Conditioned adaptation to prismatic displacement*

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Adaptation to prismatic displacement was conditioned to the wearing of a pair of goggles in 240 min of training by employing Taylor's alternation training technique. The alternation was between training exposures with both the prism and the goggles presented to S and with both absent. After the training, both the pointing to a visual target test and the pointing straight ahead test measured more adaptation and more aftereffects of adaptation when the goggles were worn than when they were not worn during testing. Analysis of the results revealed that a proprioceptive adaptation effect and possibly an oculomotor adaptation effect had been conditioned.

When an optical device tilts, distorts, or displaces the viewer's visual field it initially causes errors in localization responses (effect). These errors decrease in magnitude (adaptation effect) after some appropriate practice by S. The adaptation-effect measures are in turn taken to reflect an underlying psychological compensation (adaptation) to the optical disarrangement. Responses then made with the removal of the device exhibit an error in the direction opposite to the effect (aftereffect).

For some time, aftereffects were assumed to be conservative estimates of adaptation effects and as an equally valid indicator of adaptation, because, in the early studies which measured both, the magnitude of the former so nearly agreed with the magnitude of the latter (Rock, 1966). Recently, this supposition has been severely challenged (Freedman, 1968), partly as a result of the work of Taylor (1962), who obtained large adaptation effects and small aftereffects. One possible critical difference between early work and Taylor's lay in the fact that the former studies employed short-term and continuous training exposure to the optical device, whereas the latter employed long-term and discontinuous training exposure. Continuous exposure consists of uninterrupted viewing through the optical device; discontinuous exposure consists of two alternating training conditions, one with normal vision and the other with vision modified by the device.

To date, two alternation techniques have been developed. In one (I. Kohler, 1964), the S is exposed to a split visual field by having an optical device, prism, in the upper half and unobstructed normal viewing in the lower. Here the alternation is produced and solely dependent upon a behavior of S, namely S's changing the direction of his gaze. In the other technique (Taylor, 1962), the alternation of the training conditions depends upon the intervention of E, who places on S the optical device and later removes it. Taylor produced differential conditioned adaptations by systematically covarying other afferent processes with the training exposure conditions, specifically the sensations produced by the wearing of the spectacles which housed the optical device. Presumably the adaptation effect had become conditionally associated to wearing the spectacles, and normal vision to their absence. Thus, large adaptation effects were obtained when S wore the spectacles, but little or no aftereffect when they were removed.

With this procedure, Taylor conditioned the adaptation effect to right-left reversal and to the prismatically produced slant of horizontal surfaces. However, in the attempt to produce conditioned adaptation to prismatic displacement, the effects were not obtained, despite some 8 days of training.

In addition, other investigators (Foley & Abel, 1967; Foley, 1967) failed to employ Taylor's alternation technique successfully and to remedy the shortcomings of his studies: i.e., (1) the small N (one); (2) the inordinate amount of time needed to produce the effects (several days); and (3) a lack of objectively measured effects, the reported data being largely phenomenological. Thus, most of the experiments utilizing this technique were unsuccessful. However, due to the important implications that follow from the demonstration of differential conditioned adaptation, it seemed worthwhile to attempt to demonstrate such effects while at the same time addressing the above problems.

The present study is such a demonstration. Specifically, in 240 min of training, the adaptation to prismatic displacement was conditioned to the wearing of a pair of welder's goggles by use of Taylor's differential conditioning procedure.

EXPERIMENT

Apparatus

The displacement of the visual field was produced by a 20-diopter wedge prism which was mounted, base left, in the right frame of a pair of welder's goggles.[1] The left eye of S was occluded at all times by an eye patch. A second pair of welder's goggles had an optically plain piece of glass in its right frame.

The testing apparatus was a 60-in.-long x 26-in.-deep vertically adjustable horizontal platform which, when raied to shoulder level, allowed S to extend his arm underneath it easily. On the platform's near edge, a biteboard apparatus was fixed. On the far side of the platform was a 40-in.-wide x 30-in.-high panel perpendicular to S's line of regard. The pointing test target was a vertically oriented bar 2¼ x ¼ in. It was visible 7 deg to the right of S's midline through an eye-level 30-in.-long horizontal slit in the rear panel. The rear panel and the remainder of the apparatus were painted light gray. A meter stick permitted determination by E of S's pointing responses.

Responses

Two different manual localization tests were employed to measure the effects of training. Both involved having S stand biting the biteboard, extending his right arm under the platform and pointing with his right index finger. At the testing apparatus, S had his eyes closed at all times, except when making a pointing response. A pointing response consisted of having S open his eyes and point under the platform at the apparent location of the target. The testing platform prevented any visual feedback regarding the accuracy of his response. The pointing test (Ptg) measure was the mean of two pointing responses. The straight-ahead test (SA) measure was the mean of two responses in which S pointed, with his eyes closed, "straight ahead."

Test Conditions

These tests were performed in three testing situations: (1) (wG/wP) S wore the goggles (wG) with the prism (wP), (2) (nG/nP) S did not wear the goggles (nG) or the prism (nP), and (3) (wG/nP) S wore goggles with plain glass.

Experimental Design

Forty-eight undergraduates drawn from Howard University introductory psychology courses served as paid

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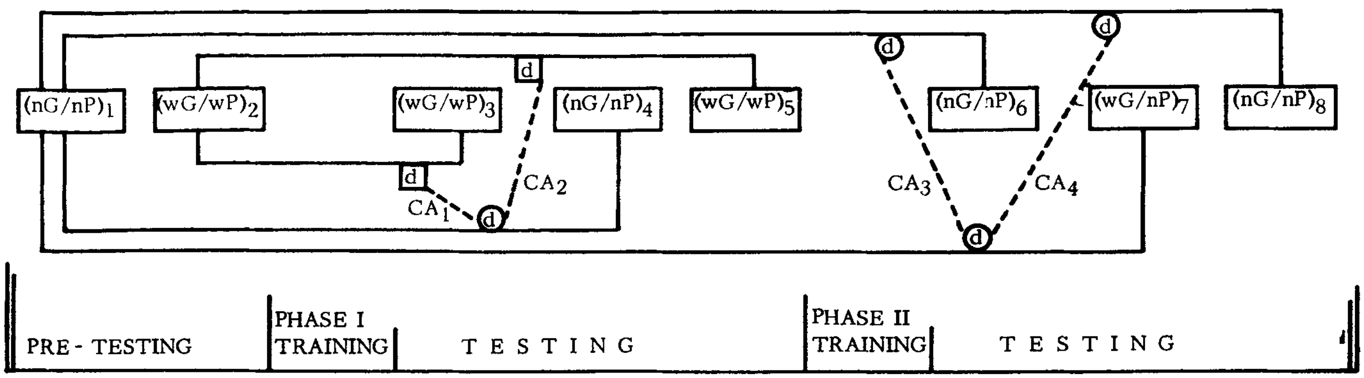

Fig. 1. Test condition sequence of the experimental group (EG). The solid lines represent differences between pre- and posttraining test conditions which result in the measurement of adaptation effects [d] and aftereffects (d). Dashed lines connecting d symbols represent differences between wG and nG effects and result in the measurement of conditioned adaptation effects (CA_1, etc.).

voluntary Ss. They were divided into three groups—an experimental group of 24 Ss and two control groups of 12 Ss each.

Each of these groups participated in the same five successive segments of the experiment: pretesting, Phase I training, posttest, Phase II training, and posttest. For the experimental group (EG), Fig. 1 depicts the manner in which the three types of test situations were distributed among the three testing segments of the experiment so as to produce a total of eight separate testing conditions. The subscripted numbers affixed to each test condition indicate its order of occurrence. Each S in the EG went through the following sequence. First was the pretesting, which involved two test conditions, $(nG/nP)_1$ and $(wG/wP)_2$. The S then received Phase I training, which was followed by Phase I posttesting. The Phase I posttesting had three test conditions, which were $(wG/wP)_3$, $(nG/nP)_4$, and $(wG/wP)_5$. This was followed by Phase II training and in turn by Phase II posttesting. Phase II posttesting also had three test conditions; they were $(nG/nP)_6$, $(wG/nP)_7$, and $(nG/nP)_8$. One of the control groups (C_I) was tested in the same way as EG, but differed from EG in its training. The second control (C_{II}) had the same wG and nG testing sequence as EG and C_I, but never had any wP testing.

The effects of training were determined by obtaining the difference between the pre- and posttraining measures of a given test in a given test situation. These differences (represented in Fig. 1 by solid lines connecting the pretest conditions to the Phase I and II posttest conditions) result in measures of adaptation effects and aftereffects, which are represented in Fig. 1 by the symbol [d] and (d), respectively, appended to each solid line. Differences between wP test conditions result in the adaptation effect measure, while differences between nP test conditions result in the measurement of the aftereffect.

Thus, we obtain from Phase I testing two measures of adaptation and a single aftereffect measure on each test. It was expected that the (wG/wP) effects, the adaptation effects, would be greater than the (nG/nP) aftereffects to the extent that the adaptation had become conditionally associated to the goggles during training. The difference between the aftereffect and each of the adaptation effects (indicated in Fig. 1 by the dashed lines labeled CA_1 and CA_2 connecting the Phase I d symbols) will be considered the measures of the conditioned adaptation (CA).

Since all Phase II testing is under nP conditions, we obtain from it three aftereffect measures on each test. Here it was expected that the wG aftereffects would be greater than the nG aftereffects, to the extent that the adaptation had become conditionally associated to the wearing of the goggles. The difference between these effects (indicated in Fig. 1 as the dashed lines labeled CA_3 and CA_4 connecting the d symbols of Phase II) will also be considered measures of conditioned adaptation.

Training Procedure

The experimental group (EG). This group was given alternation training designed to produce differential conditioned adaptation to the wearing of goggles. The training consisted of two parts, Phase I and Phase II. All 24 Ss of EG received Phase I training, but only the last 12 Ss continued on to received Phase II training.

The total EG Phase I training time of each S was 200 min. Of this time, 118 min were spent wearing the goggles with the prism (wG/wP) and 82 min with them removed (nG/nP). The (wG/wP) time was divided into six separate occasions (30, 25, 20, 15, 15, and 13 min), which alternated with the five (nG/nP) training occasions (25, 20, 15, 12, and 10 min). The Phase I training began and ended with a (wG/wP) exposure. Alternation was accomplished by having E place or remove the goggles while S's eyes were closed.

Phase II training consisted of an additional 40 min of training. It began with a (wG/wP) exposure which was followed in order by (nG/nP), (wG/wP), (nG/nP) exposures. Each exposure was of 10 min duration.

Additional training preceded Phase II testing as a precaution against two possibilities which could hamper the demonstration of CA effects. Firstly, CA effects could dissipate with time; secondly, a long series of test conditions might consistute an extinction procedure.

During each of the training exposure conditions, whether (wG/wP) or (nG/nP), S performed four different tasks. A task was included only it if or some highly similar variant had previously been effective in producing rapid adaptation. It was hoped that by saturating the training periods with such highly effective tasks a reduction in the visual differential conditioning time might be effected.

The first task, a "passive" training technique, required S to stand and look at his feet for 2 min (Wallach et al, 1963). The remaining tasks each involved active self-produced movements. In order of performance they were: walking up to and grasping a door knob five separate times with each hand (Held & Hein, 1958), walking up and down a long hallway (Weinstein et al, 1964), and throwing

Table 1
Mean Adaptation Effects (wP) and Aftereffects (nP) in Degrees Listed by Posttraining Test Conditions

Test Conditions EG and C_I	EG (N = 24)		C_I (N = 12)		Test Conditions C_{II}	C_{II} (N = 12)	
	Ptg (Deg)	SA (Deg)	Ptg (Deg)	SA (Deg)		Ptg (Deg)	SA (Deg)
Phase I					Phase I		
$(wG/wP)_3$	7.3**	3.3*	10.2**	5.0*	$(wG/nP)_3$	–1.2	–3.0*
$(nG/nP)_4$	2.4**	1.9*	9.0**	7.9*	$(nG/nP)_4$	–0.4	–0.7
$(wG/wP)_5$	6.0**	4.5*	9.6**	6.3*	$(wG/nP)_5$	–0.6	–1.2
Phase II	(N = 12)		(N = 12)		Phase II	(N = 12)	
$(nG/nP)_6$	0.1	0.4	9.5*	8.3*	$(nG/nP)_6$	0.0	–0.8
$(wG/nP)_7$	3.7*	3.5†	10.6*	7.6*	$(wG/nP)_7$	–0.8	–0.5
$(nG/nP)_8$	0.4	2.0†	9.6*	8.8*	$(nG/nP)_8$	–1.1	0.5

Note—+ signifies deviation in the direction compensatory for the prismatic displacement. — signifies deviation in the noncompensatory direction. wP conditions measured adaptation effects; nP conditions measured aftereffect.
***, *, † denote deviations significantly different from zero; $p < .001$, $p < .01$, and $p < .05$, respectively.*

and retrieving darts (Harris, 1963).

Control Group I (C_I). C_I training sought to determine if the formation of an association between the goggles and the adaptation depended upon the amount of training time in which the goggles and the prism were simultaneously presented to S. If simultaneous exposure were the critical factor, then continuous wG/wP training exposure would produce as much or more of the association than would the alternation training. Thus, this form of training may be used to determine whether the alternation procedure facilitates or interferes with the formation of the association.

The only difference in the treatment of C_I and EG was in their training. That is, while EG received alternation training, C_I received only single wG/wP training exposure. In Phases I and II of training, C_I received 118 and 20 min, respectively, of continuous (wG/wP) training. Thus, the total (wG/wP) training time of the two groups was equated.

Control Group II (C_{II}). C_{II} was also treated exactly like EG, except that the Ss were never exposed to the prism, either during testing or during training. That is, the only goggles worn by the C_{II} Ss were the pair with the optically plain glass in the frame. This group was included in order to evaluate the possible effects of the long training procedure, the repeated testing, and the repeated wearing of the goggles.

Results and Discussion

Table 1 presents a summary of the adaptation effects (wP test conditions) and the aftereffects (nP test conditions) obtained by the Ptg and SA tests. Each figure is the mean difference of pre- and posttraining measurements and is listed by its posttraining test condition.

The C_{II} results indicate that long training, repeated testing, and repeated exposure to the goggles had no significant effect on the Ptg test. The SA test was also unaffected by these factors except for a single significant, but negative, effect which was found in the first test condition of Phase I. All C_I test conditions measured significant Ptg and SA effects. EG produced significant Ptg and SA effects in each Phase I test condition. In Phase II testing, the EG Ptg test measured a significant effect in only the $(wG/nP)_7$ test condition, whereas the SA test produced significant effects in both the $(wG/nP)_7$ and $(nG/nP)_8$ test conditions. Our major concern, however, is whether or not CA effects were obtained. That is, (1) were the Phase I testing wG adaptation effects greater than the Phase I nG aftereffects, and (2) were the Phase II testing wG aftereffects greater than the nG aftereffects? Table 2 presents a summary of the mean conditioned adaptation effects obtained in Phases I and II for both the Ptg and SA test.

The Phase I, CA_1 and CA_2 figures are the mean difference between $(nG/nP)_4$ aftereffects and $(wG/wP)_3$ and $(wG/wP)_5$ adaptation effects, respectively. CA_c is the mean of the CA_1 and CA_2 effects. The Phase I Ptg CA_1, CA_2, and CA_c effects obtained from the control groups, C_I and C_{II}, were not significant. However, the Ptg CA effects obtained from EG were all highly significant. The CA_1 and CA_2, and CA_c effects were 4.9 deg ($t = 7.010$, $p < .001$), 3.6 deg ($t = 5.530$, $p < .001$), and 4.3 deg ($t = 6.931$, $p < .001$), respectively. An analysis of variance of the CA_c results of the three groups was significant ($F = 23.67$, df = 2,45; $p < .001$). The subsequent t-test comparisons (Lindquist, 1953) with 45 df revealed that the mean EG CA_c effect was significantly larger (3.4 and 4.8 deg) than those of C_I and C_{II} ($t = 3.276$, $p < .001$ and $t = 4.917$, $p < .001$).

With the SA test, the Phase I C_I and C_{II} CA effects were all negative, (i.e., the wG adaptation effects were smaller than the nG aftereffects) and not significant. Using a one-tailed test of significance, the CA_1, CA_2, and CA_c effects obtained from EG on the SA test were 1.4 deg ($t = 1.461$, $p < .1$), 2.6 deg ($t = 2.702$, $p < .01$), and 2.0 deg ($t = 2.320$, $p < .025$), respectively. An analysis of variance of the SA tests CA_c effects was significant ($F = 5.055$, df = 2,45; $p < .025$). Using a one-tailed t test with 45 df, the EG effect was found to be significantly larger (4.3 and 3.4 deg) than the C_I and C_{II} effects ($t = 2.844$, $p < .005$, and $t = 2.291$, $p < .0250$).

To summarize, the EG CA_1, CA_2, and CA_c effects for the Ptg test were all significant, whereas for the SA test only one, CA_1, was not significant but did show a strong positive trend. In addition, the EG CA_c effects of both tests were significantly larger than those effects of the control conditions. However, before concluding that the Phase I EG CA effects represent a "conditioned association" of prismatic adaptation to the wearing of goggles, several issues must be addressed. First,

Table 2
Mean Conditioned Adaptation Measures in Degrees

	EG (N = 24)		C_I (N = 12)		C_{II} (N = 12)	
	Ptg (Deg)	SA (Deg)	Ptg (Deg)	SA (Deg)	Ptg (Deg)	SA (Deg)
Phase I						
CA_1	4.9**	1.4	1.2	–2.9	–0.8	–2.3
CA_2	3.6**	2.6†	0.6	–1.6	–0.2	–0.5
CA_c	4.3**	2.0†	0.9	–2.3	–0.5	–1.4
Phase II	(N = 12)		(N = 12)		(N = 12)	
CA_3	3.6*	3.1*	1.1	–0.7	–0.8	0.3
CA_4	3.3*	1.5	1.0	–1.2	0.3	–1.0
CA_c	3.5*	2.3*	1.1	–1.0†	–0.3	–0.4

Note—+ signifies wG effects > nG effects. — signifies wG effects < nG effects.
***, *, † denote deviations significantly different from zero; $p < .001$, $p < .01$, and $p < .05$, respectively.*

are the large EG (wG/wP) effects somehow due to the presence of the prism in that testing condition? Secondly, granting that there may have been conditioning, was it the adaptation effect (a response) and not the adaptation (a generalized compensatory perceptual effect) which was conditioned? As a partial answer to the first issue, we note that the argument pertains only to the Ptg test. It is not relevant to the SA test since the prism can have no effect, during testing, on a test performed with closed eyes. Whether or not the issue, however, is valid for the Ptg test will be clarified by the results obtained in Phase II of the experiment, since in the test conditions of that phase the prism was not present. If the Ptg CA effects are due to the presence of the prism during testing, then CA effects should not be obtained from testing without it.

The Phase II CA_3 and CA_4 figures in Table 2 are the mean difference in degrees between the $(wG/nP)_7$ aftereffect and the $(nG/nP)_6$ and $(nG/nP)_8$ effects, respectively. CA_c is the mean of the CA_1 and CA_2 effects.

Neither the C_I nor the C_{II} conditions produced a significant Ptg CA effect. However, all of the EG Ptg CA effects were significant. The CA_3, CA_4, and CA_c effects were 3.6 deg ($t = 3.774$, $p < .005$), 3.3 deg ($t = 4.055$, $p < .005$), and 3.5 deg $t = 4.663$, $p < .005$), respectively.

The EG Ptg CA_3 and CA_4 effects are particularly interesting in two respects. First, they were obtained in testing conditions in which a prism was entirely absent. Second, they were obtained from Ss who had returned to essentially normal pretraining functioning. That is, as a result of the last Phase II training exposure [10 min of (nG/nP) training] the first Phase II test condition $(nG/nP)_6$ measured a mere 0.1-deg aftereffect (Table 1). Then, with only the introduction of a prismless pair of goggles, $(wG/nP)_7$, the aftereffect became 3.7 deg, which resulted in a CA_3 effect of 3.6 deg. When the goggles were then removed, $(nG/nP)_8$, the aftereffect obtained was only 0.4 deg, which in turn resulted in the CA_4 effect of 3.3 deg.

An analysis of variance of these Ptg CA_c effects revealed significant differences between the groups ($F = 4.13$, $df = 2,33$; $p < .025$). In subsequent one-tailed t tests with 33 df, the EG CA_c effect was found to be significantly larger (2.4 and 3.8 deg) than the C_I and C_{II} CA_c effects ($t = 1.941$, $p < .05$, and $t = 2.804$, $p < .005$).

Regarding the Phase II SA results, neither C_I nor C_{II} produced a significant positive CA effect. EG produced two significant CA effects, CA_3 and CA_c, which were 3.1 deg ($t = 4.270$, $p < .005$) and 2.3 deg ($t = 3.672$, $p < .005$). The CA_4 effect, 1.5 deg, although in the predicted direction, was not quite significant ($t = 1.738$, $p < .1$). The analysis of variance of the square root transformations of the Phase II SA CA_c effect measures revealed a significant difference between the groups ($F = 10.69$, $df = 2,33$; $p < .01$). In the resulting t tests with 33 df the EG CA_c effect was found to be significantly larger (3.3 and 2.7 deg) than the effects of either C_I or C_{II} ($t = 4.376$, $p < .01$, and $t = 3.371$, $p < .01$).

The results obtained from Phase II are remarkably similar to those results obtained from Phase I. The EG CA_3, CA_4, and CA_c effects for the Ptg test were all significant in Phase II, demonstrating that the results obtained in Phase I were not due simply to the presence of the prism during testing. The Phase II EG SA test resulted in significant CA_c and CA_3 effects and a marginally nonsignificant CA_4 effect. And, once again, the EG CA_c effects of both tests were significantly larger than those of the control conditions. Over all, the experiment demonstrated that it is possible to produce, in an afternoon of training, measurable CA effects to prismatic displacement by use of the Taylor alternation technique of differential conditioning.

Theoretically, Taylor employed a Hullian model and consequently regarded his results as confirmation that a particular response, the adaptation effect, had been conditioned. However, since in the present study CA effects transfer across (1) testing conditions (e.g., wP and nP), (2) types of tests (e.g., Ptg and SA), and (3) training conditions relative to testing conditions (i.e., the training was with open eyes, but the SA testing was with eyes closed), an initial hypothesis would be that these effects reflect the conditioning of some more general process than that suggested by Taylor. One possibility is that the adaptation has been conditioned. An argument against this hypothesis might be that the CA effects are due to some form of differential conscious correction by S. Such correction would involve implicit verbal self-instruction regarding the effects of the prism, its contingencies, and a mode of corrective compensatory responding.

Evidence, however, does not support this contention. First, the CA_c effects of the SA test were significant. Since S performed the test with his eyes closed, self-instruction regarding the visual effects of looking through a prism has little relevance. Second, in postexperimental interviews, most Ss were unable to verbalize either what had happened in the experiment or the general effects of the prism. All Ss denied deliberate compensation during testing.

Third, adaptive shifts of the SA test are usually taken as a measure of the proprioceptive changes in the felt position of the arm (Harris, 1963). However, the adaptive shifts in the Ptg test are considered a measure of "total" adaptation, from which the proprioceptive SA component can be deducted, resulting in a measure of oculomotor adaptive change (McLaughlin et al, 1966). Following this procedure with the EG Phase I CA_c results, the SA 2.0-deg effect would be subtracted from the 4.3-deg Ptg effect, resulting in a significant 2.3-deg effect ($t = 3.290$, $p < .01$) attributable to a possible oculomotor component. This 2.3-deg residual is so small relative to the prismatic displacement (11.6 deg) that to explain it in terms of conscious correction would constitute a gross extension of the meaning of that construct. And, on the other hand, the magnitude of the two identifiable adaptation components, 2.0 deg proprioceptive and 2.3 deg oculomotor, are so nearly identical as to suggest strongly that a single process (conditioning) underlies both effects. All told, the conscious correction hypothesis is misplaced with regard to the SA effects and untenable for the Ptg effects. We conclude that conditioning has been produced.

Whether or not the 2.3-deg effect is actually an oculomotor effect is, of course, conjectural and must be directly confirmed within the present context. However, such a response-mediated form of adaptation would conform to the type of conditioned response postulated by Taylor, namely, one which had visual localization consequences. The conditioned proprioceptive adaptation effect is, on the other hand, a conditioned perception per se, that is, one which is not mediated by conditioned response effects.

When the above procedure is applied to the Phase II results and the 2.3-deg SA CA_c effect is subtracted from the 3.5-deg Ptg effect, the residual of 1.2 representing the Phase II oculomotor effect is significant ($t = 3.169$, $p < .01$). Although the Phase II oculomotor effect is 1.1 deg smaller than that of Phase I, this difference is not significant ($t = 1.076$, $p > .2$).

We conclude that the alternation technique of training is able to produce conditioned adaptations to prismatic displacement in relatively short periods of time. That Taylor was unable to produce this effect is very likely due, as he suggests (p. 208), to a lack of adequate adaptation training in his study. The above results lead us (1) to agree with Freedman that aftereffects are not an unequivocable indicator of either adaptation effects of adaptation, and (2) to disagree with his reasons for reaching this conclusion. Freedman implies that aftereffects are intrinsically different from adaptation effects. He cites as evidence two studies in which the aftereffects never became larger than 4.0 deg (Bossom & Hamilton, 1963; Freedman, 1968) and concludes that there is an absolute limit to the magnitude of these effects. However, in both of the cited studies, the same Ss were trained in as many as four different adaptation training situations. Although unstated, it is likely that following a fairly standard procedure, after each adaptation training session the Ss spent some period of time without prismatic exposure in order for them to reestablish normal functioning prior to the next training exposure. If this is the case, then the Ss were receiving alternation training and the adaptation became differentially conditioned.

The present results also imply that adaptation effects need not be an unequivocable indicator of adaptation either. The degree to which either adaptation effects or aftereffects reflect the adaptation seems to depend upon a complex of factors. Principal among these factors is the degree to which other stimuli became conditionally associated to the adaptation and the degree to which these stimuli are present during testing.

Finally, it becomes clear now that a short-term study training situation, usually considered a single presentation of wG/wP training, is actually a single-alternation study. That is, the S's preexperimental experience can be considered an nG/nP exposure. Thus some small amount of differential association often occurs which, in turn, results in the aftereffects being somewhat smaller than the adaptation effects and, consequently, can be taken as a "conservative estimate" of the latter.

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NOTE

1. The effective field of view was 48 deg wide and 44 deg high.

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