turquoise/Grey) last?

    d. Do you feel like you have a percept (i.e. Pink/White or Turquoise/Grey) that is dominant? If yes, which one (please, indicate the percentage)?

    e. Please add any information on how you experience the color switches that is not covered by the questions above.

## Appendix B – Responses of the switchers in experiment 1

### *Switchers during the 14-days experiment*

| | Number of viewings | Number of switches | During or between viewings? | Was it a quick temporal switch and then back to initial percept? | Main percept | Switch prior to the experiment? | Additional information |
|---|---|---|---|---|---|---|---|
| 1 | 14 | 14 | During | Yes | WG | Yes | I see WG but if I concentrate I can see BB for a few seconds. I can't do it with the shoe. |
| 2 | 14 | 2 | During | Yes | WG | No | I experienced the short temporal switch when the picture was inside the envelope, I felt as if it was black/blue temporarily. |

Table B.1: Responses of the switchers for *#TheDress* regarding the switches during the 14-days experiment.

| | Number of viewings | Number of switches | During or between viewings? | Was it a quick temporal switch and then back to initial percept? | Main percept | Switch prior to the experiment? | Additional information |
|---|---|---|---|---|---|---|---|
| 1 | 14 | 2 | During | Yes | PW | Yes | - |
| 2 | 14 | 7 | During | Yes | PW | Yes | - |
| 3 | 14 | 9 | During and between | Yes | PW | No | When I experienced the color change the first time, the first perception was turquoise and grey but I experienced the color change after I focused on the hand in the picture. From the second time, I experienced the color change although I didn't focus on or care about it. |

**Table B.2:** Responses of the switchers for *#TheShoe* regarding the switches during the 14-days experiment.

*Switchers prior to the experiment*

| | Number of viewings | Number of switches | During or between viewings? | Was it a quick temporal switch and then back to initial percept? | Main percept | Switch during experiment? | Additional information |
|---|---|---|---|---|---|---|---|
| 1 | 10 | 1 | During | Yes | WG | No | - |
| 2 | 100 | 1 | Between | No | WG | No | I'm not even sure now<br>it was at a weird angle of view and projected.<br>When I looked at it after it was white and gold again |
| 3 | 20-30 | 1 | During | Yes | BB | No | I heard other people saw it white and gold so I concentrated to be able to see it for a few seconds. |
| 4 | 10 | 3 | During | Yes | BB | No | |
| 5 | >15 | Every 2-3 times | Between | - | - | No | I sometimes see WG and the other times I see BB. |
| 6 | 10 | 5-6 | During | Yes | | Yes | - |
| 7 | 2 | - | - | - | - | No | I remember to have seen both Black/Blue and White/Gold, but time is too long to remember details. |

Table B.3: Responses of the switchers for *#TheDress* regarding the switches prior to the 14-days experiment.

| | Number of viewings | Number of switches | During or between viewings? | Was it a quick temporal switch and then back to initial percept? | Main percept | Switch during experiment? | Additional information |
|---|---|---|---|---|---|---|---|
| 1 | 20 | Once per viewing | During | Yes | PW | Yes | There is a period of unclearness before the switch |
| 2 | 20 | randomly | Between | - | PW | No | - |
| 3 | 2-3 | 1 | During | Yes | PW | Yes | - |
| 4 | 2-3 | 1-2 | During | Yes | PW | No | - |

Table B.4: Responses of the switchers for *#TheShoe* regarding the switches prior to the 14-days experiment.