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Majority and Minority Influence Using the Afterimage Paradigm: A Series of Attempted Replications

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Five experiments are reported which attempt to replicate Moscovici and Personnaz's (1980) study that showed that a minority, but not a majority, produced a perceptual conversion in a task involving afterimage judgments. Given the theoretical importance of the study, a number of replications were conducted which were designed to test four explanations. The experiments also address a methodological issue that had not been previously examined, namely within-phase effects. Afterimage shifts were found for a majority and minority source only when there were more trials after-influence compared to pre-influence. In all the experiments there was a consistent within-phase effect showing afterimages gradually shifted toward the complementary color of green. These results suggest that afterimage shifts are due to a within-phase effect of afterimages progressively moving to the complementary color of green and to subject suspiciousness. The experiments therefore call into the question the validity of the paradigm as an appropriate test of conversion theory.

INTRODUCTION

This paper describes a series of experiments designed to replicate Moscovici and Personnaz's (1980) study that claims to show that a minority can produce perceptual conversion. The results of this experiment, and others from the researchers, are widely cited as evidence in favor of Moscovici's (1980) Conversion Theory. Moscovici proposes that majority and minority influence are determined by two separate cognitive processes which result in different levels of public and private influence. In the case of majority influence, individuals engage in a *comparison process* whereby they compare their own response with that of

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the majority without considering the majority's message. The result of this process is that majorities lead to public compliance with little private change. On the other hand, minorities are unlikely to have public influence as individuals wish to avoid directly identifying with minority groups. However, because of their distinctiveness, minorities cause a *validation process* whereby individuals cognitively analyze the message in order to understand the minority's position. This can lead to conversion behavior—that is, greater private than public influence.

Evidence in favor of Moscovici's dual process model heavily relies upon the demonstration that majority and minority influence have a differential impact upon public and private levels of influence. A recent meta-analysis of 97 minority influence experiments by Wood et al. (1994) concluded that ''minority advocacy generates a very different pattern of influence effects than appeals from majority sources, which is congruent with Moscovici's emphasis on the different determinants of minority and majority impact'' (p. 339). However, the most dramatic evidence in favor of Moscovici's Conversion Theory, which is widely cited, has come through his research with the *afterimage paradigm* (Moscovici & Personnaz, 1980; see Personnaz & Personnaz, 1995, for a review, Moscovici & Personnaz, 1991, for a similar adaptation, and Moscovici, 1996, for an overview of the development of the method).[1] This paradigm concerns color perception and uses two subjects. The subjects are shown a series of blue slides to which they have to make two responses: (a) color of slide (either blue or green) and (b) an afterimage judgment of the slide (on a 9-point scale). An afterimage is obtained by having subjects view a white screen after looking at the blue slide. Under these circumstances an afterimage develops which is the complementary color of the stimulus. In fact the same slide, which is unambiguously blue, is used throughout the study.

The experiment has four phases with a number of trials in each, and in each phase the subjects name the slide and give an afterimage score. One of the subjects is, in fact, a confederate who in the second phase publicly calls the blue slides green. False feedback concerning prior subjects' responses puts a green response as either a majority or a minority view. The confederate only responds publicly to the slide color and not to the afterimage. In this case, the color response represents the manifest or public level of influence. On the other hand, since subjects are presumably unaware that the afterimage judgment is linked to the color of the slide, this measure is the latent response and represents a true perceptual change. If the subjects are not influenced by the confederate on a latent level then subjects should report the afterimage as being the complementary color of blue (that is, yellow). However, if ''there were a change in the perceptual scheme, with or without a related change in verbal response, subjects looking at a

[1] The paradigm was developed from the original blue–green experiment by Moscovici, Lage, and Naffrechoux (1969) (see also, Moscovici & Lage, 1976; Nemeth, Swedland & Kanki, 1974).

white screen would indicate a complementary color that is closer to red–purple'' (Moscovici & Personnaz, 1980, p. 273), that is, the complementary color of green.

The results obtained by Moscovici and Personnaz (1980) show that there was no manifest influence for either a majority or minority. In other words, few subjects publicly change their view that the blue slide was green. In the case of afterimage judgments an intriguing picture emerged. First, as predicted by the researchers, when the confederate represented a majority view there was no corresponding change in afterimages across the phases. However, when the confederate was believed to be a minority member, subjects shifted their afterimage judgments to the complementary color of green. It appears that a minority calling the blue slide green caused subjects to change their perceptual code, and, though not publicly changing the naming of the blue slide, they began to see its afterimage closer to that of the complementary color of green. The results of this study, which were replicated in a second experiment, seem both baffling and counter intuitive and have led some authors to call them ''Astounding! Astonishing! Implausible?'' (Baron, Kerr, & Miller, 1992).

Results using the afterimage paradigm have been mixed. Moscovici and Personnaz (1980), Personnaz (1981), and Personnaz and Personnaz (1987) have found evidence in favor of the dual process model; that is, minorities produced conversion in that they caused subjects to report afterimages closer to the complementary color of green while majorities did not (see also, Kozakaï, Moscovici, & Personnaz, 1994; Moscovici & Doms, 1982). However, in a direct replication of the original study, Doms and Van Avermaet (1980) found conversion behavior for *both* a minority and a majority source and concluded that this was due to increased attention to the stimulus arising from the confederate's deviant response. Thus, when the subjects focused on the slides they became attuned to any green hues that might be present in the slides, which led to a shift in afterimage judgment, irrespective of influence condition.

Further evidence for a link between afterimage shifts and attention to the slide has been shown by Sorrentino, King, and Leo (1980). This experiment, which only focused on minority influence, found no overall change in afterimage scores *except* for those subjects who were suspicious of the experiment (as determined by a post-experimental questionnaire). They suggest that those subjects who were suspicious of the experiment focused more upon the slide and therefore attended to the green hues which in turn resulted in the afterimage shifts. Given that subjects are more likely to be suspicious of a minority response than that of a majority, it seems likely that the effect of increased attention is more prone to occur for the former than for the latter situation. Thus the observed effects using the afterimage paradigm may not reflect changes in perception, as maintained by Moscovici and Personnaz, but could be due to varying attention to the slide.

Personnaz (1981) and Moscovici and Personnaz (1986) have tried to improve the methodological aspects of the study by the use of a spectrometer to measure subjects' perception of the slide and afterimage. A spectrometer is a device with which to measure the wavelength of different colors. For both the slide and

afterimage, subjects used a spectrometer to indicate the color they perceived, which gave a wavelength reading in nanometers. The results supported the original study and showed that majority influence did not result in a change in spectrometer scores while minority influence caused a shift in spectrometer scores toward the complementary color of green. In contrast, Kakalevakis (1996) has developed a computer version of the paradigm that overcomes many of the methodological problems of the original study; for example, subjects indicated their afterimage scores on a hue circle instead of the 9-point scale previously employed. In this study, there were no changes in afterimage scores, nor time to respond, for either a majority or a minority source compared to a no-influence control condition.

Recently Moscovici and Personnaz (1991) reinterpreted their original findings within an increased attention framework but only in the case of minority influence. They state that a minority causes ''a conflict that leads most individuals to look more attentively at the stimulus. In short, a validation process is set in motion to see whether the deviant responses might contain a grain of truth'' (p. 102). This explanation is compatible with the increased attention hypothesis described by Doms and Van Avermaet but differs considerably from Moscovici and Personnaz's (1980) original position of a true perceptual change.

The various explanations offered to explain these results center around the notion that increased attention to the slide results in subjects' perceiving more of a green hue in the blue slide and this results in afterimages in the direction of the complement of green. The main difference in the explanations concerns the trigger for the increased attention, which is proposed as being due to (a) ''consistent judgment emitted by the minority'' (Moscovici & Personnaz, 1991, p. 102), (b) ''discrepant information'' (Doms & Van Avermaet, 1980, p. 290), and (c) ''initial suspiciousness of subjects'' (Sorrentino et al., 1980, p. 300).

Moscovici's explanation for the afterimage effect is based upon the notion that a minority source creates more cognitive evaluation of its response than does a majority source. This assumption has been challenged by Mackie (1987) who proposes the *objective consensus* approach to understanding majority and minority influence (see also, De Vries, De Dreu, Sordijn, & Schuurman, 1996). The basic premise is that people assume majority positions are correct and that the majority's arguments are valid. Therefore, unlike Moscovici, she argues that exposure to a counter-attitudinal majority motivates individuals to engage in more thorough cognitive evaluation of the stimulus. Drawing upon Mackie, a fourth hypothesis suggests that afterimage shifts should occur for a majority who expresses an opinion different from that of the subject. Thus, differing hypotheses for afterimage shifts are proposed: minority only (Moscovici), majority only (Mackie), both majority and minority (Doms & Van Avermaet), and suspicious subjects (Sorrentino et al.).

A recent study by Martin (1995) offers an insight into the afterimage effect. This study followed the same procedure as the Moscovici and Personnaz (1980) experiment except with a ''pure'' blue slide (that is, one that contained a very

small proportion of green hues[2]). Under this situation increased attention to the slide should result in afterimages more in the direction of the complementary color of blue (as virtually none of the slide's color spectrum was in the green zone). If the afterimages did shift toward the complementary color of blue, then this would represent *negative* influence, that is, in the direction opposite to that endorsed by the source. Indeed, the study showed that afterimages did shift toward the complementary color of blue for both a majority and minority source but not in a no-influence control condition. Thus, consistent with the Doms and Van Avermaet hypothesis, a deviant response, irrespective of whether it was labeled a majority or minority position, led to afterimage shifts. An interesting methodological aspect to this study is that it employed the same number of trials within each phase (five) in order to examine within-phase effects, which had not hitherto been attempted in previous research. The study showed that afterimage scores within the post-influence phase progressively shifted toward the afterimage of blue, while such a trend was not observed in the pre-influence phase.

It is interesting that previous research has not examined within-phase effects, as color perception tends to be sensitive to repeated presentations of the same stimulus (Abramov & Gordon, 1994). If, as observed in Martin (1995), afterimage scores do tend to shift across the trials then this has major implications for the observed findings, especially as these studies differ in the number of trials employed in each of the phases. The original Moscovici and Personnaz study employed more trials post-influence (15) than pre-influence (five). If a within-phase effect does result in afterimage scores progressively shifting to the complementary color of green, then one should expect the mean of a 15 trial phase to be more toward the complementary color of green than the mean of a five trial phase. If this were true for the original study, a design using more post- than pre-influence trials, then there would be a stronger induction toward finding afterimage shifts. This effect, by itself, would not fully explain why shifts occur in the minority condition but not in the majority or control conditions.

In summary, the chromatic afterimage paradigm has produced inconsistent results concerning majority and minority influence. In particular the claim that exposure to a minority result in subjects being ''converted to a different way of seeing'' (Moscovici, 1980, p. 235) seems unsubstantiated, yet these findings are regularly cited as evidence in favor of Moscovici's dual process model. Given the theoretical implications of the paradigm, the present experiments were conducted to (a) test the alternative explanations for afterimage shifts and (b) address the methodological issues concerning within-phase effects and the role of subject suspiciousness.

[2] The slide used in the original Moscovici and Personnaz (1980) study is termed ''blue–green'' by the manufacturers while the slide used in the Martin (1995) study is termed ''pure blue'' by the same manufacturing company.

OVERVIEW OF METHODOLOGY

Afterimage Paradigm

The same basic paradigm was used in each of the studies and is described below. As far as possible, the same methodology was employed as in the Moscovici and Personnaz (1980) experiment.

Subjects

All the subjects used in these studies were female undergraduate students from the University of Wales, Swansea. None of the subjects was aware of the chromatic afterimage effect nor did they know the confederates.

Procedure

The subject and confederate entered the experimental room where there were two chairs facing a white screen. The subjects were tested for color blindness using the Ishihara (1954) test. This test consists of an array of colored dots some of which form the outline of numbers. If subjects are able to correctly perceive the numbers then they are not color blind. The aim of the test was twofold, first, to eliminate any subjects with color blindness (none was omitted) and second, to demonstrate to the subject that the confederate's response could not be attributed to perceptual defects.

The subjects were informed that the experiment concerned color perception and that they would view a series of slides and be asked their color and an indication of the chromatic afterimage. The slide was the same as that used by Moscovici and Personnaz (Kodak-Wratten Number 45).[3] The afterimage was obtained by subjects focusing on the blue slide for 15 s and then fixating onto a white screen. Once the afterimage had formed, they were required to rate the color on a 9-point scale (1 = yellow, yellow/orange, orange, orange/red, red, red/pink, pink, pink/purple, 9 = purple). The experiment took place over four phases, each of which consisted of a number of trials using the same slide.

Phase 1: Pre-influence. In this phase, the subjects indicated the color of the slide (blue or green) and provided a rating of the afterimage color on a response form. At the end of this phase the response manipulation was conducted. The subjects were given a sheet of paper that reputedly gave average responses from previous subjects who had participated in the study. In the majority influence condition, subjects were told that 81.8% of people see the slide as green, while 18.2% of people see it as blue. The response distribution was reversed in the minority influence condition.

Phase 2: Influence. In this phase, subjects named the color of the slide aloud. The confederate always responded first and said "green" to every slide. No afterimage scores were taken.

Phase 3: Post influence I—confederate present. This was the same as the first phase where subject and confederate gave both slide color and afterimage judgments on a form. At the end of this phase, the experimenter informed the subjects that there were two final parts to the study; one was a questionnaire and the other a final series of slides. The confederate was taken to a separate room to complete the questionnaire while the naive subject completed the final phase.[4]

Phase 4: Post influence II—confederate absent. With the confederate no longer in the room, the subject was shown the slides again and was asked to make slide and afterimage judgments on a form. Following this, subjects completed a post-experimental questionnaire that assessed their awareness of the experimental hypotheses and any suspiciousness they may have had with the experiment.

Confederates

All the confederates were female students and of a similar age to the subjects. The same confederate (or confederates as in experiment 2) was used throughout each experiment, and she was blind to

[3] Van Avermaet (personal communication) notes that repeated use of the same slide can lead to discoloration due to the heat of the projector. To avoid this problem the slide was changed at regular intervals.

[4] In the original Moscovici and Personnaz (1980) experiment the confederate said that she would have to leave the room because of a prior appointment. Given the experiment only takes about 20 min, it did not seem credible to have the confederate leaving due to a prior appointment.

experimental condition. The confederates were asked to respond in a normal way and to respond ''green'' in a clear voice to all the slides during the public phase (phase 2).

Plan of Studies

Five experiments are reported. Previous studies have employed different numbers of trials per phase. In the original Moscovici and Personnaz (1980) study there were 5, 15, 15, and 5 trials for each of the four phases. This can potentially create problems in statistically analyzing between phases due to the fact that mean phase scores are based upon different numbers of trials. Therefore, an initial aim in the first two experiments was to use a consistent number of trials for each of the phases (namely, 5). An additional aim of using the same number of trials per phase is that this enables one to consider *within* phase effects which had not hitherto been examined. In the second experiment, a group context was used in which the majority and minority were physically represented rather than being implied by false feedback from previous respondents. Instead of using a single confederate, as in the original study, groups of four subjects were used, which contained either three (majority) or one (minority) confederates. It can be hypothesized that the group context would increase social pressure to conform to the majority position. The third and fourth experiments closely follow the original study in terms of the number of trials per phase and each also included a no-influence control condition. In the third experiment the initial pre-influence stage was omitted, while in the fourth it was included and was thus a direct replication in terms of number of trials per phase of the Moscovici and Personnaz study. In the final experiment, which was similar to the original Moscovici and Personnaz (1980) study, subjects were asked to remember the majority/minority response manipulation. The aim of this was to ensure that subjects had processed this information and had retained it during the experiment.

EXPERIMENT 1

Subjects and Design

Using the afterimage paradigm, 24 female undergraduate subjects were randomly allocated into a majority or minority influence condition. The same female confederate was used throughout the experiment. Each of the four phases consisted of five trials.

Results and Discussion

None of the subjects in any of the phases gave a green response to the blue slide in either the majority or minority influence conditions. Clearly subjects perceived the stimulus to be blue, and there was no manifest influence. While this is consistent with previous research using the paradigm, according to the dual process model majorities should cause more manifest influence (as represented by a greater proportion of green responses) than minorities.

Afterimage scores were analyzed using a 2 condition (majority vs minority) $\times$ 3 phases (pre-influence vs post-influence I vs post-influence II) $\times$ 5 trial number ANOVA with the last two factors being repeated measures.[5] The mean afterimage scores as a function of condition and phases are shown in Table 1.

According to Moscovici and Personnaz, afterimage scores should move closer to the complementary color of green (get higher) in the minority condition but not

[5] Kakalevakis (1996) notes that the mean afterimage score in the Moscovici and Personnaz (1980) pre-influence scale phase was 5.08 on a 9-point scale which corresponds to an afterimage of ''red''—thus, he argues, subjects were not meeting the baseline criterion of perceiving the slide as blue otherwise they should have an afterimage score below the midpoint. In the experiments reported in this paper all the pre-test mean scores were below the midpoint of the scale (3.5, 4.3, 4.1, and 3.8 for experiments 1, 2, 4, and 5, respectively).

TABLE 1
MEAN AFTERIMAGE SCORES FOR EXPERIMENT 1

	Phases		
	Pre-influence	Post- influence I	Post- influence II
Majority	3.15	3.02	3.08
	(1.86)	(2.02)	(1.79)
Minority	3.85	3.78	3.33
	(1.81)	(1.89)	(1.49)

Note. $n = 12$ per condition, higher scores represent afterimages nearer to the complementary color of green and therefore greater influence. Standard deviations in parentheses.

in the majority condition. The means clearly do not support this. The main effects for condition, $F(1, 22) < 1$, phase $F(2, 44) = 1.12$, and the interaction, $F(2, 44) = 1.00$ are all nonsignificant. Moscovici (1996), in discussing the development of the paradigm, noted that some subjects were influenced while others were not. It is possible that the mean afterimage scores are hiding participants who shifted toward the complementary color of green and that this may have been more likely in one particular condition. To explore this, change scores were computed by subtracting the post-influence I mean from the pre-influence mean and allocating subjects into one of three categories; (a) afterimage score decreased, (b) afterimage score stayed the same, and (c) afterimage score increased—showing influence. This showed that 11 subjects reduced their afterimage score ($M = .62$), nine subjects' scores stayed the same, and four subjects' scores increased ($M = 1.1$). There was no difference in the distribution of subjects in these influence change categories by source condition (decreased 5/6, stayed the same 6/3, and increased 1/3 majority/minority, respectively, $\chi^2(2) = 2.09$).

Returning to the ANOVA, there was a significant main effect for trial number, $F(4, 88) = 8.75$, $p < .001$. This is shown in Fig. 1. Pooled across phases and conditions, subjects' perception of the slide gradually moved toward the complementary of green (the red end of the scale). The fact that trial number did not significantly interact with the other variables shows that this pattern was the same for each condition and for all phases. A series of regression analyses was conducted to test the best equation for the trend (linear, quadratic, or cubic).[6] The linear equation was significant showing that afterimage scores increased as a function of trial number (linear equation; afterimage score $= 2.716 + 0.222$ (trial number), $F(1, 118) = 3.8$, $p < .05$).

In summary, the results of the first experiment do not replicate those found by Moscovici and Personnaz (1980). However, closer examination of the data shows that the factor trial number showed an interesting pattern. In both influence conditions, irrespective of phase, subjects' rating of the afterimage gradually becomes closer to the complementary color of green. Since this effect occurred in

[6] To simplify presentation only significant trend analyses are reported.

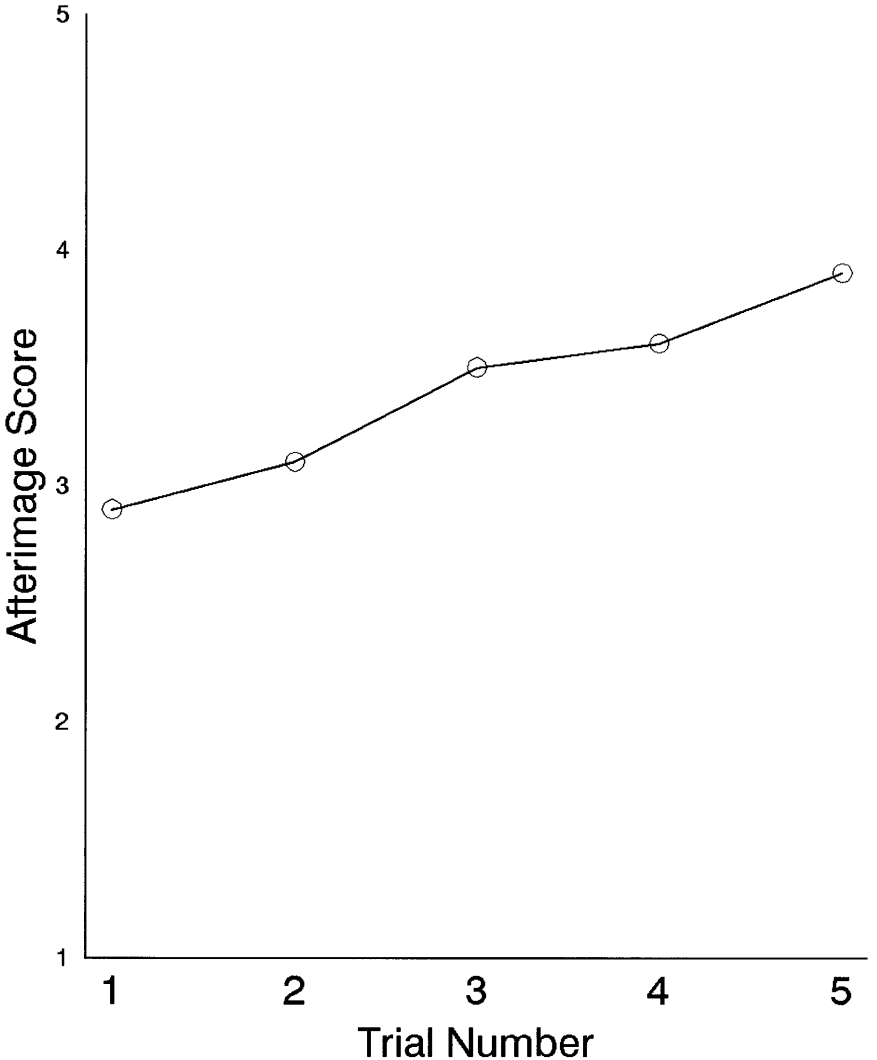

FIG. 1. Afterimage scores as a function of trial number for experiment 1.

phase I (pre-influence), the observed effect cannot be due to a gradual effect of influence.

EXPERIMENT 2

Subjects and Design

Twenty-four female undergraduate students were randomly allocated to a majority or minority influence condition. The standard afterimage paradigm was used with five trials per phase but with the following alterations. Groups of four individuals were tested at the same time. No false feedback concerning previous respondents was given. In the minority condition there was one confederate and

TABLE 2
MEAN AFTERIMAGE SCORES FOR EXPERIMENT 2

	Phases	
	Pre-influence	Post-influence I
Majority	4.05	4.28
	(1.49)	(1.76)
Minority	4.57	4.62
	(1.81)	(1.97)

Note. $n = 12$ per condition, higher scores represent afterimages nearer to the complementary color of green and therefore greater influence. Standard deviations in parentheses.

three naive subjects, while in the majority condition there were three confederates and one naive subject. The confederate(s) always responded first. The same confederate was used throughout the minority condition, while three confederates (chosen from a team of five) were used in the majority condition (which included the confederate used for the minority condition). Due to practical problems in the minority condition, where there were three naive subjects, it was not possible to arrange for them to be tested alone in phase four (post-influence II), and therefore this phase was omitted.

Results and Discussion

It was anticipated that having the majority physically present, rather than implied by false feedback, should increase conformity as shown by a greater number of green responses given by the naive subjects. Contrary to this expectation, there were no green responses in any of the phases for either the majority or minority conditions.

The afterimage scores were analyzed using a 2 condition (majority vs minority) $\times$ 2 phases (pre-influence vs post-influence) $\times$ 5 trial number ANOVA with repeated measures on the last two factors. Mean afterimage scores by condition and phases are given in Table 2. Consistent with the previous experiment, and again contradictory to Moscovici and Personnaz (1980), the main effects for condition, phase, and the interaction were all nonsignificant (all $F < 1$).

Consistent with experiment 1, there was a significant main effect for trial number, $F(4, 88) = 3.54$, $p < .01$, and trial number did not significantly interact with the other variables. This main effect is shown in Fig. 2. While the pattern of scores across the trials is similar to the previous experiment, the linear equation was not significant, $F(1, 118) = 1.73$.

ROLE OF SUBJECT SUSPICIOUSNESS IN EXPERIMENTS 1 AND 2

The accounts of the afterimage effect outlined in the Introduction explain the phenomenon by the process of increased attention to the slide. While the various explanations differ as to the cause of the increased attention, Sorrentino et al. (1980) claim that it is due to subject suspiciousness of the experiment. To test this, subjects in the first two experiments completed a post-experimental questionnaire concerning their perceptions of the study. A question asked if they had been

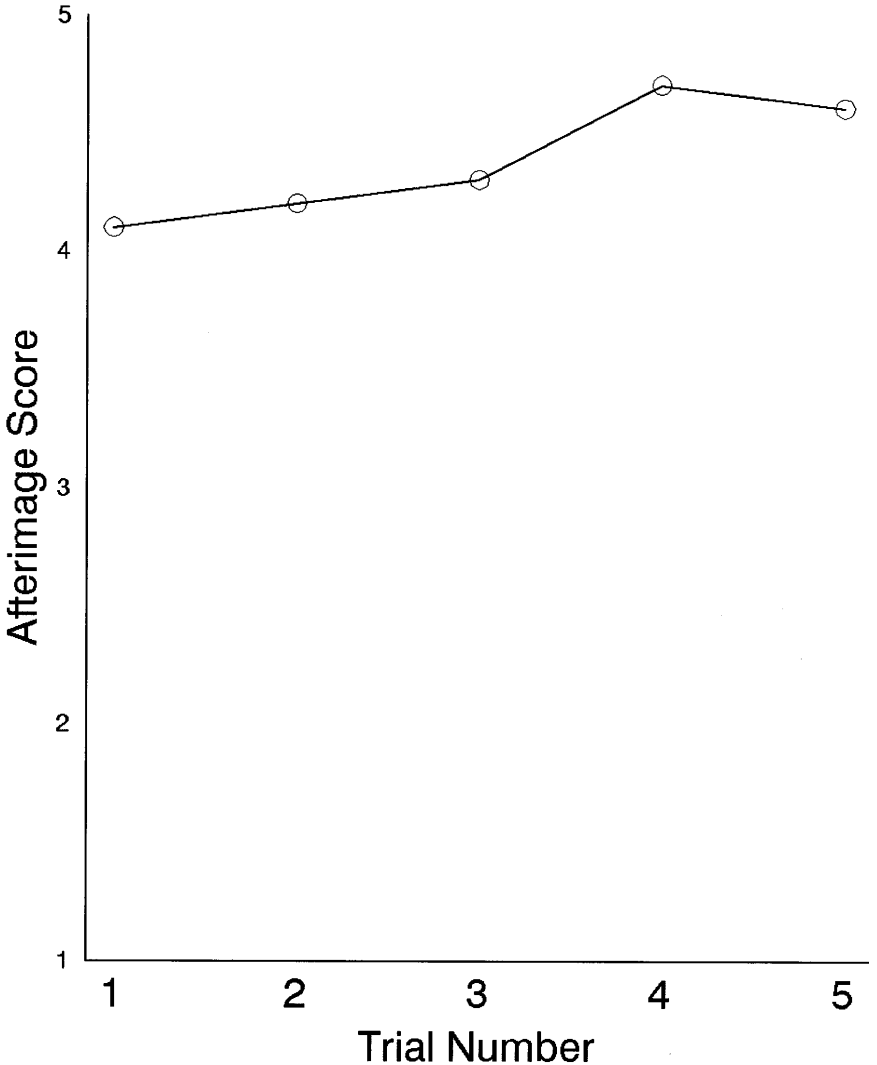

FIG. 2. Afterimage scores as a function of trial number for experiment 2.

suspicious of any aspect of the study, using a 5-point scale from 1 ''Not at all suspicious'' to 5 ''Highly suspicious.'' There was no difference in reported suspiciousness between subjects in the majority and minority conditions for either experiment 1 ($M = 3.42$ and $M = 2.83$, $t(22) = 0.92$) or experiment 2 ($M = 3.67$ and $M = 2.58$, $t(22) = 1.80$). On the basis of the suspiciousness responses, two groups of subjects were formed which were either low in suspiciousness (scored 1 or 2 on the scale, $n = 20$) or high in suspiciousness (scored 4 or 5 on scale, $n = 24$).

Afterimage scores were analyzed with a 2 experiment (first vs second) × 2 suspiciousness (low vs high) × 2 phase (pre-influence vs post-influence I) × 5 trial number ANOVA with repeated measures over the last two factors.[7] The main effect for experiment, $F(1, 40) = 3.62$, $p < .065$, showed that there was a tendency for subjects in the second experiment ($M = 4.26$) to give higher afterimage scores than those in the first experiment ($M = 3.29$). However, the effect of experiment was qualified by a significant interaction with level of suspiciousness, $F(1, 40) = 4.12$, $p < .05$. Consistent with Sorrentino et al., in the first study the high-suspicion subjects gave higher afterimage scores ($M = 4.11$) than did low-suspicion subjects ($M = 2.46$). There was no difference between low and high suspicious subjects in the second experiment ($M = 4.48$ and $M = 4.03$, respectively). The only other significant interaction concerned suspiciousness and trial number, $F(4, 160) = 3.21$, $p < .015$, and this is displayed in Fig. 3.

A number of points can be observed from Fig. 3. The scores for the low suspicious subjects remained constant across the trials, while those for the high suspicious subjects progressively increased. Analysis of simple main effects showed that the trial number effect for low suspicious subjects was nonsignificant, $F(4, 160) = 1.28$, while for the suspicious subjects it was highly significant, $F(4, 160) = 4.78$, $p < .001$. Furthermore, the pattern observed for the suspicious subjects follows a linear trend (linear equation; afterimage score = 3.173 + .279 (trial number), $F(1, 118) = 5.70$, $p < .02$). These results show that the trial number effect, across five trials, observed above occurs only for subjects who report suspiciousness concerning the study.

Findings from the above two experiments clearly indicate within-phase changes in afterimage scores for both a majority and a minority source. While these experiments have used materials and procedures similar to those used by Moscovici and Personnaz (1980), they differed in the number of trials per phase. These experiments used five trials in all four phases in order to facilitate comparisons, while the original study employed 5, 15, 15, and 5 trials per phase. Therefore, to determine whether the within-phase effect observed in the above experiments is found in a 15 trial phase a third experiment was conducted. Furthermore, a control condition was included (without a confederate) in the design to find out if the within-phase effect is a function of repeatedly viewing the slide, or instead, exposure to a counter-attitudinal response. Another distinctive feature of the third experiment is that the first phase (pre-influence) was omitted. Since all studies using the afterimage paradigm show no difference between conditions for pre-influence, such a phase is not required. Furthermore, it is possible that a pre-influence phase creates a norm of responding for subjects that inhibits perceptual change in later phases.

[7] It should be noted that the first two experiments were conducted by the same experimenter and the confederate used in the first study also served in the second (with additional confederates in the majority condition). Condition was not used as a factor because it had not been shown to be linked to influence in either experiment and there was no difference in subject suspiciousness between the conditions in either experiment.

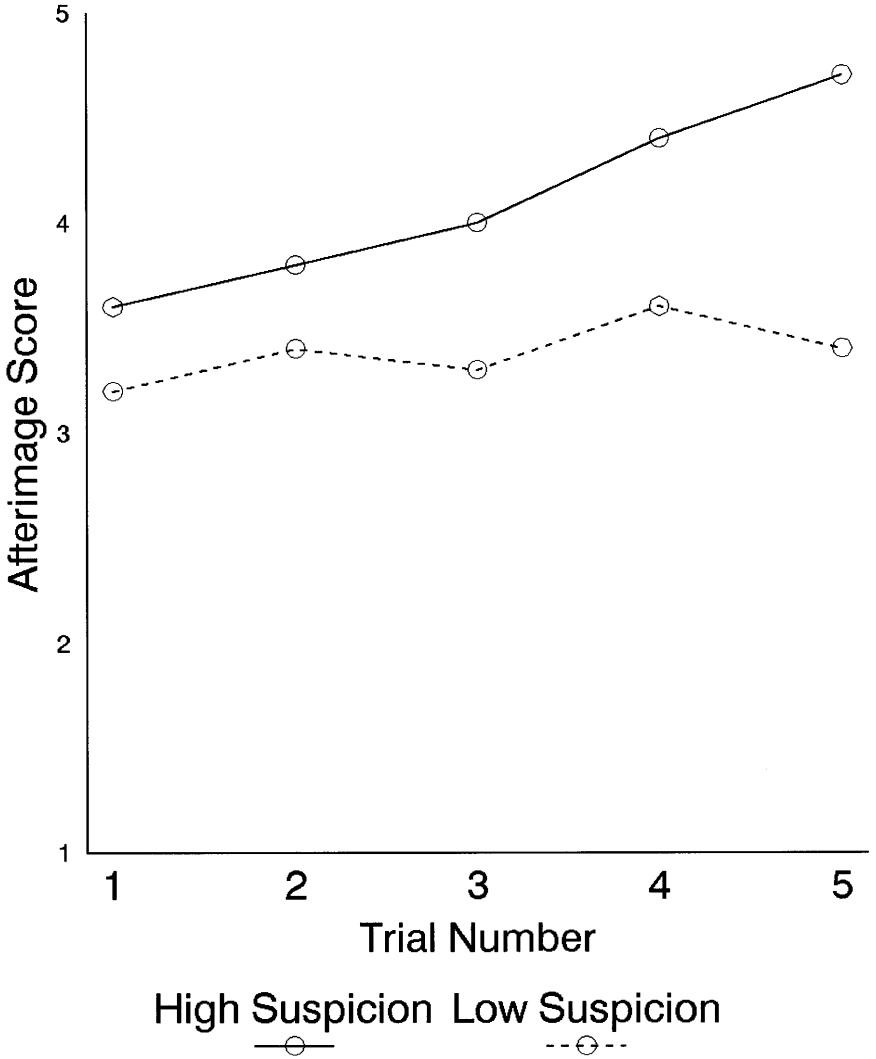

FIG. 3. Afterimage scores as a function of subject suspicion and trial number for experiments 1 and 2.

EXPERIMENT 3

Subjects and Design

Thirty-six female undergraduate students served as subjects and were randomly assigned to three conditions; majority influence, minority influence, and control. The study used the afterimage paradigm with one confederate representing a majority or minority (via false feedback). The same confederate was used throughout the experiment. The main differences from the previous experiments were, first, the initial phase (pre-influence) was omitted; second, there were 15 trials in the influence phase; third, the number of trials in the third phase (post-influence I: confederate present) was 15 to be

TABLE 3
MEAN AFTERIMAGE SCORES FOR EXPERIMENT 3

	Phases	
	Post-influence I	Post-influence II
Majority	3.62	3.50
	(2.29)	(2.53)
Minority	2.78	3.02
	(1.78)	(2.76)
Control	4.65	3.98
	(2.21)	(2.26)

Note. $n = 12$ per condition, higher scores represent afterimages nearer to the complementary color of green and therefore greater influence. Standard deviations in parentheses.

the same as the Moscovici and Personnaz (1980) study; and fourth, a no-influence control condition was included which contained two naive subjects.

Results and Discussion

Only one subject responded green in any of the phases. The subject, who was in the majority condition, called the slide ''green'' twice (out of five trials) in the first phase (public influence phase), eight (out of 15 trials) in post-influence I, and four (out of five trials) in post-influence II. The afterimage scores were analyzed using a 3 condition (majority vs minority vs control) $\times$ 2 phase (post-influence I vs post-influence II) ANOVA with the last factor being repeated-measures. Mean afterimage scores by condition and phase are given in Table 3.

The results show that the main effects for condition, $F(2, 33) = 1.33$, and phase, $F(1, 33) < 1$, and the two-way interaction, $F(2, 33) < 1$, were all nonsignificant. The within-phase effect was examined for the 15 trials in the post-influence I phase by a 3 condition (majority vs minority vs control) $\times$ 15 trial number ANOVA with the last factor being repeated-measures. The condition main effect and two way-interaction were both nonsignificant, $F(2, 33) = 2.38$ and $F(28, 462) < 1$, respectively. However, there was a significant main effect for trial number, $F(14, 462) = 2.96$, $p < .001$, which is shown in Fig. 4.

As can be seen from Fig. 4, the scores progressively shifted toward the afterimage of green over the 15 trials. The trend is linear (linear equation; afterimage = 3.04 + .08 (trial), $F(1, 538) = 9.73$, $p < .002$). Furthermore, as expected there was a significant difference between the first five and last 10 trials ($M = 3.26$ and $M = 3.89$, $t = 3.26$, $p < .003$). This shows that a 15 trial phase would have a higher mean afterimage score ($M = 3.68$) than a five trial phase ($M = 3.26$). Analysis of the afterimage scores in the fourth phase (post influence II: confederate absent) showed nonsignificant main effects for condition, $F(2, 33) < 1$, and trial number, $F(4, 132) = 1.89$, and a nonsignificant two-way interaction, $F(8, 132) < 1$.

In summary, this experiment replicates the findings of the first two experiments

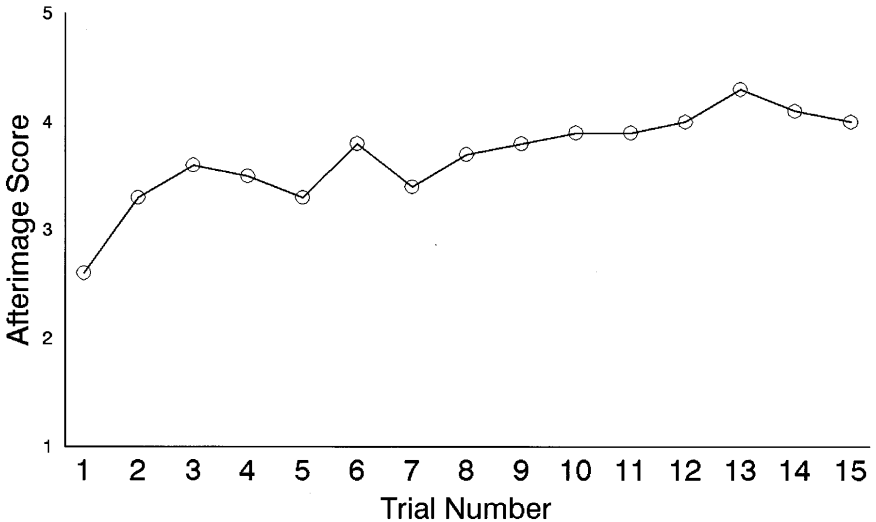

FIG. 4. Afterimage scores as a function of trial number for experiment 3.

by showing no afterimage difference between the source conditions. The within-phase effect which was found in a five trial phase is seen to continue for a 15 trial phase, supporting the view that greater afterimage change is likely in situations where there are more post- than pre-influence trials. This hypothesis, together with the role of subject suspiciousness (which was not measured in this experiment), is examined in experiment 4.

EXPERIMENT 4

Subjects and Design

Forty-eight female undergraduate students served as subjects, and they were randomly assigned to three conditions; majority influence, minority influence, and a no-influence control. The study used the afterimage paradigm, with the same female confederate representing a majority or minority (via false feedback) throughout the experiment. The experimental design paralleled that of experiment 3 except that a pre-influence phase was included. Thus, the study directly replicated the Moscovici and Personnaz (1980) study with 5, 15, 15, and 5 trials per phase.

Results and Discussion

None of the subjects gave a green response to the slide either publicly or privately. The mean afterimage scores were analyzed by a 3 condition (majority vs minority vs control) $\times$ 3 phase (pre-influence I vs post-influence I vs post-influence II) ANOVA with the last factor being repeated-measures. Mean afterimage scores are given in Table 4.

The analyses showed a nonsignificant main effect for condition, $F(2, 45) = 1.96$, and a nonsignificant two-way interaction, $F(4, 90) = 1.14$. However, there was a significant phase effect, $F(2, 90) = 3.38$, $p < .04$. The Tukey HSD comparison of means procedure showed that afterimage scores moved toward the

TABLE 4
MEAN AFTERIMAGE SCORES FOR EXPERIMENT 4

	Phases		
	Pre-influence	Post- influence I	Post- influence II
Majority	4.25	5.00	4.93
	(1.59)	(2.00)	(2.26)
Minority	4.34	4.70	4.54
	(1.09)	(1.65)	(1.16)
Control	3.71	4.04	3.45
	(1.57)	(1.78)	(1.62)

Note. $n = 16$ per condition, higher scores represent afterimages nearer to the complementary color of green and therefore greater influence. Standard deviations in parentheses.

complementary color of green between pre-influence and post-influence I (confederate present), $p < .05$, and that there was not a significant difference between pre-influence and post-influence II (confederate absent) and between post-influence I and post-influence II.

To test the hypothesis that afterimage shifts are greater with more trials in the post-influence phase compared to the pre-influence phase, a series of planned comparisons was conducted. To facilitate comparisons with the five trials in the pre-influence phase, three scores were computed from the 15 trial post-influence I phase which represents increasing numbers of trials; (a) first five trials, (b) first 10 trials, and (c) all 15 trials. To satisfy the above hypothesis, then the difference between the pre-influence phase (five trials) and first post-influence category (five trials) should be smaller than the difference between the pre-influence phase and the longer post-influence categories (b & c). Furthermore, the difference should be largest when comparing the pre-influence phase with the 15 trial post-influence phase. The comparisons support the hypothesis. The difference between the pre-influence ($M = 4.10$) and first post-influence category (first five trials, $M = 4.43$) was nonsignificant, $F(1, 47) < 1$. The difference between pre-influence phase and the second category (first 10 trials, $M = 4.46$) was also nonsignificant, $F(1, 47) = 2.34$. However, the difference between the pre-influence phase and the post-influence category (all 15 trials, $M = 4.58$) was significant, $F(1, 47) = 6.33$, $p < .015$. Thus comparing the five trial pre-influence score with the first five trials of post-influence shows no significant difference and is consistent with the first two experiments. However, comparing the pre-influence phase with a post-influence phase with many more trials shows a significant difference.

The within-phase effect was examined for the 15 trials in post-influence I by a 3 condition (majority vs minority vs control) $\times$ 15 trial number ANOVA with the last factor being repeated-measures. The condition and trial main effects were both nonsignificant, $F(2, 45) = 1.18$ and $F(14, 630) = 1.12$, respectively. However, there was a significant two-way interaction, $F(28, 630) = 1.60$, $p < .03$,

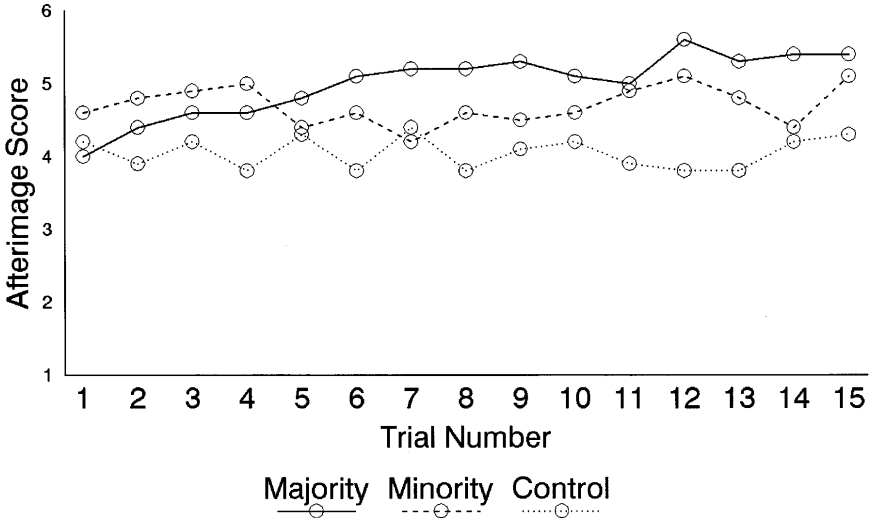

FIG. 5. Afterimage scores as a function of source and trial number for experiment 4.

which is shown in Fig. 5. As can be seen from this figure, there appears to be an increasing trend occurring for the majority condition and not for the other two conditions. Analysis of simple effects shows that this trend was significant for the majority condition, $F(14, 630) = 2.69$, $p < .001$, but not for the minority and control conditions, both $F(14, 630) = <1$. Trend analyses showed that the pattern observed in the majority condition was linear (linear equation; afterimage score = 4.229 + .093 (trial number), $F(1, 238) = 7.83$, $p < .006$).

Subjects reported their level of suspiciousness with the study on a 7-point scale at the end of the study. A one way ANOVA across conditions showed a significant condition difference, $F(2, 45) = 5.97$, $p < .005$. Subjects in the majority ($M = 4.63$) and minority ($M = 3.87$) conditions were more suspicious than those in the control condition ($M = 2.56$) [$t(45) = 3.41$, $p < .001$ and $t(45) = 2.17$, $p < .035$, respectively]. There was no difference in reported suspiciousness between the majority and minority conditions [$t(45) = 1.24$]. On the basis of these responses, subjects were categorized as being either low suspicious (scoring 1 or 2, $n = 19$) or highly suspicious (scoring 5, 6, or 7, $n = 27$) on the scale.[8] The afterimage scores in the post-influence phase were analyzed with a 2 suspicious (low vs high) × 15 trial number ANOVA with the last factor being repeated-measures. The main effect for the suspicion factor was nonsignificant, $F(1, 31) =$

[8] Since subjects in the influence conditions reported higher suspiciousness than those in the control condition, most of the majority/minority condition subjects are in the highly suspicious group while most of the control condition subjects are in the low suspicious group. However, additional analyses show nonsignificant main effect for condition, $F(2, 35) = 1.02$, nonsignificant interactions between condition and suspiciousness, $F(2, 35) < 1$, and condition and trial number, $F(28, 490) = 1.22$, and finally a nonsignificant three-way interaction, $F(28, 490) < 1$.

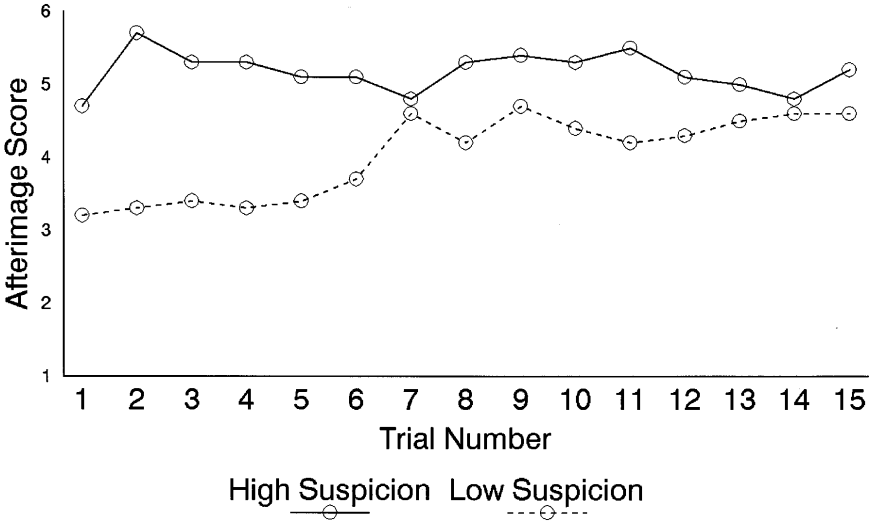

FIG. 6. Afterimage scores as a function of subject suspicion and trial number for experiment 4.

2.0. The trial number factor was significant, $F(14, 546) = 1.97$, $p < .02$, and so was the two-way interaction, $F(14, 546) = 2.03$, $p < .015$. The interaction is shown in Fig. 6.

As can be seen from the figure, the scores for the highly suspicious subjects were higher than those of the low suspicious subjects. Furthermore, the trend across the trials for the highly suspicious subjects was constant, while an increasing trend occurred for the low suspicious subjects. Analysis of the simple interaction effects shows that the trend for the low suspicious subjects to be significant, $F(14, 546) = 2.81$, $p < .001$, but nonsignificant for the highly suspicious group, $F(14, 546) < 1$. The trend for low suspicious subjects follows a linear pattern (linear equation; afterimage score = 3.23 + .102 (trial number), $F(1, 208) = 9.43$, $p < .003$). This experiment replicates experiments 1 and 2 and extends them to show that, in a 15 trial phase, low suspicious subjects' afterimage scores progressively rise to reach a level similar to that of highly suspicious subjects.

The four experiments so far have been consistent in their findings, especially with respect to the effects of trial number. However, few significant effects have been found for source condition. Experience of conducting the studies, coupled with post-experimental interviews, suggests that subjects pay little attention to the source manipulation, although this was presented in the same manner as the original study. To ensure that subjects processed the source manipulation, a fifth study was conducted with both source conditions, where subjects were asked to remember the source feedback as they would be tested on this at the end of the study.

TABLE 5
MEAN AFTERIMAGE SCORES FOR EXPERIMENT 5

	Phases		
	Pre-influence	Post- influence I	Post- Influence II
Majority	4.38	5.28	4.98
	(1.46)	(1.21)	(1.57)
Minority	3.23	4.07	4.28
	(1.86)	(1.71)	(1.69)

Note. $n = 16$ per condition, higher scores represent afterimages nearer to the complementary color of green and therefore greater influence. Standard deviations in parentheses.

EXPERIMENT 5

Subjects and Design

Thirty-two female undergraduate students served as subjects, and they were randomly assigned to two conditions: majority or minority influence. The study used the afterimage paradigm, with the same female confederate representing a majority or minority (via false feedback) throughout the experiment. The experimental design paralleled that of experiment 4 except that when subjects were given the false feedback (source manipulation) at the start of the second phase, they were informed that they had to remember the feedback information as they would be required to recall this at the end of the study. Thus, the study replicated Moscovici and Personnaz's (1980) study with respect to the number of trials per phase, that is, 5, 15, 15, and 5.

Results and Discussion

All the subjects correctly recalled the source manipulation at the end of the study. None of the subjects gave a green response either publicly (respond aloud) or privately (pre-influence I, post-influence I, or post-influence II). The mean afterimage scores were analyzed by a 3 condition (majority vs minority vs control) $\times$ 3 phase (pre-influence vs post-influence I vs post-influence II) ANOVA with the last factor being repeated-measures. Mean afterimage scores are given in Table 5.

There was a significant main effect for condition, $F(1, 30) = 4.18$, $p < .05$, showing that subjects in the majority condition ($M = 4.88$) gave higher afterimage scores than those in the minority condition ($M = 3.86$). There was also a significant main effect for phase, $F(2, 60) = 9.83$, $p < .001$. Tukey HSD procedure shows that afterimage scores in the post influence I phase ($M = 4.68$) were significantly higher than those in the pre-influence phase ($M = 3.81$) ($p < .05$). None of the other contrasts were significant. These results replicate those by Doms and Van Avermaet (1980) in that both a majority and minority source resulted in subjects shifting their afterimage scores towards the complementary color of green.

To test whether the observed afterimage shifts were due to a greater number of trials in the post-influence phase, a series of planned comparisons was conducted which were identical to those done for experiment 4. Three scores were computed

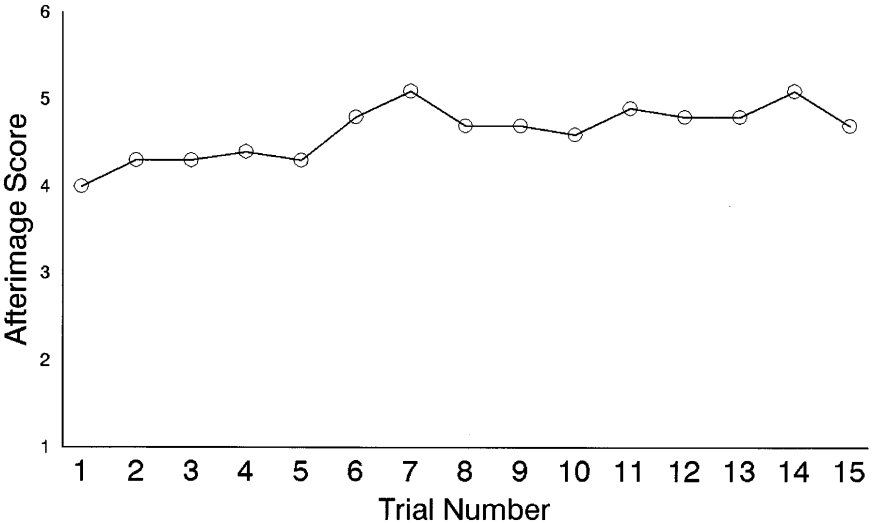

FIG. 7. Afterimage scores as a function of trial number for experiment 5.

from the 15 trial post-influence I phase which represents increasing numbers of trials: (a) first five trials, (b) first 10 trials, and (c) all 15 trials. In contrast to experiment 4, there was a significant difference between the pre-influence phase ($M = 3.81$) and the first category of five trials ($M = 4.33$), $F(1, 31) = 8.48$, $p < .007$. This shows that there were significant afterimage shifts when comparing a post-influence phase with a pre-influence phase consisting of equal number of trials. However, there was also a significant difference between the pre-influence phase and the second post-influence category (first 10 trials, $M = 4.57$), $F(1, 31) = 7.61$, $p < .001$, and the total post-influence phase (all 15 trials, $M = 4.68$), $F(1, 31) = 15.63$, $p < .001$. It is interesting that the mean afterimage shift using the total 15 trial post-influence phase is statistically greater than that using the first five trials of post-influence. Indeed, the difference between the 15 trial post-influence phase and pre-influence phase is statistically larger than the difference among the first five trials of post-influence and pre-influence ($t(31) = 2.66$, $p < .02$). While afterimage shifts were observed for a post-influence phase with equal number of trials with the pre-influence phase, significantly larger afterimage shifts were observed with a post-influence phase with more trials compared to the pre-influence phase.

The next stage was to examine the trial number effect in the post-influence I phase by a 2 condition (majority vs minority) $\times$ 15 trial number ANOVA with the last factor being repeated-measures. The condition main effect was significant showing subjects in the majority condition had a higher afterimage score ($M = 5.28$) than those in the minority condition ($M = 4.07$), $F(1, 30) = 5.41$, $p < .03$. Consistent with previous experiments, there is a significant trial number effect, $F(14, 420) = 2.72$, $p < .001$ (see Fig. 7). The trial number effect did not

interact with source condition, $F(14, 420) = 1.09$. Trend analyses showed that the linear equation was significant showing that there was a gradual shift in afterimage judgments toward the complementary of green (linear equation; afterimage score = 4.252 + 0.053 (trial number), $F(1, 478) = 7.47$, $p < .007$).

In experiment 4 there was an interaction between subject suspiciousness and trial number. In this experiment, subjects were asked to rate how suspicious they were of the survey results they had read (the source manipulation). This aspect was chosen because it was mentioned as the most suspicious aspect of the study by subjects in the previous experiments. Subjects rated their level of suspiciousness on a 7-point scale. Comparison of the suspiciousness ratings and source condition revealed an interesting pattern. A χ^2 test of condition by suspiciousness ratings was highly significant ($\chi^2(5) = 25.67$, $p < .0001$). Of the 16 subjects reporting low suspiciousness (rating 1 or 2), 15 subjects were in the minority condition. On the other hand, of the 13 subjects who reported the source manipulation as being highly suspicious (rating 6 or 7), all were in the majority condition. Thus, the most suspicious subjects were in the majority condition. Since the slide is seen as blue by all the subjects, this result is not surprising—convincing subjects that over 82% of people see a blue slide as green, as in the majority condition, is difficult to achieve without raising some level of suspicion!

Afterimage scores were examined by a 2 suspiciousness (low vs high) $\times$ 15 trial number ANOVA with the last factor being repeated-measures. There was a highly significant suspiciousness main effect, $F(1, 25) = 9.62$, $p < .005$, showing that highly suspicious ($M = 5.41$) subjects had higher afterimage scores than low suspicious subjects ($M = 3.78$). There was also a main effect for trial number, $F(14, 350) = 2.20$, $p < .007$, and consistent with experiment 4 a significant two-way interaction, $F(14, 350) = 1.79$, $p < .05$. The two-way interaction is shown in Fig. 8. Analysis of simple interaction effects shows that the trend for high suspicious subjects was nonsignificant, $F(14, 350) = 1.69$, while for low suspicious subjects it was significant, $F(14, 350) = 2.39$, $p < .003$. The trend for the low suspicious subjects was linear (linear equation; afterimage score = 4.147 + 0.053 (trial number), $F(1, 238) = 3.71$, $p < .05$). This pattern is very similar to experiment 4 showing highly suspicious subjects have higher afterimage scores than low suspicious subjects and that the trend for the low suspicious subjects shows an increasing shift across the trials.

GENERAL DISCUSSION

The aim of these experiments was to attempt to replicate the Moscovici and Personnaz (1980) study which reported that minorities are able to produce a perceptual conversion. Moscovici and Personnaz interpreted the results as supporting their dual process model of majority and minority influence. Perceptual conversion, they claim, is due to the fact that a minority source induces subjects to cognitively evaluate the minority's response in order to see if there is any truth its position. As a result of this validation process subjects begin to see as the minority sees. Alternative explanations for these results rely upon the belief that increased

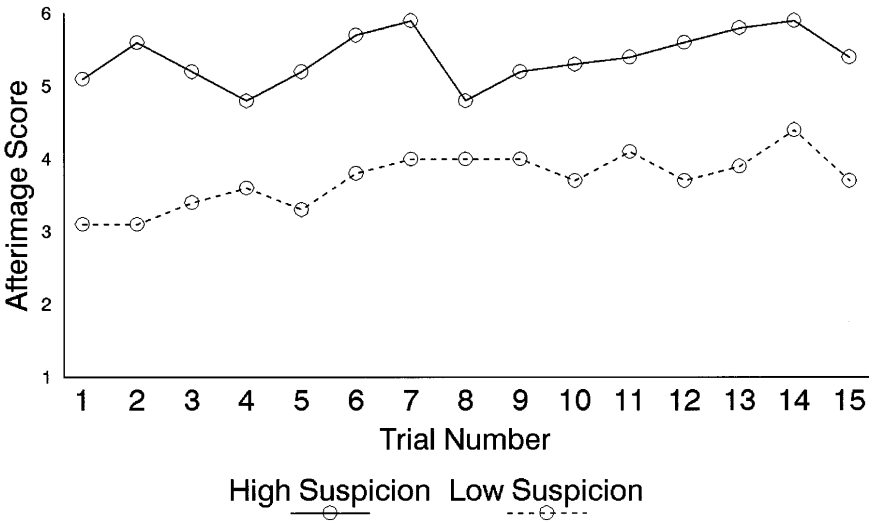

FIG. 8. Afterimage scores as a function of subject suspicion and trial number for experiment 5.

attention to the slide results in perceiving the green hues contained in it and therefore perceiving afterimages which are the complementary color of green. The trigger for the increased attention has been suggested to be a deviant minority (Moscovici & Personnaz, 1980), a deviant majority (Mackie, 1987), any deviant response (Doms & Van Avermaet, 1980), or subject's suspiciousness (Sorrentino et al., 1980). The pattern of results predicted from these four explanations differ such that afterimage shifts should occur for a minority only (Moscovici & Personnaz), majority only (Mackie), any deviant response irrespective of nature of source (Doms & Van Avermaet), or for subjects who are suspicious (Sorrentino et al.).

The results of these experiments in relation to the afterimage scores can be summarized. In the first two experiments which had the *same* number of pre- and post-influence trials, no afterimage shifts were found for either source (majority/minority). In experiment 3, where the pre-influence phase was omitted, there was no difference between the majority and minority conditions on post-influence scores. In experiments 4 and 5, which had *more* trials post- than pre-influence, significant afterimage shifts were found for each source of influence. In terms of the above hypotheses no evidence is found to confirm the hypotheses of Moscovici and Personnaz or Mackie. However, in the experiments which directly replicate the original study (4 and 5) afterimage shifts are found for both a majority and minority which is consistent with the Doms and Van Avermaet view that shifts are more likely when confronted with a deviant response.[9]

[9] Interestingly, in experiment 4 the main effect for phase does not significantly interact with source condition suggesting a phase effect also for the control condition. Inspection of means, however,

The inconsistency between the experiments, and those of other researchers, suggests underlying processes may be able to account for these differences. Following from earlier work (Martin, 1995), the afterimage scores were examined within each phase, which had previously not been analyzed (researchers preferring to examine mean phase scores). The Moscovici and Personnaz study had 5, 15, 15, and 5 trials for phases 1 to 4, respectively, while experiments 1 and 2 in this paper used five trials in all four phases. All the experiments showed a significant within-phase trend showing that afterimage scores progressively moved toward the complementary color of green. Trend analyses consistently showed the relationship to be linear, which suggests that the within-phase effect observed in a five trial phase persists so that the mean score for a 15 trial phase is greater than that for a five trial phase. The within-phase effect explains why no afterimage shifts were found when comparing pre- and post-influence phases with equal number of trials (experiments 1 and 2), but afterimage shifts were observed when there were more post- than pre-influence trials (experiments 4 and 5).

This assumption was further examined in experiments 3, 4, and 5 which each had a 15 trial post-influence phase. In each of these experiments there was a significant trial order effect for the 15 trial phase which was similar to that observed in a five trial phase. This trend was linear showing that afterimage scores increased as a function of trial number. Moreover, in each experiment a 15 trial phase led to a higher afterimage mean than a five trial phase. The strongest test of the above hypothesis was made possible in experiments 4 and 5, which directly replicated the original Moscovici and Personnaz study by having more trials (15) post- than pre-influence (5). If the proposed explanation is correct, then afterimage shifts should occur for each source condition when a pre-influence mean of five trials is compared with a post-influence mean of 15 trials but not with a post-influence mean of the first five trials. The results for experiment 4 fully supported this view. For experiment 5, there were significant afterimage shifts when the pre-influence phase was compared with the first five trials of post-influence. However, afterimage shifts were significantly greater when the pre-influence phase was compared with the entire 15 trial post-influence phase. This is consistent with the view that afterimage shifts are more likely in situations where there are more trials in the post-influence phase than the pre-influence phase. Experiment 5 was the only experiment to find significant afterimage shifts when phases of equal number of trials were compared. The most likely explanation for this is that in Experiment 5 subjects were asked to remember the source

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shows that the difference in the control condition is small. It could be argued that if a within-phase trend occurs in the control condition, one should find an afterimage shift. While in experiment 3 there was no source condition by trial interaction, examining the control condition alone showed a nonsignificant effect, $F(14, 462) = 1.26$, nor for the control condition in experiment 4 (see Fig. 5). Furthermore, Martin (1995), using a pure blue slide, did not find a within-phase effect in a no-influence control condition but did for the influence conditions. Thus a within-phase effect tends to be weak under control conditions.

information and this makes more salient the deviancy of the source which could lead to more attention being directed to the task.

Many possible explanations can be given for this within-phase trend, and a potential explanation may be a process of perceptual adaptation as a result of methodological factors. Between phases, when experimental instructions are given, participants' gaze is focused away from the stimulus material, and their eyes become adapted to the surroundings (which were darker in order to facilitate afterimages). When each phase begins, the subjects are exposed to a much brighter stimulus (the blue slide), and their eyes become perceptually bleached resulting in the perception of lighter afterimages. With a blue stimulus, lighter afterimages correspond to the yellow end of the continuum. Over successive slide presentations, as the eyes accommodate, subjects perceive progressively darker afterimages. Although a perceptual adaptation explanation would explain the observed pattern of results, further empirical research is needed to support such an explanation.

While afterimage shifts maybe linked to the number of trials within the phases, this cannot be a full explanation for two main reasons. First, if this were true then it would be reasonable to argue that the afterimage shifts should occur equally for a majority and a minority source, which did not occur in the original experiment. Second, if the number of trials was the only criterion for afterimage shifts, then it should occur in a no-influence condition, that is, without exposure to a deviant response. In every study which has used a no-influence control condition, none has found afterimage scores to change over the phases (see footnote 9). To explain this difference it is necessary to examine the trial order effect in relation to subject suspiciousness of the study. According to Sorrentino et al. (1980) subjects who are suspicious about the study pay greater attention to all aspects of the experiment, including the slide, and thus are more likely to perceive the green hues in the slide. In all four of the experiments which measured subject suspiciousness (experiments 1 and 2 combined, 4, and 5), there was a significant relationship between subject suspiciousness and trial number. Consistent with Sorrentino et al. (1980), highly suspicious subjects gave higher afterimage scores than those low in suspiciousness. In experiments 1 and 2, which had five trials per phase, low suspicious subjects showed little change within the phase while highly suspicious subjects showed an increasing trend, i.e., afterimage scores increasing over the trials toward the complementary color of green. When examining a 15 trial phase, as in experiments 3, 4, and 5, again highly suspicious subjects gave higher afterimage scores than low suspicious subjects. However, the pattern across the trials for highly suspicious subjects is consistent while for low suspicious subjects it rises in a linear fashion. Therefore, subjects who are suspicious are more likely to show greater afterimage shifts than those low in suspiciousness.

Two inter-related processes can be identified which might help to explain afterimage shifts. First, the within-phase effect and second the role of subject suspiciousness. In experiments which have more post- than pre-influence trials, the paradigm is biased toward finding afterimage shifts. This is most likely to

occur when the experiment evokes suspicion in the subjects, such as through a deviant response rather than in a no-influence control condition. If one departs from Moscovici's perspective then a minority should be perceived as being more deviant than a majority and consequently a minority source would be more likely to evoke suspicion and therefore conversion (note that Mackie, 1987, predicts the opposite, namely that a differing majority leads to more suspicion). Of course, subjects' levels of suspiciousness can be triggered by factors other than the nature of the source and these contextual factors may have a more powerful impact than does the source manipulation. In situations where there are equal pre- and post-influence trials the paradigm is unlikely to show conversion unless experimental conditions evoke particularly strong levels of suspicion compared to other conditions. A prediction that follows from this, is that it should be possible to obtain significant afterimage shifts by simply manipulating subject suspiciousness independently of source.

The studies reported in this paper have failed to replicate the claim that minorities are able to produce a perceptual conversion. The data do not support either the Moscovici and Personnaz or Mackie hypotheses. The results offer support for an explanation based upon the integration of a within-phase effect and subject suspiciousness. Therefore, it maybe possible to explain the afterimage findings with a number of methodological effects without recourse to the notion of a genuine changing of perception.

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