BIMANUAL COORDINATION: ATTENTIONAL FOCUS AND PRIOR LEARNING

THE INFLUENCE OF ATTENTIONAL FOCUS AND PRIOR LEARNING ON THE ACQUISITION OF A NEW BIMANUAL COORDINATION PATTERN

By

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Abstract

This study was designed to examine three issues concerning the learning of a new coordination pattern. The first issue examined was the root of the conflicting findings of previous work concerning the effect of learning a novel coordination pattern on the performance an intrinsically stable antiphase pattern (Fontaine, Lee, & Swinnen, 1997; Lee, Verschueren & Swinnen, 1995; Zanone & Kelso, 1992). Consideration of these experiments revealed that different metronomes were used, and that this metronome difference is critical because it may have influenced the learners' attentional focus during learning. Therefore, the present experiment sought to examine whether a difference of attentional focus was the cause of this conflict. The second issue was whether the superiority of an external focus over internal focus of attention during learning would be evident in the learning of a new coordination pattern. And last, this study set out to examine the issue of prior learning of a bimanual coordination pattern on the learning of a new coordination pattern. Two groups of participants (one with an internal focus of attention, and the other with an external focus of attention) learned to perform a 90° relative phase (RP) coordination pattern over two practice sessions, and were then asked to perform a 135° RP pattern in a third session. An additional two groups of participants (one with an internal focus of attention, and the other with an external focus of attention), served as controls, and learned to perform the 135° RP pattern over all three sessions. Results of this experiment did not support the hypothesis that a difference in attentional focus during learning is responsible for the conflicting findings concerning the effect of learning on intrinsic pattern performance. Although the results seem to indicate that an external focus of attention is more beneficial than an internal focus of attention during learning of a new coordination pattern, further work without feedback as a confounding factor is required. Finally, results show that prior learning does influence the learning of a new coordination pattern in that positive transfer of learning was evident (prior learning of the 90° pattern facilitated performance of the 135° pattern), and findings provide evidence for the creation of a new attractor with learning.

Foreword

This thesis has been written in a format suitable for publication. The first section of this thesis is an extended review of the literature pertinent to this study. The second section contains a manuscript titled "The influence of attentional focus and prior learning on the acquisition of a new bimanual coordination pattern."

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Review of the literature

Introduction

Everyday life requires us to use more than one limb simultaneously in order to accomplish one or more tasks. For example, to pour a glass of juice, one might hold the glass in one hand while using the other hand to pour the juice from the pitcher. When both hands are used together, either to accomplish a common task, or two different tasks, this is termed bimanual coordination. Although the example of pouring a glass of juice is quite simple, more complex bimanual coordination tasks can be very difficult to perform. However, these complex coordination tasks can be learned with significant practice, as is observed in highly skilled drummers for example. How complex bimanual coordination patterns are learned is an important question in the study of movement coordination.

Dynamical Pattern Theory

Dynamical pattern theory applies the principles of physics and non-linear dynamics in an attempt to understand and explain how humans are able to coordinate complex behaviours (Haken, Kelso, & Bunz, 1985). Beyond its impact on coordination research, dynamic pattern theory has also influenced research in development, aging, and ergonomics (Lee, 1998). As such, this theory has become very influential and well recognized. However, there is some disagreement in the literature where attempts have been made to confirm certain hypotheses generated by this theory, especially as it pertains to learning new patterns of coordination.

According to dynamical pattern theory, people possess a set of intrinsic coordination dynamics, or spontaneous coordination tendencies. The term intrinsic dynamics refers to the stable coordination patterns that are possessed before a new coordination pattern is learned (Kelso, 1995). There are two common, intrinsically stable coordination patterns; the in-phase pattern (0° relative phase, or the simultaneous activation of homologous muscle groups), and the anti-phase pattern (180° relative phase, or alternating activation of homologous muscle groups). Relative phase (RP) is defined as the expression of the position of one limb within its cycle relative to the other limb within its cycle, and is used to evaluate temporal coordination (Schmidt & Lee, 1999).

Intrinsic patterns act as attractors when new and unstable bimanual coordination tasks are attempted. The intrinsic pattern can be thought of as a strong magnet, and the new unstable pattern is like a quarter. Just as a magnet would attract the quarter, the intrinsic patterns influence unstable patterns, and eventually the unstable pattern will be pulled to one of them. However with extensive practice, the new pattern can become more stable, and able to resist the pull of the intrinsic pattern. Although both intrinsic patterns act as attractors, the in-phase pattern is more stable and attractive than the anti-phase pattern (i.e., the in-phase pattern is a stronger magnet than the anti-phase pattern). The fact that the in-phase pattern is a stronger attractor has been demonstrated by a series of experiments in which an involuntary switch from the anti-phase pattern to the in-phase pattern occurred when movement frequency reached a critical limit (Kelso, 1984). The entire strength of all of the 'magnets' and 'quarters' reflects the dynamic landscape.

Dynamical pattern theory states that all learning occurs as the result of modifications to the dynamic landscape, in the direction of the new pattern (Zanone & Kelso, 1997). Further, it is proposed that once a new pattern is learned, it too becomes an attractor, and consequently will have the power to influence subsequent learning (Schöner, Zanone & Kelso, 1992). Accordingly, in keeping with the magnet and quarter analogy described above, it can be said that, with practice, the quarter itself (the new pattern) becomes magnetized (becomes attractive to unstable patterns). The following sections will deal with these two important issues concerning the learning of new bimanual coordination patterns.

Issue 1: The creation of a new attractor with learning

To date, little work has examined whether newly learned patterns do in fact behave as attractors during the learning of yet another new coordination pattern. In order to determine if the contextual interference effect occurs during the acquisition of a new bimanual coordination pattern, Tsutsui, Lee, and Hodges (1998) required participants to learn three coordination patterns (45°, 90°, and 135° RP), in either a blocked or random fashion. In the case of blocked practice, participants were required to learn one pattern first, followed by a second, and then by a third. If the prediction that learning creates new attractors is true, then the way in which these three patterns were learned differed considerably because of very different attractor landscapes influencing them. However, as it was not central to the purpose of the Tsutsui et al. study, the effect of prior learning on the learning of a new pattern was not considered in the analysis of the results.

More recently, Wenderoth and Bock (2001) asked participants to learn to produce a mean relative phase relationship of 90° by moving the handles of two parallel sliding devices. The relative motion of two cycling quantities can be plotted on orthogonal axes, and the result is called a Lissajous figure. The Lissajous figure for the 90° RP pattern is a circle. The required response was displayed on a computer monitor, and consisted of a target moving along a circle at the desired movement frequency, with a cursor representing the resultant feedback of their arm movements. The participants' task was to track the target with the cursor as closely as possible. Forty trials were performed on two consecutive days. Although the main purpose of this study was to examine switching time and its usefulness as a measure of learning, the authors conducted an additional experiment with five of the participants who had already been trained in the 90° RP task.

This secondary experiment required the participants to produce either a 70° or 110° RP pattern, both of which were represented on the monitor by an ellipse. Just as during the learning of the 90° RP pattern, a target was present to guide their actions. However, at the midpoint of each 40 second trial, the screen went blank and participants were instructed to continue to produce the 70°/110° RP pattern.

Results indicated that although the participants were able to perform the new pattern while the visual guidance was present on the monitor, as soon as vision was removed the unstable 70°/110° RP pattern was attracted by the previously learned 90° RP pattern. Although no statistical analyses were performed, the authors concluded from this observation that during the 2 days of practice of the 90° pattern a new attractor had evolved. This conclusion was based on the evidence that attempts to perform the unstable 70°/110° RP task without online feedback resulted in the production of the newly practiced 90° pattern, rather than either of the intrinsic patterns (in-phase or anti-phase).

Even though the results of Wenderoth and Bock (2001) are in line with the dynamical pattern theory prediction that new attractors will emerge with learning, for a few reasons their results should be interpreted with caution. Because the participant group was composed of only a subset of the main experimental participants, the sample was very small. Further, no control group was included in the study. That is, there is no basis on which to assume that these participants performed any differently than a group of participants with no experience with the 90° pattern would have performed given the same situation. In order to find more conclusive evidence for the creation of a new attractor with learning, the performance of participants who have learned the 90° pattern should be compared to the performance of a control group with no prior experience or skill in performing the 90° pattern.

Again, while the formation of a new attractor is consistent with dynamical pattern theory, it is somewhat surprising that with only two days of practice the 90° pattern would display more attractive strength than the very intrinsically stable in-phase pattern. Perhaps the 90° pattern was only attractive because the new pattern (70°/110° RP) was so much closer to it (20° difference) than to the in-phase or anti-phase patterns (both with a 70° difference). In the present study a transfer pattern was selected that was equidistant from the intrinsic patterns and the newly learned pattern.

Issue 2: The effect of learning on the intrinsic coordination patterns

Because dynamical pattern theory claims that learning is the direct result of changes to the individual's preferred and stable coordination tendencies, the theory also considers the reciprocal effect of new learning on the previously stable intrinsic coordination patterns. Dynamic pattern theory postulates that in addition to the adoption of a new coordination pattern, previously existing coordination capabilities change with learning. That is, it is predicted that when a new coordination pattern is learned, not only will the intrinsic dynamics affect this learning, but also the learning of the new pattern will affect subsequent performance of these previously stable patterns. As a result, given that the entire coordination landscape is altered when a new coordination pattern is learned, transfer of learning should be observed (Zanone & Kelso, 1994). Here, the term transfer refers to changes in the capability to perform other coordination patterns (including the intrinsic coordination patterns) following the learning of a novel pattern. In this case, transfer can refer to either an enhanced capability (positive transfer) or a diminished capability (negative transfer) to perform other patterns. Attempts to confirm the hypothesis that learning will somehow alter the performance of previously stable patterns have generated conflicting results.

In the first test of this hypothesis, Zanone and Kelso (1992) asked participants to learn flexion and extension movements of their index fingers with a relative phase relationship of 90°. A visual metronome was used to display the appropriate phasing to the learners. This visual metronome consisted of two light-emitting diodes (LEDs), placed 8 cm apart at the height of the learners' gaze. Participants were instructed to flex and extend their right finger in time with the right LED, and the left finger in time with the left LED. Practice occurred over 5 consecutive days. On each day, before and after practice, and between the training blocks, a 'scanning run' was performed to assess the entire coordination dynamic. A computer controlled the onset of each LED so that different relative phases were possible. The scanning run consisted of progressively increasing the relative phasing of the metronome from 0° to 180°, in 15° increments. Seven days following practice the participants returned to perform a retention test (on the 90° pattern) and a final scanning run.

Results of the scanning runs indicated that where a typical bistable (two attractors in the layout) pattern had existed before practice of the new pattern (0° and 180° RP), a tristable (three attractors in the layout) pattern of performance during the scanning run had emerged after learning (0°, 90°, and 180° RP). More importantly however, it was observed that following learning of the 90° RP pattern, performance of the anti-phase pattern had been destabilized. This result supports the dynamical notion that learning a new coordination pattern results in the modification of the entire range of attractor layout. Although consistent with dynamic pattern theory, such a finding is surprising because, in this case, the learning of a new coordination pattern resulted in negative transfer, in that a previously stable pattern was destabilized.

Lee, Swinnen, and Verschueren (1995) conducted a related study in which participants practiced making repetitive arm movements towards and away from the body midline with a phase difference of 90°. An auditory metronome, operating at 1 Hz, was used to pace participants' actions such that 1 cycle of the specified movement was completed coincident with each beat of the metronome. Concurrent visual feedback of the relative motion of the arms was provided, and subjects were instructed to attempt to stay in the specified mode of coordination for the entire trial. Performance of the intrinsic patterns was measured before and after practice of the 90° RP pattern.

Lee et al. also found a destabilization of the anti-phase pattern following practice of the new pattern. However, in contrast to the findings of Zanone and Kelso (1992), this destabilization was only evident at the end of the first day of practice. Performance of the anti-phase pattern returned to normal pre-practice levels on the second day, and remained at normal levels for the remainder of the practice sessions. These findings led the authors to conclude that the learning of the 90° task had no permanent transfer effects on the performance of existing stable coordination patterns (i.e., the intrinsic 0° and 180° RP patterns).

In light of the conflicting findings generated by Zanone and Kelso (1992), and Lee et al. (1995), another study was conducted by Fontaine, Lee, and Swinnen (1997, Experiment 2) in order to further examine the effect of learning a 90° pattern on the intrinsically stable in-phase and anti-phase patterns. Practice was extended to six days so that the stability of the intrinsic patterns could be measured more frequently during the learning process, and over a longer practice time frame. Further, the extended practice meant that the stability of the newly learned pattern was more firmly established. Similar to the results of Lee et al. (1995), a temporary deterioration in the performance of the intrinsic patterns was seen from pre-practice to post-practice each day. However, this negative transfer effect was not permanent, as performance always returned to pre-practice levels on the following day. Thus, attempts to replicate the findings of Zanone and Kelso (1992), and to confirm the hypothesis that the learning of a new coordination pattern will not only be affected by the existing dynamics, but also affect the entire underlying existing dynamics, have yielded conflicting results, and this issue remains to be settled.

Attentional Focus

While variables affecting the learning and performance of motor skills have a long history of research, until recently the effect of attentional focus during practice has been largely ignored. Anecdotal evidence from sport has suggested that focusing on body movements while executing a well-learned task can be detrimental to motor performance (Gallwey, 1982). From this anecdotal evidence, a line of research has emerged comparing the effects of an internal focus of attention to an external focus of attention during learning. The term 'internal focus of attention' refers to a focus of attention that is internal to the learner's own body, and the term 'external focus of attention' refers to a focus of attention that is external to the learner's own body. For example, when practicing kicking a soccer ball to a target, one could focus on the specific movements made by the leg during the kick (an internal focus of attention), or one may focus on the target (an external focus of attention).

Wulf, Höβ, and Prinz (1998) first investigated the possibility that the detrimental effect of an internal focus of attention would be evident if internal focus instructions were given to learners while acquiring a new skill. To examine this prospect, Wulf et al. (1998) compared the performance of three groups of subjects on two different tasks; a slalom ski simulator (Experiment 1), and a stabilometer balancing task (Experiment 2). For each task an internal focus group was instructed to focus on their body movements during practice, an external focus group was instructed to focus on the effects of their actions on the environment, and a control group received no instructions concerning the focus of their attention during practice.

For both experiments, retention tests following two days of practice indicated that an external focus of attention (attention directed at the effect of the learners' actions on the environment rather than on the actual body movement) enhanced learning relative to the other groups. With results indicating that the instructions provided to those learning a motor skill could significantly affect performance, further investigation into this issue was required.

A follow-up study by Shea and Wulf (1999) tested the generalizability of the results of Wulf et al. (1998). More specifically, Shea and Wulf were interested in finding out if the internal vs. external attentional focus dichotomy evident for pre-practice instructions would hold true in terms of the type of feedback provided to the learners during practice. This aim was accomplished by comparing the performance of four groups of participants on the stabilometer balancing task (as used by Wulf et al., 1998), with each of the four experimental groups receiving different instructions. The internal focus group was instructed to focus on their feet, while the external focus group was instructed to focus on markers placed on the stabilometer during performance. The remaining two groups viewed a computer screen that displayed feedback concerning their deviations from the horizontal; the feedback/internal focus group was told that the display represented the movement of their feet, while the feedback/external focus group was told it represented movement of the markers on the stabilometer. Scores from a delayed retention test (no feedback provided) revealed a learning advantage for both of the external focus groups (regardless of feedback condition).

The similar findings of these two studies (Shea & Wulf, 1999; Wulf et al., 1998), and the demonstrated enhancement of learning by external focus of attention induced either by instructions or feedback, have led to further research to determine if this phenomenon holds true in real-world situations. One such study examined the effects of attentional focus on the learning of a golf pitch shot (Wulf, Lauterbach, & Toole, 1999). Results were consistent with previous findings; those participants who focused on the club swing during practice (external focus) performed better than did those participants who focused on their arm swing (internal focus). This replication of previous findings outside of the laboratory suggests that manipulating a learner's focus of attention during practice could prove to be a valuable tool in clinical and rehabilitation settings (McNevin, Wulf, & Carlson, 2000).

Though the results of the attentional focus work have been quite consistent, many questions concerning this phenomenon remain unanswered. A recent study by Wulf and colleagues (Wulf, McNevin, Fuchs, Ritter, & Toole, 2000) tackled two such problems. The issue addressed in Experiment 1 was whether it is critical to focus on the effects of one's movements on the environment, or if it is sufficient to choose any external cue that will distract the learner's attention from attention to their own movements. Two groups of participants, without any tennis experience, practiced a tennis forehand shot, and returned one day later for a retention test. The 'antecedent group' was instructed to focus on the trajectory of the ball as it approached them (prior to the shot), and the 'effect group' was instructed to direct their attention to both the trajectory of the ball after it was hit and the target. Though participants in the two groups focused their attention on different cues, the antecedent and the effect are both external cues.

While both experimental groups improved their performance during practice, the effect group performed significantly better than the antecedent group during the retention test. From these results, the authors concluded that focusing on movement effects is more effective than focusing on some other external cue. With this information, a new question emerges; is directing attention to the anticipated effects of an action (those effects occurring after the movement is finished) most beneficial for learning?

This question was addressed in Experiment 2 (Wulf et al., 2000). The preliminary hypothesis offered by Wulf et al. was that focusing on an anticipated effect could be detrimental, as it may distract attention from correct movement production. Therefore, Wulf et al. argued that directing attention to movement effects that are related to correct movement technique might be more effective for learning than directing attention to a movement effect that is not technique related. To test this idea, two groups of participants with no previous golf experience learned to make a golf shot. The 'club group' was instructed to focus on the arc of the club head during the swing (an external and effect-centred cue related to movement *technique*). The 'target group' was instructed to focus their attention on the ball trajectory and target (an external and effect-centred cue related to movement *outcome*). It was found that an external focus of attention on movement technique enhanced both performance and learning compared to an external focus on an effect that was not technique related.

Overall, the results of these two experiments help to shed some light on the unanswered questions concerning the attentional focus effect. We now know that an effect of the learner's actions, external to the body, and related to proper movement technique is the most favourable location in which to direct attention during learning. However, the question of why an external focus of attention is more effective than an internal focus of attention is still unanswered. One idea that has been proposed to answer this question is the "action effect hypothesis" (Prinz, 1997). The hypothesis states that actions are best planned and controlled by their intended effects, possibly because this allows for unconscious control processes to take over. Further, the superiority of an external focus fits well within an ecological framework, such that it makes sense to focus on the effects of actions on the environment because particular aspects of the environment can be critical to success (Wulf et al., 2000). Additional research is warranted to explore these possibilities.

The influence of attentional focus and prior learning on the acquisition of a new coordination pattern

Introduction

Bimanual coordination is the organization of the simultaneous actions of a person's two hands. The hands may be working to accomplish separate tasks, or together to fulfill one goal. While many bimanual actions are performed in everyday life, new bimanual coordination tasks can require extensive practice before they are performed with stability and accuracy. In order to explain how complex actions are coordinated and learned, dynamical pattern theory applies the principles of physics and non-linear dynamics. According to dynamic pattern theory humans possess a set of intrinsic coordination dynamics, or spontaneous coordination tendencies. The term intrinsic dynamics refers to the stable coordination patterns that are possessed before a new coordination pattern is learned (Kelso, 1995). The in-phase pattern (0° relative phase, or the simultaneous activation of homologous muscle groups), and anti-phase pattern (180° relative phase, or alternating activation of homologous muscle groups) are intrinsically stable coordination patterns. Relative phase (RP) is defined as the expression of the position of one limb within its cycle relative to the other limb within its cycle, and is used to evaluate spatial-temporal coordination (Schmidt & Lee, 1999). These intrinsic dynamics both affect, and are affected by the learning of a new coordination pattern.

Unlike more traditional approaches to learning, dynamic pattern theory takes into account the effect of a learner's previously existing coordination capabilities on the to-be-learned skill. More specifically, the intrinsic dynamics act as attractors; they dominate novel coordination patterns, and cause the unstable, novel patterns to fall in line with the stable intrinsic patterns. Further, when a new coordination pattern is learned, it is acquired through modifications to the existing intrinsic dynamics. Hence, the intrinsic dynamics greatly influence the learning of new patterns, and must be taken into consideration when assessing learning.

Once learning has taken place, and the new pattern is stable, dynamic pattern theory hypothesizes that it too will act as an attractor during learning of other novel coordination dynamics. This hypothesis has been supported by the results of Wenderoth and Bock (2001). Participants were required to learn a 90° relative phase (RP) coordination pattern, and were then tested on their performance of a 70° pattern. Although subjects were able to perform this 70° RP with visual feedback, once this visual feedback was removed, they fell back into performance of the previously practiced 90° pattern. While these results are consistent with predictions of dynamic pattern theory, it is important to note that the performance of these participants was not compared to the performance of a control group having no previous experience with the 90° RP pattern.

Attempts to investigate the reverse phenomenon, the influence of learning a new coordination pattern on the performance of the intrinsic patterns (in-phase and anti-phase), has generated conflicting results. Zanone and Kelso (1992) undertook the first experiment testing this idea. Five participants learned to perform index finger movements with a 90° RP relationship, with the help of a visual metronome consisting of two LEDs. Before and after each of five days of practice, participants' performance of the intrinsic coordination patterns was assessed. Results indicated that the anti-phase pattern was destabilized following learning of the 90° RP pattern. This 'negative transfer' finding, while surprising, is in line with predictions of the dynamical pattern theory.

Lee, Swinnen, and Verschueren (1995) conducted a similar experiment, requiring participants to practice making repetitive arm movements in a 90° RP pattern, using an auditory metronome to pace their movements. Consistent with the previous findings of Zanone and Kelso (1992), Lee at al. (1995) also found changes to performance of the anti-phase pattern following learning of a new coordination pattern. However, in contrast to Zanone and Kelso's finding, the disruption to the anti-phase pattern was only temporary. More specifically, the anti-phase performance degraded from pre-practice to post practice on day one, but on day two returned to normal pre-practice levels, and remained at these levels for the duration of the experiment.

Due to the conflicting results of these two experiments (Lee et al., 1995; Zanone & Kelso, 1992), Fontaine, Lee, and Swinnen (1997) set out to resolve this inconsistency. Using an arm flexion and extension task similar to that used by Lee et al., this time the practice period was extended so that the stability of the intrinsic patterns could be monitored over a longer learning period. Just as was found by Lee et al., results showed only a temporary deterioration in the anti-phase pattern performance.

The studies discussed above that have generated incompatible results (Fontaine et al., 1997; Lee at al., 1995; Zanone & Kelso, 1992) all involved the learning of a 90° RP coordination pattern. However, it is important to note that different equipment and tasks were used in these studies. It may be that certain task dissimilarities, which could result in different learning styles, are the root of this critical difference in findings, and not an issue with dynamic pattern theory per se. One potentially important discrepancy between the two methodologies employed is the metronome used to convey the phasing pattern to be learned by the participant. While Zanone and Kelso (1992) used a visual metronome, Lee et al. (1995), as well as Fontaine et al. (1997, Experiment 2) used auditory metronomes.

This difference in the type of metronomes used may be an important one, because it may have led the participants in these studies to focus their attention differently during learning and thus resulted in a different influence on the anti-phase pattern (i.e. temporary vs. and permanent disruption to the attractor landscape). More specifically, the use of a visual metronome requires the learner to visually fixate on the metronome in order to achieve the correct phase relation. In contrast, the use of an auditory metronome allows for mobility in the gaze of the learner, and as such provides opportunity to observe and focus on one's own actions. One hypothesis regarding the effect of these differing stimulus conditions is that the former situation seems to create, or at least tolerate, an external focus of attention, while the latter situation encourages an internal focus of attention for the learner during practice. This discrepancy in attentional focus may influence the way that the new coordination pattern is learned, and therefore may affect the role of the intrinsic dynamics in learning, and conversely, the effect that learning has on the intrinsic dynamics.

Although there is much anecdotal evidence that 'thinking too much' about an action that one is attempting to perform can be detrimental to performance, only recently has this idea been tested directly. The original idea has been refined, and it was proposed that 'thinking too much' about the action itself directs the learner's attention within the body, and that this internal focus of attention is detrimental to learning compared to a focus of attention that is external to the body. A literature comparing the effects and internal and external focuses of attention during learning has begun to emerge.

Wulf, Höβ and Prinz (1998) compared stabilometer balancing and a slalom ski simulator performance of a group of participants instructed to maintain an external focus of attention, to another group instructed to maintain an internal focus of attention, and a control group given no attentional focus instructions. Results of a retention test revealed that an external focus of attention enhanced learning relative to both the internal focus group and the control group. From these results, Wulf et al. concluded that a focus of attention external to the learner's body is more beneficial for learning than a focus of attention internal to the learner's body. This attentional focus effect has since been replicated using other tasks in golf and tennis (Shea & Wulf, 1999; Wulf, Lauterbach, & Toole, 1999; Wulf, McNevin, Fuchs, Ritter, & Toole, 2000). However this phenomenon has not been investigated in the learning of a bimanual coordination pattern.

The effects of attentional focus could prove useful in explaining the previously described discrepancies in the bimanual coordination literature. As outlined above, different metronomes used by Zanone and Kelso (1992), Lee at al. (1995), and Fontaine et al. (1997), may have elicited different foci of attention among their participants. Specifically, it is hypothesized that the visual metronome used by Zanone and Kelso (1992) encouraged an external focus of attention, and conversely, that the auditory metronome used by Lee et al. (1995), and Fontaine et al. (1997) fostered an internal focus of attention.

Purpose

The purpose of the present experiment was to examine three predictions arising from the foregoing discussion.

1) The first purpose of this experiment is to examine the effect of attentional focus on the learning of a new bimanual coordination pattern. Consistent with previous findings, (Shea & Wulf, 1999; Wulf et al., 1998; and Wulf et al., 1999), it was hypothesized that attentional focus would influence learning of a new coordination pattern. Specifically, participants in the external focus group would display a learning advantage over participants in the internal focus group during the learning of the novel coordination tasks.

2) A second purpose of the experiment was to examine the prediction that the contrasting findings concerning the effect of a newly learned coordination pattern on the previously stable anti-phase pattern may be attributed to differential focus of attention during practice. This premise was be tested by comparing two groups of participants learning to perform a new coordination pattern, one with an external focus and one with an internal focus, on their subsequent performance of in-phase and anti-phase patterns. It was hypothesized that an external focus of attention during learning of the novel coordination pattern would permanently disrupt the performance of the anti-phase pattern (e.g., as in Zanone & Kelso, 1992), but an internal focus of attention would not

permanently disrupt performance of the anti-phase pattern (e.g., as in Lee et al., 1995 & Fontaine et al., 1997)

3) Finally, the third purpose of this experiment was to examine the effects of a newly-learned coordination pattern on the learning of a novel coordination pattern (135° RP). More specifically, the 135° transfer task examined the role of a newly acquired pattern (90° RP) on the acquisition of a second new pattern (135° RP). As previously discussed, Wenderoth and Bock (2001) found that a newly learned 90° pattern acted as an attractor for a novel pattern. But, it was unclear whether these results would be replicated in this experiment. Wenderoth and Bock used a 70° RP transfer pattern; 70° RP is much closer to 90° (only a 20° difference) than to any other stable coordination pattern (0° or 180° RP). A 135° pattern was used as the transfer pattern for this experiment because 135° is equidistant from both 90° and 180° RP. Because 180° RP is an intrinsically stable pattern, the same attractive properties of the 90° pattern seen by Wenderoth and Bock (2001) for a 70° pattern might not be observed here for a 135° pattern. However, it was hypothesized that prior learning of the 90° coordination pattern would influence subsequent learning of the 135° coordination pattern because those participants who learn the 90° task prior to the 135° task would initially be more variable in performing the 135° pattern, since they will have three attractors (0°, 90° and 180°) influencing their performance.

Methods

Participants

Participants were recruited from the McMaster University community. A total of 28 people participated in this experiment, including 18 females and 10 males. Participants had a mean age of 24.6 years. Participants were paid $20.00 after completing the final test session. All participants signed informed consent forms complying with McMaster University's policy on ethics in research, advising them of their right to discontinue participation at any time. No participants chose to leave the experiment early.

Apparatus and Task

The apparatus consisted of 2 linear sliding devices positioned in parallel on a table (see figure 1). Unlike the end-to-end configuration used by Lee et al. (1995), and Fontaine et al. (1997), the slides were arranged side-to-side, so that all movements were made towards and away from the frontal plane of the body (rather than towards and away from the *midline* of the body). This type of slide arrangement was chosen because it allows for continuous vision of both of the involved limbs during practice. This vision of involved limbs during practice was considered important in establishing an internal focus of attention during practice. Compared to other symmetrical and non-symmetrical arrangements, a side-to-side positioning of the slides has been found to produce the most accurate and stable performance of both the in-phase and anti-phase patterns (Almeida, Welsh & Lee, 1999). As well, this type of arrangement has previously been used for the learning of a 90° RP coordination pattern (Wenderoth & Bock, 2001). Linear potentiometers fixed to each sliding device encoded displacement. A computer was used to control the metronomes (both visual and auditory) as well as to begin and end each trial.

Insert Figure 1 about here

Participants were seated at the center of the apparatus so that it was at a comfortable height for producing forearm movements in the horizontal plane. An adjustable chair was used, and participants were encouraged to make themselves comfortable before beginning the experiment. A monitor was located on the table, beyond the apparatus, and at the height of each participant's gaze. Augmented feedback, consisting of a two-dimensional plot of the relative motion of the two limbs, called a Lissajous figure, was displayed on this monitor. The Lissajous figure for a 90° RP pattern is a circle, and for a 135° RP pattern it is an ellipse (with the right end lower than the left on the screen). A second monitor, connected to the first by a cable, provided a duplicate display to the experimenter. How and when augmented feedback was displayed differed by experimental group and between phases of the experiment, and is described in more detail below.

The participants' task was to learn to perform a continuous bimanual coordination pattern in which both limbs moved at the same frequency, but with a constant phase difference of 90° or 135°, depending upon the group to which the participant was assigned. More specifically, the participants learned to make forearm movements while grasping the handles of the linear slides, so that the limbs and slides moved in a smooth and consistent way, with the right limb always leading the left by 1/4 of a cycle (for 90° RP) or by 1/8 of a cycle (for 135° RP). Further, participants were required to synchronize their movements with an auditory metronome operating at 1 Hz. Participants' performance of the in-phase and anti-phase coordination patterns was probed before and after each practice session. For those participants assigned to learn the 90° coordination pattern, transfer of learning to the 135° pattern was assessed after two days of practice.

Experimental Design and Schedule

Participants recruited for this experiment were randomly assigned to one of four groups (see Table 1). Each group was composed of eight participants. Two groups practiced the 90° coordination pattern during the learning phase of the experiment (days 1 and 2); one group with an internal focus of attention, and the other group with an external focus of attention. The remaining two groups served as controls, practicing the 135° coordination pattern for the full duration of the experiment; one group with an internal focus of attention, and the other group with an external focus of attention. During the transfer phase of the experiment all groups performed the 135° coordination pattern.

This experiment occurred in three sessions, with each session occurring on a separate day, and with no more than two days of rest between each session. Days 1 and 2 (comprising the learning phase) were identical; each participant practiced the coordination pattern specified for the group to which they belonged, and with an attentional focus specified for that group. Day 3, the transfer phase of the experiment, differed from the previous sessions, as all four groups performed the same coordination pattern (135° RP). On all three days of practice, probes of the performance of the intrinsic coordination patterns (one each for in-phase and anti-phase) were administered before and after practice of the to-be-learned pattern (see Table 2).

Procedure

Participants were randomly assigned to one of the four experimental groups. The groups differed in terms of the coordination pattern that was practiced during the initial learning phase, the instructions that were given before and during practice, as well as the feedback that was provided throughout the practice sessions. Participants in the internal focus groups (internal-90° RP and internal-135° RP groups) received a static feedback display immediately following the completion of each trial. Specifically, the monitor displaying feedback was covered with heavy construction paper, and participants were allowed to lift the cover, and view trial results for 5 seconds immediately following each trial (this duration was timed by the experimenter). The display for the internal focus groups consisted of the static target Lissajous figure (circle or ellipse), as well as the tracing produced by their movements during the trial. In order to foster an internal focus of attention, prior to each day of practice learners in these groups were provided with written instructions directing them to focus on the movement of their limbs relative to one another throughout the experiment (see Appendix A). Further, the instructions stated that this attention to limb movement would ensure correct relative phasing

Participants in the external focus groups (external-90° RP and external-135° RP) received online visual feedback throughout each trial. In addition to the static trace of the target Lissajous figure (circle or ellipse) and the dynamic trace of the learner's performance, the feedback available to these participants included a target moving around the circle in time with the auditory metronome (i.e. cycling at 1 cycle per second). The cycling target makes this task similar to a dynamic tracking task. The moving target was used in an attempt to elicit an external focus of attention among these participants (as was hypothesized to be the case with the visual metronome used by Zanone & Kelso, 1992). Wenderoth and Bock (2001) also employed this type of task and feedback display, and required participants to learn to perform a 90° RP coordination pattern. Participants in that study were able to achieve stable and accurate performance of the 90° pattern following this manner of practice. The written instructions given to participants in the external focus groups also directed participants to focus their attention externally. Specifically, prior to beginning practice each day, these participants were instructed to focus their attention on the feedback displayed on the screen during practice, and to attend to the way their limb movements affected this feedback (see Appendix A). As the internal groups viewed feedback for 5 seconds following each trial, this delay between trials was matched for the external groups, and those participants waited 5 seconds before beginning each new trial.

For all experimental groups, 34 trials, each 20 seconds in duration, were performed on each of the first two days of practice. Each practice session occurred on a separate day, and sessions were separated by no more than two days of rest. The first two trials conducted on each day were probes of the performance of the intrinsic coordination patterns (in-phase and anti-phase). One probe trial was administered for each intrinsic pattern, beginning with 0° RP, followed by 180° RP. These probe trials were followed by 6 blocks of 5 trials of the to-be-learned 90°, or 135° RP pattern. A second pair of probe trials followed practice of the to-be-learned pattern, identical to those completed at the beginning of each session.

Upon completion of the two practice sessions of the learning phase (no more than 2 days following the second practice session), participants completed a 2-stage transfer test, which was standardized for all participants. The first stage of the transfer test consisted of 2 probe trials, followed by 6 blocks of 5 trials of the 135° RP coordination pattern, and then another 2 probe trials. Feedback and focus of attention instructions provided during the first stage of the transfer phase were identical to the feedback and focus given in the learning phase of the experiment (as described above).

The second stage of the transfer test consisted of one block of 5 trials of the 135° coordination pattern. However, this block was different from those carried out in first transfer stage because no feedback (the monitor facing the participants was covered), or attentional focus instructions were provided to participants, therefore all participants performed this final stage under equated conditions. A visual metronome replaced the auditory metronome to convey correct timing to the participants. The visual metronome consisted of a green LED operating at 1 Hz. This second stage of the transfer phase was necessary in order to determine if any differences detected between attentional focus groups were simply due to the difference in the feedback display provided to the internal (static display) and the external (online display) practice groups.

Analysis

Each trial resulted in approximately 4000 estimates of relative phase (20 seconds per trial x 200 samples per second). These data were reduced to measures of mean relative phase (per trial) and its standard deviation (within a trial), indexing measures of performance accuracy and consistency. However, to facilitate comparison of different task goals (90° vs. 135° RP) a measure of absolute constant error was calculated by taking the absolute value of the actual RP achieved (mean RP) subtracted from the target RP (i.e. 90° or 135° RP). One final measure was then determined, which reflected a combined measure of accuracy and consistency. Root mean square error (RMSE) was calculated as the square root of the sum of absolute constant error squared and standard deviation squared. For analytical purposes, RMSE scores were averaged into blocks, with five trials per block. The primary variable of interest was RMSE, and ACE and SD are only reported where they are useful in interpreting the RMSE results. For all analyses alpha was set at 0.05. Analyses of variance were performed to examine the three predictions outlined for the experiment (please refer to the final section of the introduction), as follows:

1) In order to answer questions concerning the effect of attentional focus on the learning of a new bimanual coordination pattern a 2 group (90° RP, 135° RP) x 2 attentional focus (internal, external) x 3 day (day 1, day 2, day 3) x 6 block mixed design analysis of variance, with repeated measures on the last two factors, was carried out. Also the influence of attentional focus without augmented feedback was assessed in a 2 pattern (135° RP, 90° RP) x 2 focus (internal, external) x 5 trial ANOVA was performed on the last block of the final day of practice.

2) In order to answer the question of whether prior learning of the 90° pattern affected performance of the novel 135° pattern, a 2 pattern (135° RP, 90° RP) x 2 attentional focus (internal, external) x 6 block mixed design ANOVA with repeated measures on the last factor was performed. In this analysis, the Day 1 performance of the control groups (internal-135° RP and external-135° RP) was compared to the Day 3 performance of the experimental groups (internal-90° RP and external 90° RP).

3) In order to determine if new learning (of either the 90° pattern of the 135° pattern) disrupted performance of the intrinsic patterns (0° and 180° RP), a 2 learned pattern (90°, 135°) x 2 attentional focus (internal, external) x 3 day (1, 2, 3) x 2 intrinsic pattern (0°, 180°) x 2 time of test (pre- and post-practice) mixed design ANOVA with repeated measures on the last three factors was performed.

Where appropriate, Tukey's Honestly Significant different post-hoc test was performed.

Results

1) Learning & Attentional Focus

A significant main effect was found for Day ($F(2, 48) = 11.53$; $p<.0001$). Post-hoc analyses revealed that only days 1 and 2, and days 1 and 3 differed significantly. This improvement in performance from day 1 to days 2 and 3 shows that participants were able to learn the novel coordination patterns. The lack of improvement from day 2 to day 3 reflects of the fact the 90° group switched to the novel 135° pattern on day 3. This switch is highlighted by the main effect for day on the mean RP data ($F(2, 48)=$

6.09; p<.004) (see Figure 2). Similarly, a significant main effect for block ($F(5, 120)$= 13.89, p<.0001) indicates improvement in performance within day of practice.

Insert Figure 2 about here

Of particular interest was a significant main effect of attentional focus, with the external focus group performing with less error than the internal focus group (F (1, 24)= 10.89, p<.003). Further, a trend toward a significant focus of attention x day x block interaction ($F(10, 240)$= 1.74; p<.071) revealed that, while the internal and external focus groups initially performed at the same level, with practice the superiority of the external focus effect emerged and became more pronounced over time (see Figure 3).

Insert Figure 3 about here

Significant pattern x day ($F(2, 48)$= 6.61; p<.003) (see Figure 4), and pattern x block ($F(5, 120)$= 58.23, p<.001) interactions show that the 90° RP pattern was initially performed with greater error than the 135° RP coordination pattern. These results seem to indicate that it was easier to learn the 90° pattern than it was to learn the 135° pattern. Additionally, the pattern x day x block interaction was significant ($F(10,240)$= 3.14; p<.0001).

Insert Figure 4 about here

Last Block Performance:

All participants, regardless of group, performed the 135° pattern with no augmented feedback for the last block of five trials. Analysis of the RMSE data revealed a significant attentional focus x trial interaction ($F(4, 96) = 2.74$, $p < .0497$) (see Figure 5).

Insert Figure 5 about here

Additionally, when the absolute constant error data were considered, there was a strong trend towards a significant main effect for attentional focus ($F(1, 24) = 3.97$, $p < .0577$), with the external focus group once more showing superior performance.

Further, when the mean RP data were analyzed, a significant main effect for group ($F(1, 24) = 6.43$; $p < .018$) was found. The 135° RP group produced a higher mean RP pattern (mean= 136.7 ° RP), which was also closer to the target 135° RP pattern than the 90° group (mean= 118.8° RP),. This finding is not surprising as the 135° group had two more days of practice on the 135° pattern than the 90° group.

2) Effect of Prior Learning

To examine the effect of prior learning of the 90° pattern on the learning of the 135° pattern, day 1 performance of the 135° group was compared to the day 3 performance of the 90° group (for both groups this was the first session practicing the 135° pattern).

Analysis of the RMSE data revealed a significant main effect for pattern group (F (1, 24)= 7.04; $p<.013$). The group that had previously learned the 90° pattern (mean RMSE= 22.5), performed the 135° pattern better than the group with no prior practice of the 90° pattern (mean RMSE= 27.4).

Additionally, as reported in the preceding section, there was a significant main effect for focus of attention (F (1, 24)= 14.72; $p<.0001$) with the external group's performance being superior to that of the internal focus group. The two groups began performing at the same level, and the external group gained its advantage as practice progressed, as indicated by the focus by block interaction ($F(5, 120)= 4.82$; $p<.005$).

There was also a significant 2-way interaction between pattern and block ($F(5, 120)= 8.27$, $p<.0001$), indicating that the performance of the 90° RP and 135° RP groups was initially different, and became more similar over time (see Figure 6). The 135° group (with no experience with 90° RP) began with a significantly higher mean RMSE than the 90° RP group (with previous practice of 90° RP). While the 90° group began with a performance advantage, the two groups were performing at similar levels by the end of the session.

Insert Figure 6 about here

When the mean RP data were analyzed, a significant pattern x block interaction was found ($F(5, 120)= 8.611$; $p<.0001$) (see Figure 7). To begin the session the 90° group performed with a lower mean RP than the 135° group, with the performance of the two groups becoming more similar over time. This is probably because participants in the 135° group were initially attracted to the intrinsically stable 180° RP (anti-phase) pattern, but the 90° group had a lower mean RP because it was pulled toward the previously learned 90° RP pattern. As practice progressed each group broke away from its respective attractor, and the 135° was stabilized, resulting in more similar performance between the two groups.

Insert Figure 7 about here

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3) Intrinsic Pattern Performance:

A significant main effect for day was detected (F (2, 48)= 7.49, p<.001). Participants improved their performance of the intrinsic patterns from day 1 to day 3. There was also a main effect for intrinsic pattern performed (F(1, 24)= 112.48, p<.001). The in-phase pattern was performed with greater accuracy than the anti-phase pattern. A significant day by intrinsic pattern interaction (F(2, 48)= 10.79, p<.001) revealed that there was more improvement in the anti-phase pattern than in the in-phase pattern. This result makes sense, as anti-phase began with poorer performance, and therefore had more room to improve.

The pattern x focus x time (F(1, 24)= 4.59; p<.043), and the pattern x focus x intrinsic pattern x time (F(1, 24)= 4.80; p<.038) interactions were also significant. In any case, the external focus of attention (nor did the internal focus of attention for that matter) did not cause any deterioration in the performance of the anti-phase pattern.

Discussion

1) Learning & Attentional Focus

Learning of the new coordination pattern did take place, as participants significantly improved their performance on all tasks with practice. There was no apparent improvement on day three. This is explained by the fact that on this last day of the experiment, half of the participants switched to a new coordination pattern (135°) (refer to Figure 2). Initially, learners were able to perform the 135° RP pattern with less error than the 90° RP pattern. It may be that 135° RP is easier to perform and learn because it is located closer to the intrinsically stable 180° RP pattern than the 90° RP pattern is to either the 0° or 180° patterns. Therefore the new pattern doesn't have as far to pull from the intrinsically stable pattern to be achieved.

For both the 90° and 135° RP coordination patterns, the external focus group displayed a learning advantage over the internal focus group. The internal and external focus groups began performing at the same level, but the external focus group gained a learning advantage over time. Although this result is consistent with previous findings (Shea & Wulf, 1999; Wulf et al., 1998; Wulf & Toole. 1999), further interpretation of this result is necessary.

The internal and external focus groups received different types of feedback. The external group received online feedback, while the internal focus group received static feedback only after the completion of each trial. The augmented feedback provided to the two groups was manipulated in an attempt to elicit a different focus of attention. The online feedback was designed to draw the attention of the external focus group to an effect of their action that was external to their body. In contrast, it was considered to be more effective to instruct them to focus their attention on their own limb movements by withholding online feedback from the internal focus group.

It could be argued that the performance difference found between the groups is not actually an effect of attentional focus but rather is a result of the difference in feedback received by the two groups during practice. In an attempt to control for these feedback differences, the last block of trials on the third day equated all participants, regardless of group membership, requiring them to perform 135° RP pattern with no feedback whatsoever. During this last block of trials, there was a significant focus x trial interaction for the RMSE data, and a very trend towards significance for attentional focus ($p<.058$) for the absolute constant error data. This would seem to indicate that it was indeed attentional focus, and not simply augmented feedback differences, that contributed to this difference in performance between the two groups. However feedback differences continue to confound the results since the external focus group reached a much higher level of performance than the internal focus groups during the learning phase. It could be that this advantage persisted into the last block of trials, regardless of the attempt to equate feedback conditions.

2) Effect of Prior Learning

Prior learning of the 90° RP pattern influenced the way in which the 135° RP pattern was learned. When the group with prior learning of the 90° pattern was compared to the group without this experience, the 90° group performed the 135° pattern with less error. Therefore, there is evidence for some positive transfer of learning, meaning that performance of the 135° pattern was facilitated by prior practice of the 90° pattern. However it is unclear exactly what is transferred.

Further, the process by which the novel 135° pattern was acquired differed between the two groups. Typically, the first attempts to perform a new coordination pattern resulted in the production of one of the intrinsic patterns (in-phase or anti-phase). For the 135° RP group, this is exactly what happened. They were drawn to the anti-phase attractor. But, according to Zanone and Kelso (1992), subsequent to learning the 90° pattern the attractiveness of the 180° pattern will be weakened. Thus, attempts to perform the novel 135° coordination pattern should destabilize and fall into the newly learned 90° pattern. In accordance with this prediction, for those with previous practice of the 90° pattern, attempts to perform the novel 135° RP pattern fell into the now stable 90° RP pattern (refer to figure 7). Therefore, in addition to positive transfer, there was some negative transfer from the performance of the 90° pattern to the performance of the 135° pattern (performance of the 135° pattern deteriorated due to the attractiveness of the newly learned 90° pattern).

This finding supports the dynamical pattern theory prediction that learning changes the entire landscape in that it created a new attractor that will influence subsequent learning. This result is also consistent with the previous finding of Wenderoth and Bock (2001), who examined participants' performance of a 70° RP pattern following practice of a 90° RP task. They found that attempts to produce the novel 70° RP pattern ultimately failed and instead performance fell into the now stable 90° RP pattern. While Wenderoth and Bock argued only for negative transfer from 90° RP to 70/110° RP, the results of this study argue both for positive and negative transfer from 90° RP to 135° RP. Further, it seems that in the present experiment, the positive transfer outweighed the negative transfer (overall, performance of the 135° was enhanced by prior practice of the 90° pattern).

The present experiment adds to the previous finding of Wenderoth and Bock because the inclusion of a control group allowed for direct comparison between groups with and without prior learning of the 90° pattern. Also, Wenderoth and Bock's use of a 70° RP task was problematic because it is much closer to the newly learned 90° pattern than to either the in-phase or anti-phase patterns. Perhaps, it was not surprising then that the 90° RP pattern acted as the attractor in this situation. However, in the present study, the transfer task of 135° RP is equidistant to the newly learned 90° RP and intrinsically stable 180° RP.

3) Intrinsic Pattern Performance

The results of this experiment do not support the destabilization of the anti-phase pattern following learning, regardless of attentional focus. Therefore, the findings reported here do not support the idea that attentional focus differences are the reason for the conflicting results in the existing literature (Zanone & Kelso, 1992; Lee et al., 1995; Fontaine et al., 1997). However, attentional focus is not the only discrepancy in the tasks used in this body of work, and there are other possible explanations that remain to be tested.

First, in all instances the metronome (both visual and auditory) specified the absolute time constraints of the moving limbs (e.g., 1 Hz). However, the visual metronomes specified relative timing (relative phase) information as well, which is not provided by the auditory metronomes. Perhaps the added information supplied to participants in Zanone and Kelso's (1992) work gives them a learning advantage, and that the better learned the novel task is, the more it disrupts the performance of the intrinsic patterns.

Other than the difference in metronomes used between the two groups of research there are other differences. One of the larger differences is the type of movement involved. Zanone and Kelso (1992) required participants to flex and extend the index fingers in a 90° RP pattern. However, Lee et al. (1995), and Fontaine et al. (1997) required learners to flex and extend their forearms at the elbow in a 90° phase relationship. Since attentional focus does not account for the differences in these studies, perhaps, it is this difference in actions. There is a body of literature that indicates that finger actions are controlled differently than arm movements. The results of behavioural studies indicate that while the brain controls arm, hand and finger movements contralaterally, ipsilateral control is evident only for arm movements. Studies investigating split-brain monkeys (Brinkman & Kuypers, 1973) showed that while reaching movements made with the arm were correct and efficient, hand and finger movements lacked this accuracy. More recent work on human callostomy patients has uncovered some ipsilateral control of the hand and fingers (Trope, Fishman, Gur, Sussman, & Gur, 1987). However, this ipsilateral control of the hand and fingers was not as accurate and efficient as the ipsilateral control of the arm. Therefore, if the way in which movements of the hand and fingers are controlled differs (contralaterally, and ipsilaterally, respectively), then it could be this difference that has created the discrepancy in the findings of Zanone and Kelso (1992) (who used a task involving finger movements), Lee et al. (1995) and Fontaine et al. (1997) (who used tasks involving arm movements).

Summary

While this experiment failed to resolve conflicting findings concerning the effect of learning a new bimanual coordination pattern on the performance of the intrinsic coordination patterns, it did produce some interesting new findings. The present findings lend support to the idea that learning creates new attractors that will influence subsequent learning. In the future, work examining learning should take into account existing coordination abilities. Also, while the results seems to indicate that attentional focus influences learning of a new bimanual coordination pattern, these findings are confounded by feedback differences between the internal and external focus groups. Further work should attempt to manipulate focus of attention while keeping feedback constant across groups in order to more conclusively determine the effect of attention on the learning of a new coordination pattern.

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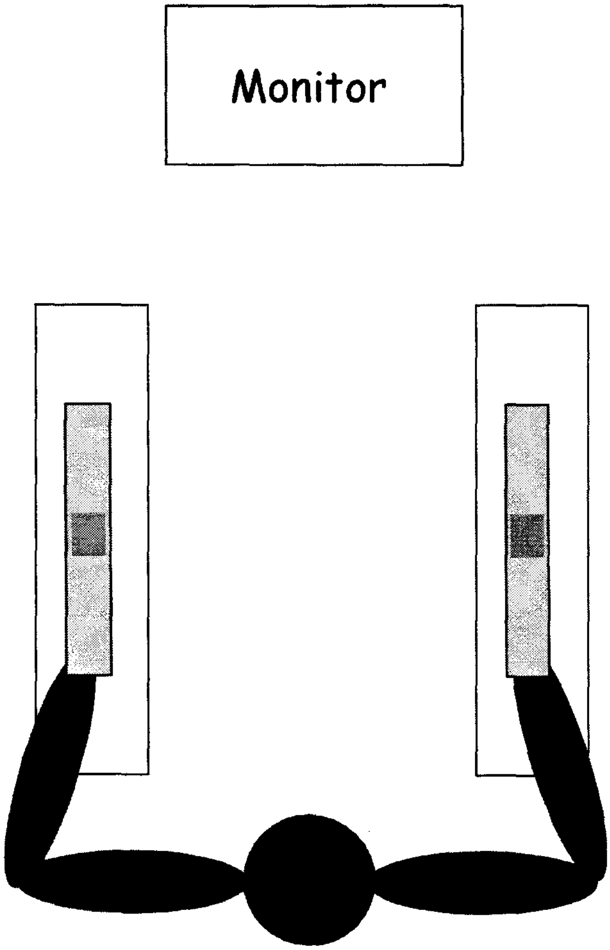
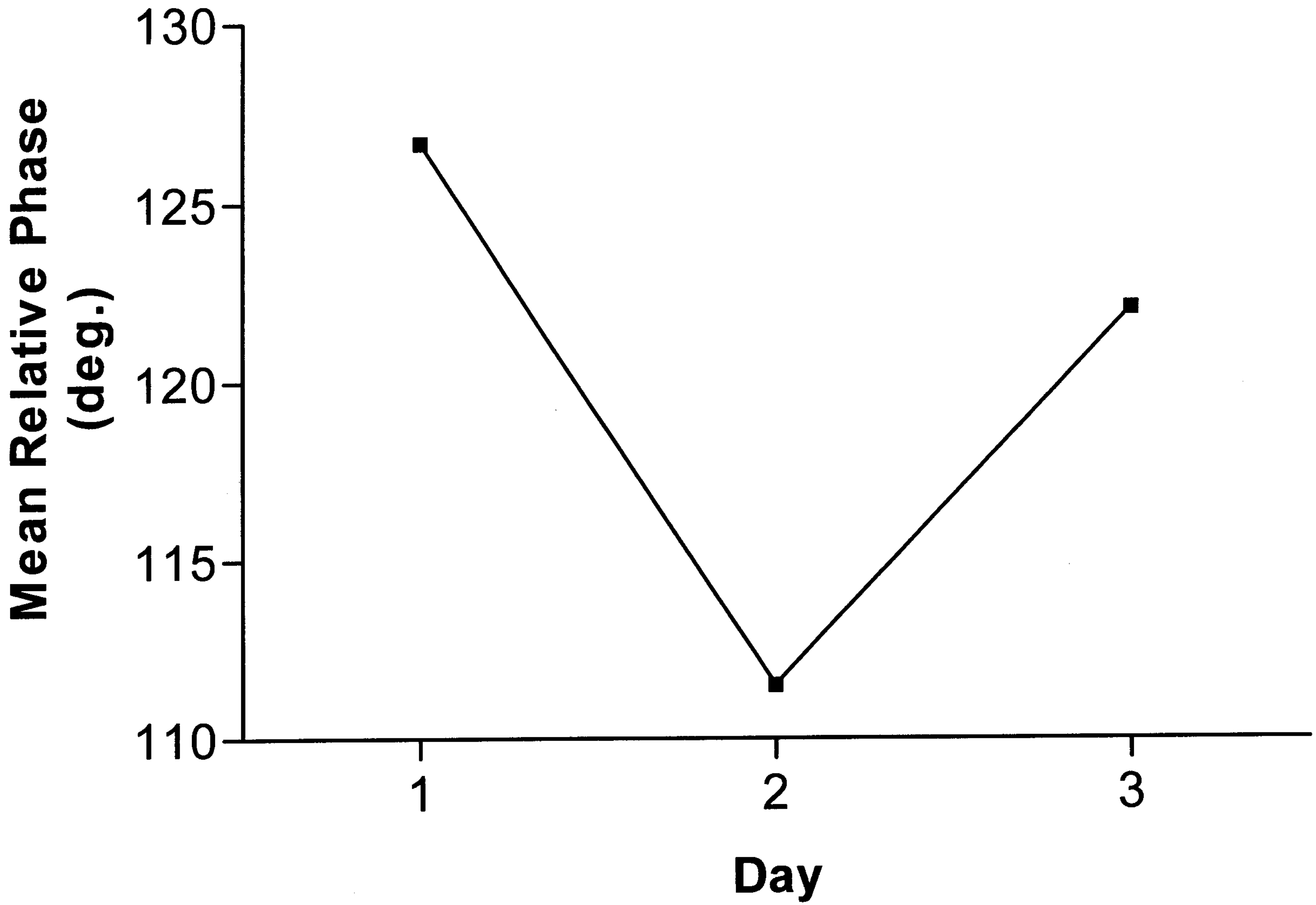
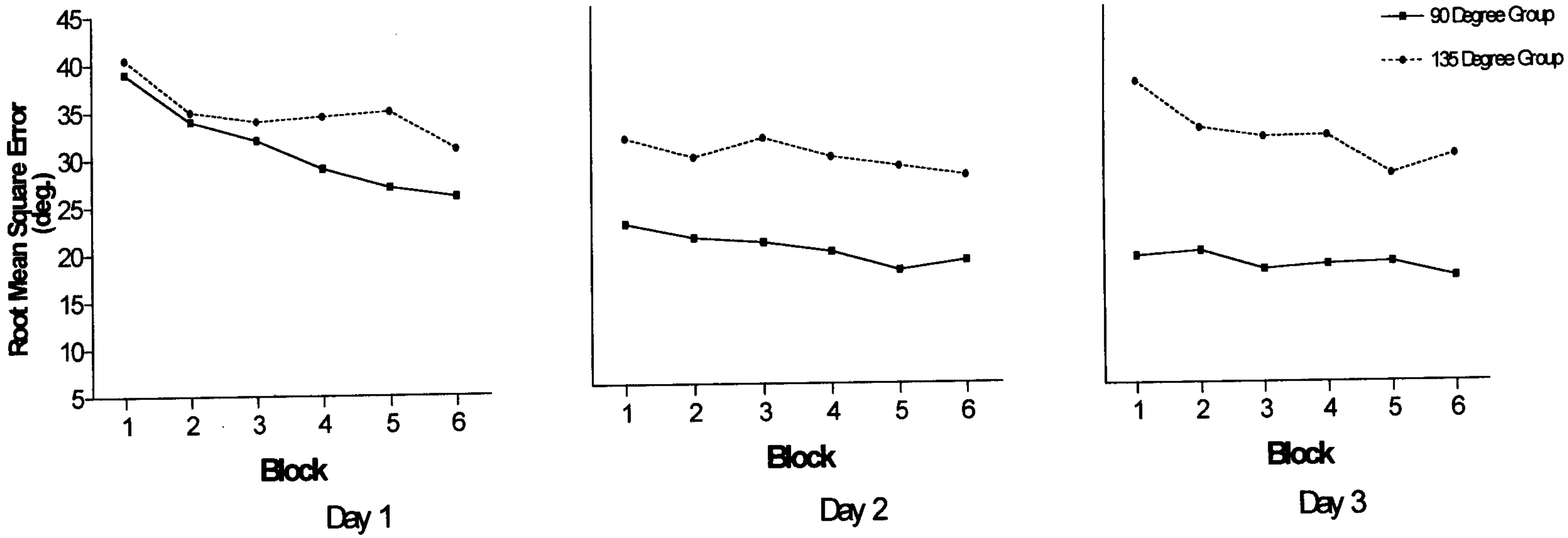
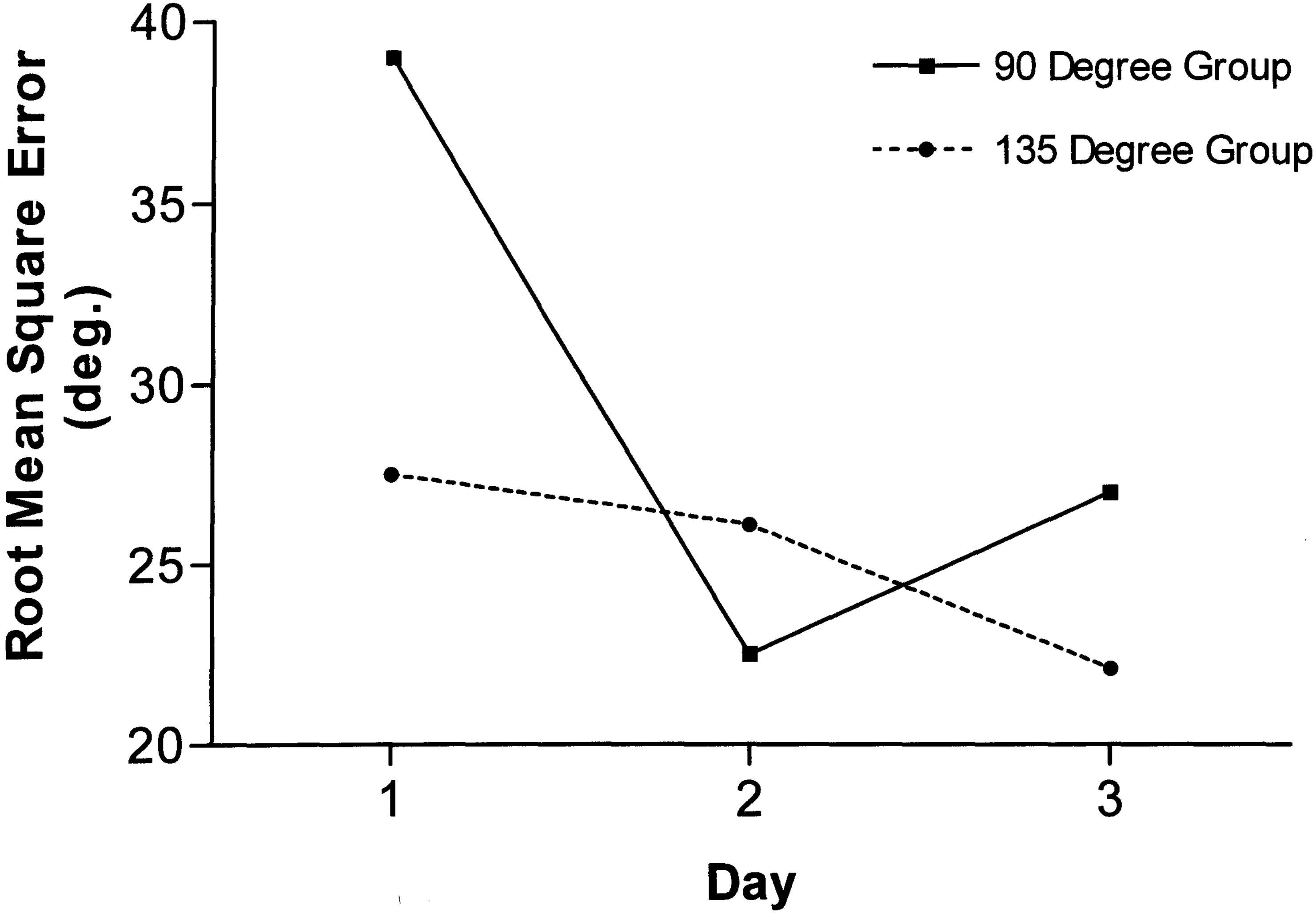
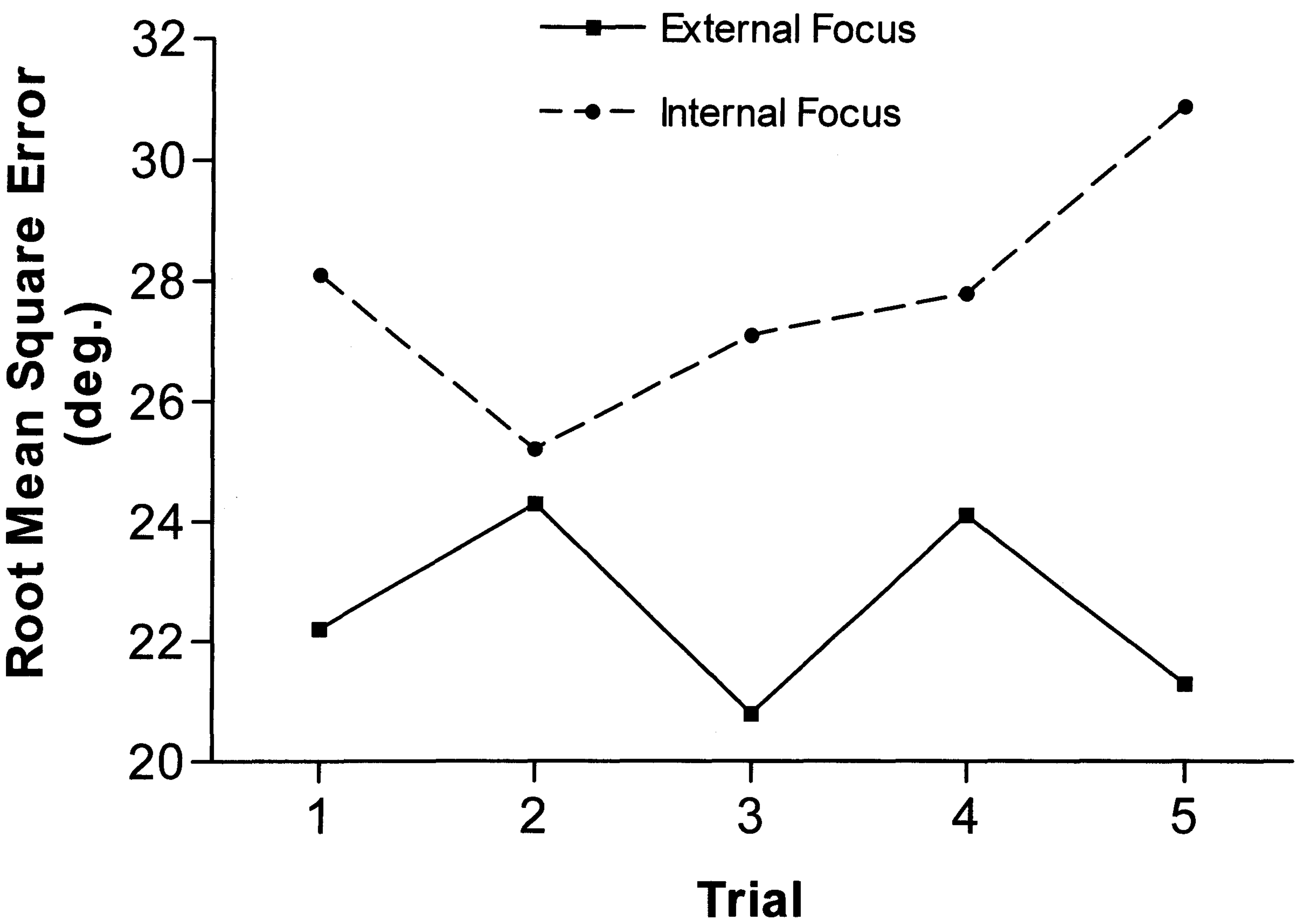

Monitor

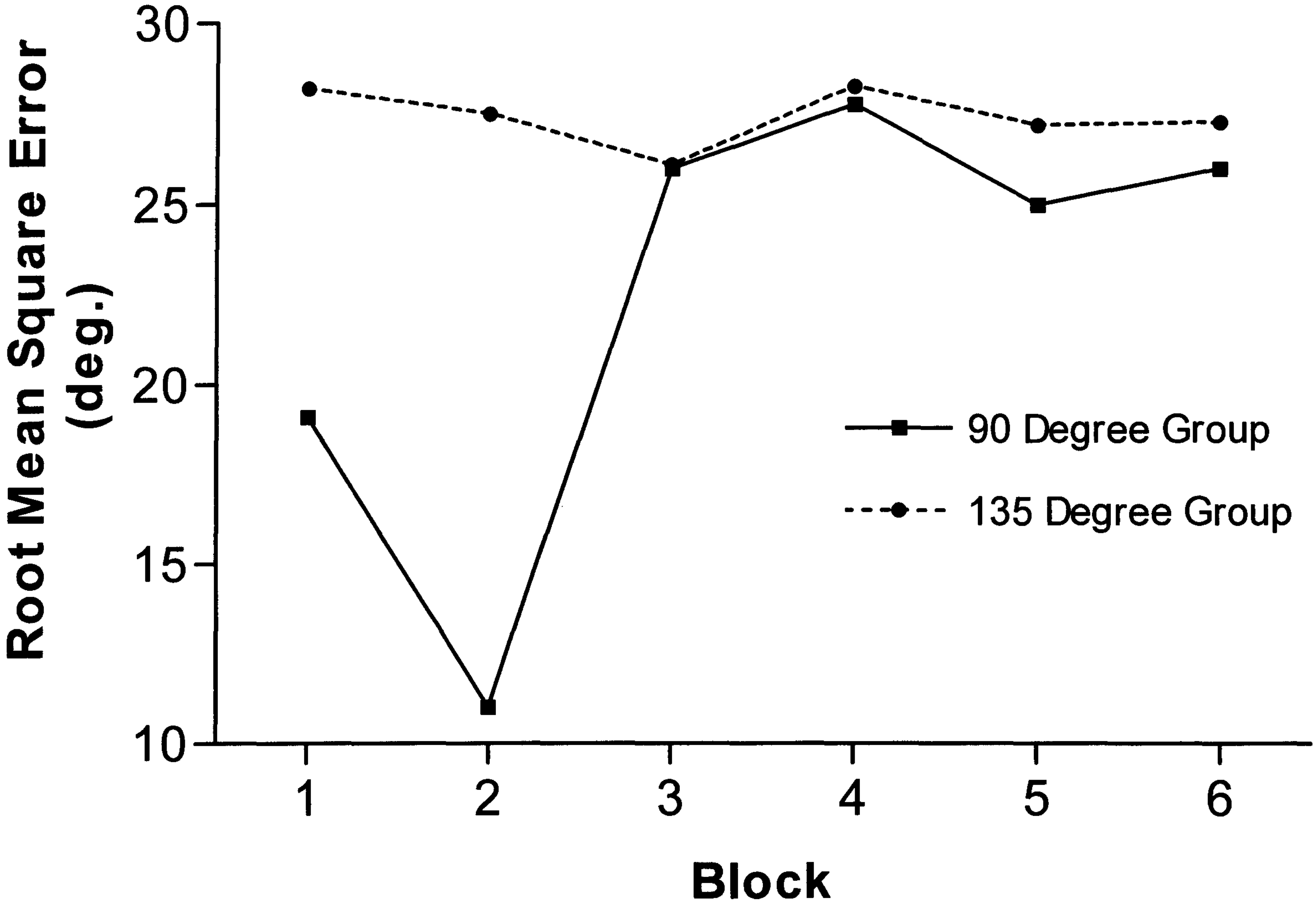

130
125
120
115
110
Mean Relative Phase (deg.)
1
2
3
Day



Root Mean Square Error (deg.)
45
40
35
30
25
20
15
10
5
1
2
3
4
5
6
Block
Day 1
Day 2
Day 3
90 Degree Group
135 Degree Group


Root Mean Square Error (deg.)
40
35
30
25
20
90 Degree Group
135 Degree Group
1
2
3
Day


External Focus
Internal Focus
Root Mean Square Error (deg.)
32
30
28
26
24
22
20
1
2
3
4
5
Trial


Root Mean Square Error (deg.)
30
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6
Block
90 Degree Group
135 Degree Group

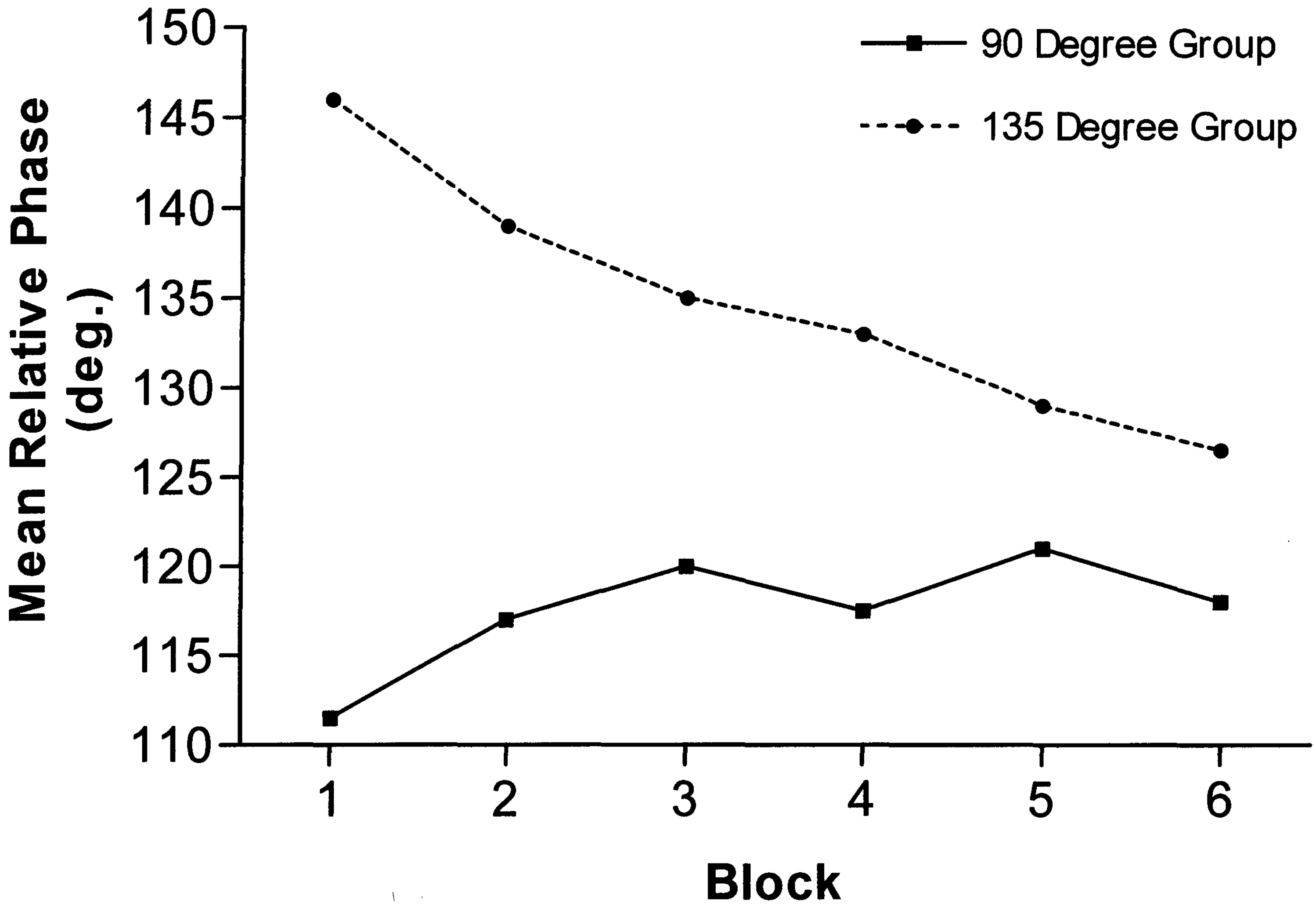
Mean Relative Phase (deg.)
150
145
140
135
130
125
120
115
110
90 Degree Group
135 Degree Group
1
2
3
4
5
6
Block

Table 1. Overview of Experiment

Learning Style	Pattern Performed During Learning Phase	Pattern Performed During Transfer Phase
Internal Focus	90° RP	135° RP
	135° RP	135° RP
External Focus	90° RP	135° RP
	135° RP	135° RP

Table 2: Experimental Schedule

Group	Learning Phase			Transfer Phase			
	Days 1 & 2			Day 3 - Stage 1			Day 3 - Stage 2
Internal-90°	0°, 180° probes	30 trials 90°	0°, 180° probes	0°, 180° probes	30 trials 135°	0°, 180° probes	5 trials 135°
Internal-135°		30 trials 135°					
External-90°		30 trials 90°					
External-135°		30 trials 135°					

Table 3 – Mean Relative Phase for Intrinsic Pattern Probes

Group	Day 1				Day 2				Day 3			
	In-phase		Anti-phase		In-phase		Anti-phase		In-phase		Anti-phase	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
E-90°	6.630	7.325	175.004	164.209	7.638	5.462	173.080	170.299	7.35	7.047	169.065	167.366
	7.461	4.690	164.185	164.251	6.002	5.942	171.525	164.724	5.316	8.493	167.126	162.084
	5.771	6.637	162.369	171.438	5.317	3.959	169.942	156.469	6.602	5.838	172.237	168.044
	5.462	6.555	170.092	170.233	5.807	6.555	166.360	168.194	7.973	4.753	172.669	171.351
	5.907	5.751	168.680	169.160	6.942	7.879	163.031	169.992	6.117	7.585	170.475	171.848
	5.005	6.550	171.295	175.358	5.058	5.520	175.315	170.987	7.44	14.634	173.311	173.178
	4.420	4.186	168.167	168.268	3.421	5.338	173.932	166.022	3.533	3.221	168.464	170.447
I-90°	5.096	7.005	171.342	170.968	3.588	4.709	173.326	172.528	3.401	3.744	171.302	171.750
	7.664	16.663	165.078	168.834	4.221	4.262	168.878	168.426	6.213	3.560	172.869	174.714
	6.047	6.326	165.682	169.728	5.297	3.786	172.112	171.330	6.664	8.462	171.609	172.498
	7.125	4.086	169.675	170.199	4.153	7.492	170.386	168.901	4.144	6.740	170.262	170.905
	5.610	6.357	165.555	169.981	5.050	6.170	170.150	168.335	7.772	5.082	171.729	169.569
	5.231	6.316	169.935	171.848	7.573	4.524	170.147	172.490	8.572	5.021	168.524	172.290
	3.353	5.686	171.283	164.522	6.116	5.420	167.789	169.996	4.588	5.725	168.095	171.482
E-135°	5.951	4.850	171.070	172.343	6.830	4.194	173.746	172.554	6.445	5.154	174.290	173.272
	2.997	2.942	173.809	171.363	4.901	4.398	169.867	174.350	3.986	5.913	174.944	174.294
	4.708	4.542	166.442	171.739	3.569	3.417	174.330	170.217	6.478	2.830	172.444	172.976
	5.21	4.06	169.59	170.20	5.78	4.24	170.83	168.12	4.648	4.753	170.810	175.548
	5.240	6.025	167.051	167.669	4.041	3.992	170.092	171.006	5.192	5.739	169.871	171.505
	7.534	8.005	153.993	162.875	5.692	3.041	.157.742	168.109	4.440	3.232	161.698	161.329
	3.701	5.886	167.225	164.848	5.292	6.044	170.346	169.649	5.289	4.307	173.339	169.660
I-135°	4.514	5.982	168.523	171.206	6.351	5.701	172.826	169.402	8.949	5.726	170.621	167.730
	5.793	4.324	171.622	173.941	5.377	5.738	167.377	158.850	4.981	3.233	171.021	168.212
	6.008	4.770	164.378	165.660	8.120	4.569	173.913	173.137	5.168	4.380	175.450	171.704
	4.738	4.532	168.597	169.375	4.401	3.775	171.752	168.471	7.312	4.527	173.066	170.722
	6.155	7.362	166.706	166.043	6.312	7.260	164.948	170.554	5.851	6.777	170.532	167.537
	4.925	3.951	165.076	168.303	3.789	6.271	173.388	167.875	4.090	5.975	176.731	170.377
	5.046	5.375	167.517	165.564	5.151	8.608	168.532	169.103	7.512	5.309	166.709	171.765

*Note. E= External focus of attention, I= Internal Focus of Attention

Table 4 – Standard Deviation for Intrinsic Pattern Probes

Group	Day 1				Day 2				Day 3			
	In-phase		Anti-phase		In-phase		Anti-phase		In-phase		Anti-phase	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
E-90°	4.415	5.573	4.416	13.771	5.126	3.836	4.430	8.306	4.809	5.159	7.449	8.619
	5.789	3.028	10.606	13.113	4.446	3.988	6.126	11.987	3.431	6.876	9.650	11.044
	4.596	5.112	9.221	6.595	4.922	3.048	7.995	12.427	4.994	4.400	7.097	8.174
	3.556	6.119	7.790	7.299	4.263	6.119	8.529	8.837	5.825	3.938	6.129	5.744
	4.799	3.711	6.769	8.153	4.961	5.002	9.169	7.401	3.990	4.916	7.369	5.585
	3.047	4.284	7.377	3.508	3.537	4.063	3.293	4.532	5.709	8.212	4.055	5.949
	3.882	2.996	11.400	8.022	2.401	4.002	4.247	9.376	2.347	2.521	6.986	6.515
I-90°	3.915	5.288	6.668	5.340	2.952	3.715	4.372	5.179	2.642	2.710	5.026	5.936
	5.489	0.928	9.037	6.774	3.187	3.148	6.684	7.572	3.668	3.171	6.560	3.934
	4.768	4.162	8.575	6.720	4.171	2.982	5.496	6.551	4.346	4.857	5.526	5.612
	4.847	2.825	7.507	7.026	3.238	4.501	6.336	6.486	3.365	4.554	6.005	6.197
	4.416	4.057	9.044	9.026	3.719	4.499	7.151	8.824	5.208	3.370	7.036	8.187
	3.672	3.841	8.025	6.992	5.069	3.298	6.394	5.092	5.920	4.119	7.145	6.404
	2.670	4.238	6.518	10.353	4.901	4.075	7.352	7.036	3.134	3.940	8.007	5.609
E-135°	3.479	3.524	7.460	4.739	5.320	3.293	4.130	4.968	3.836	4.024	4.298	4.500
	2.317	1.909	5.164	4.824	3.106	3.016	6.161	3.792	2.939	3.519	3.731	3.982
	3.778	3.048	9.971	7.240	2.904	2.212	4.929	6.978	4.128	2.027	5.572	4.297
	4.204	3.931	8.924	7.026	4.763	4.281	6.452	10.268	3.181	3.883	5.924	4.282
	4.114	6.896	9.376	17.172	3.166	2.709	6.682	6.003	3.423	4.017	5.765	5.546
	3.655	3.910	11.145	8.936	3.596	2.219	10.131	6.125	3.261	2.551	9.992	10.360
	2.493	3.987	11.761	10.480	4.007	4.857	6.128	8.090	3.548	7.031	4.635	7.017
I-135°	3.096	5.443	8.362	5.832	5.650	3.749	6.231	6.590	5.179	4.321	6.601	9.858
	3.751	3.892	5.771	6.008	4.137	3.705	9.417	7.673	3.617	2.436	6.161	8.545
	4.706	3.386	9.680	9.906	8.338	3.192	3.865	5.116	3.549	3.072	2.978	6.410
	4.059	3.131	7.276	6.794	3.212	2.451	6.750	8.094	5.457	3.355	5.036	6.016
	4.447	5.891	9.927	9.107	4.600	4.759	10.336	7.342	5.767	4.457	7.524	7.714
	3.904	3.012	8.882	8.207	2.885	4.839	5.132	9.972	2.807	4.251	4.112	6.208
	3.431	3.944	8.299	9.896	3.949	6.015	8.745	8.151	6.204	3.771	9.785	5.964

*Note. E= External focus of attention, I= Internal Focus of Attention

Table 5 – Absolute Constant Error for Intrinsic Pattern Probes

Group	Day 1				Day 2				Day 3			
	In-phase		Anti-phase		In-phase		Anti-phase		In-phase		Anti-phase	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
E-90°	6.63	7.325	4.996	15.791	7.638	5.462	6.92	9.701	7.354	7.047	10.935	12.634
	7.461	4.69	15.815	15.749	6.002	5.942	8.475	15.276	5.316	8.493	12.874	17.916
	5.771	6.637	17.631	8.562	5.317	3.959	10.058	23.531	6.602	5.838	7.763	11.956
	5.462	6.555	9.908	9.767	5.807	6.555	13.64	11.806	7.973	4.753	7.331	8.649
	5.907	5.751	11.32	10.84	6.942	7.879	16.969	10.008	6.117	7.585	9.525	8.152
	5.005	6.55	8.705	4.642	5.058	5.52	4.685	9.013	7.444	14.634	6.689	6.822
	4.42	4.186	11.833	11.732	3.421	5.338	6.068	13.978	3.533	3.221	11.536	9.553
I-90°	5.096	7.005	8.658	9.032	3.588	4.709	6.674	7.472	3.401	3.744	8.698	8.25
	7.664	16.663	14.922	11.166	4.221	4.262	11.122	11.574	6.213	3.56	7.131	5.286
	6.047	6.326	14.318	10.272	5.297	3.786	7.888	8.67	6.664	8.462	8.391	7.502
	7.125	4.086	10.325	9.801	4.153	7.492	9.614	11.099	4.144	6.74	9.738	9.095
	5.61	6.357	14.445	10.019	5.05	6.17	9.85	11.665	7.772	5.082	8.271	10.431
	5.231	6.316	10.065	8.152	7.573	4.524	9.853	7.51	8.572	5.021	11.476	7.71
	3.353	5.686	8.717	15.478	6.116	5.42	12.211	10.004	4.588	5.725	11.905	8.518
E-135°	5.951	4.85	8.93	7.657	6.83	4.194	6.254	7.446	6.445	5.154	5.71	6.728
	2.997	2.942	6.191	8.637	4.901	4.398	10.133	5.65	3.986	5.913	5.056	5.706
	4.708	4.542	13.558	8.261	3.569	3.417	5.67	9.783	6.478	2.83	7.556	7.024
	5.21	4.055	10.406	9.801	5.778	4.243	9.171	11.885	4.648	4.753	9.19	4.452
	5.24	6.025	12.949	12.331	4.041	3.992	9.908	8.994	5.192	5.739	10.129	8.495
	7.534	8.005	26.007	17.125	5.692	3.041	22.258	11.891	4.44	3.232	18.302	18.671
	3.701	5.886	12.775	15.152	5.292	6.044	9.654	10.351	5.289	4.307	6.661	10.34
I-135°	4.514	5.982	11.477	8.794	6.351	5.701	7.174	10.598	8.949	5.726	9.379	12.27
	5.793	4.324	8.378	6.059	5.377	5.738	12.623	21.15	4.981	3.233	8.979	11.788
	6.008	4.77	15.622	14.34	8.12	4.569	6.087	6.863	5.168	4.38	4.55	8.296
	4.738	4.532	11.403	10.625	4.401	3.775	8.248	11.529	7.312	4.527	6.934	9.278
	6.155	7.362	13.294	13.957	6.312	7.26	15.052	9.446	5.851	6.777	9.468	12.463
	4.925	3.951	14.924	11.697	3.789	6.271	6.612	12.125	4.09	5.975	3.269	9.623
	5.046	5.375	12.483	14.436	5.151	8.608	11.468	10.897	7.512	5.309	13.291	8.235

*Note. E= External focus of attention, I= Internal Focus of Attention

Table 6 – Root Mean Square Error for Intrinsic Pattern Probes

Group	Day 1				Day 2				Day 3			
	In-phase		Anti-phase		In-phase		Anti-phase		In-phase		Anti-phase	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
E-90°	7.965	9.204	6.667	20.952	9.198	6.674	8.216	12.771	8.956	8.733	13.231	15.293
	9.443	5.582	19.042	20.493	7.469	7.156	10.457	19.417	6.327	10.921	16.089	21.046
	7.377	8.377	19.896	10.807	7.245	4.996	12.848	26.610	8.278	7.310	10.518	14.483
	6.517	8.967	12.603	12.193	7.203	8.967	16.087	14.747	9.874	6.172	9.555	10.382
	7.610	6.844	13.189	13.563	8.532	9.332	19.28	12.447	7.303	9.038	12.042	9.881
	5.859	7.826	11.410	5.818	6.172	6.854	5.726	10.437	9.381	16.780	7.822	9.051
	5.882	5.168	16.431	14.212	4.179	6.671	7.406	16.831	4.241	4.090	13.486	11.563
I-90°	6.426	8.776	10.928	10.492	4.646	5.997	7.978	9.091	4.306	4.621	10.045	10.163
	9.426	16.688	17.445	13.067	5.289	5.298	12.975	13.830	7.214	4.767	9.689	6.589
	7.700	7.572	16.689	12.27	6.742	4.819	9.613	10.866	7.955	9.756	10.047	9.368
	8.617	4.967	12.765	12.059	5.266	8.740	11.514	12.855	5.338	8.134	11.448	11.005
	7.139	7.541	17.042	13.485	6.271	7.636	12.172	14.626	9.355	6.097	10.858	13.260
	6.391	7.392	12.872	10.739	9.112	5.598	11.745	9.073	10.417	6.494	13.518	10.022
	4.282	7.091	10.884	18.621	7.837	6.781	14.258	12.230	5.556	6.949	14.347	10.198
E-135°	6.893	5.995	11.636	9.004	8.657	5.332	7.494	8.951	7.500	6.538	7.146	8.094
	3.788	3.507	8.061	9.892	5.802	5.332	11.858	6.804	4.952	6.880	6.283	6.958
	6.036	5.469	16.829	10.984	4.601	4.070	7.512	12.016	7.681	3.481	9.388	8.234
	6.694	5.647	13.708	12.0592	7.488	6.027	11.213	15.706	5.632	6.137	10.933	6.177
	6.662	9.157	15.987	21.140	5.133	4.824	11.950	10.813	6.218	7.005	11.654	10.145
	8.373	8.908	28.294	19.316	6.732	3.784	24.455	13.375	5.508	4.117	20.851	21.352
	4.462	7.109	17.364	18.423	6.637	7.753	11.434	13.137	6.368	8.245	8.114	12.496
I-135°	5.473	8.087	14.200	10.552	8.500	6.823	9.502	12.479	10.339	7.173	11.469	15.739
	6.901	5.817	10.173	8.532	6.784	6.830	15.748	22.498	6.155	4.048	10.88	14.559
	7.631	5.849	18.377	17.428	11.638	5.573	7.210	8.560	6.269	5.349	5.437	10.483
	6.238	5.508	13.526	12.611	5.448	4.500	10.65	14.08	9.123	5.634	8.569	11.057
	7.593	9.428	16.591	16.665	7.810	8.680	18.259	11.963	8.215	8.111	12.093	14.657
	6.284	4.968	17.367	14.288	4.762	7.920	8.369	15.698	4.960	7.332	5.253	11.451
	6.101	6.666	14.989	17.502	6.490	10.501	14.421	13.608	9.742	6.511	16.504	10.167

*Note. E= External focus of attention, I= Internal Focus of Attention

Table 7. Mean Relative Phase Data – Day 1 (*Note. E= External focus of attention, I= Internal Focus of Attention)

Group	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	Trial 11	Trial 12	Trial 13	Trial 14	Trial 15
	106.9	137.4	140.3	122.5	104.9	101.4	93.0	92.4	108.3	119.9	107.1	125.5	103.3	99.2	84.6
	163.4	169.7	155.9	158.1	160.1	149.3	143.9	138.1	129.3	154.6	147.1	159.9	154.0	161.5	164.7
	163.8	149.4	140.3	159.8	140.3	129.8	133.4	128.7	142.4	123.8	128.6	144.3	129.0	135.7	120.7
E - 90°	117.4	95.8	109.6	107.5	95.1	104.8	100.6	105.5	98.5	103.4	95.2	111.5	117.5	107.7	87.5
	140.3	124.7	126.1	106.9	102.5	130.7	113.9	108.5	108.4	101.3	107.7	109.0	107.9	108.3	119.4
	152.0	124.2	107.3	115.1	104.4	109.8	129.6	113.0	101.7	114.5	115.0	124.7	134.4	134.7	114.6
	158.8	156.9	121.0	117.3	135.1	113.4	89.4	151.8	126.6	146.1	133.5	139.2	114.3	101.5	109.3
	156.0	167.5	124.6	149.7	139.8	132.8	144.8	94.5	105.0	89.3	109.3	101.1	113.6	109.8	89.0
	150.9	172.2	171.1	165.7	157.9	170.2	165.7	161.4	163.1	165.4	158.9	163.0	151.6	154.9	156.1
	164.3	167.3	159.0	150.3	146.4	162.9	143.5	157.5	159.4	155.0	164.1	165.0	164.4	168.0	168.2
I - 90°	164.8	60.6	118.7	170.5	82.9	88.7	95.9	82.8	101.8	82.3	79.3	87.1	84.6	98.2	116.6
	87.1	88.0	77.8	72.6	71.4	72.9	70.7	78.6	79.7	86.3	76.4	105.9	79.7	69.0	98.3
	96.4	120.3	122.9	100.0	119.9	98.9	121.4	111.2	100.3	103.8	127.3	95.9	88.6	100.3	108.0
	127.0	92.1	163.0	157.1	104.1	134.4	109.1	139.2	96.2	139.7	124.3	109.4	134.4	74.4	84.4
	166.5	156.5	150.4	159.3	87.4	110.7	118.2	150.6	150.6	144.5	134.7	155.4	127.5	124.6	131.5
	157.0	161.2	150.7	161.4	114.9	123.7	120.9	131.9	135.8	132.6	133.3	149.9	141.1	133.2	123.6
	138.6	141.8	139.0	152.8	150.2	145.6	144.8	164.6	119.6	118.6	112.1	154.5	142.1	147.6	147.1
E – 135°	147.8	134.6	136.5	148.4	144.1	135.6	130.3	131.9	138.3	133.7	138.2	128.0	135.6	130.1	136.2
	153.2	157.5	171.0	152.0	165.5	160.2	159.5	167.7	162.8	164.4	154.7	157.1	135.0	153.3	154.9
	98.0	120.9	97.3	71.8	128.8	112.6	112.7	151.1	140.7	144.6	130.7	138.8	140.7	146.7	134.2
	165.2	165.0	167.9	159.0	135.3	134.8	102.9	128.8	126.6	110.1	99.3	113.5	109.1	131.4	110.7
	125.6	148.0	138.1	119.7	162.4	155.2	154.1	159.4	166.9	146.8	160.8	138.1	136.6	155.7	166.7
	120.6	128.3	123.4	129.5	149.2	116.6	108.6	104.1	105.8	95.7	94.7	96.2	94.7	93.9	78.3
	160.0	162.1	162.0	153.6	167.6	154.3	154.9	155.3	157.5	160.7	153.0	154.6	148.6	152.3	152.2
I - 135°	159.2	164.3	157.1	156.3	157.8	160.4	152.8	164.4	166.6	157.5	163.2	165.4	161.5	159.7	164.8
	168.7	162.0	160.9	162.5	165.1	134.5	135.6	130.4	139.8	133.3	122.5	122.4	108.7	141.1	147.7
	143.6	170.5	165.8	158.4	156.5	143.5	160.5	159.3	141.1	155.3	143.5	139.2	145.7	145.6	150.2
	162.6	147.3	155.9	155.4	160.9	157.6	153.5	159.3	159.1	148.9	150.7	141.5	137.6	157.2	139.0

Group	Trial 16	Trial 17	Trial 18	Trial 19	Trial 20	Trial 21	Trial 22	Trial 23	Trial 24	Trial 25	Trial 26	Trial 27	Trial 28	Trial 29	Trial 30
E - 90°	113.6	88.9	113.7	107.2	79.2	104.2	136.2	103.3	110.3	111.7	113.0	77.7	109.7	93.3	111.2
	168.5	148.9	121.0	157.3	141.0	144.4	147.8	130.7	131.0	153.6	145.1	132.6	110.3	137.1	134.4
	124.7	125.8	108.0	121.6	112.3	108.0	109.0	104.6	109.4	96.8	99.0	91.5	104.3	100.7	96.0
	96.3	106.8	102.2	91.8	99.4	101.5	94.3	100.9	103.6	96.3	91.1	99.5	94.5	91.9	85.2
	106.5	96.8	104.4	111.7	123.8	115.5	102.5	120.1	115.2	103.3	96.1	100.2	101.4	106.5	111.2
	113.7	104.6	104.7	103.9	103.6	106.5	98.6	97.9	109.9	85.9	116.3	106.2	98.6	100.5	102.2
	122.5	107.5	125.7	114.3	111.2	87.7	123.5	108.9	102.7	108.6	114.6	124.5	119.5	130.1	130.5
I - 90°	86.8	105.9	88.9	114.7	83.0	137.1	106.2	103.9	100.1	112.1	99.8	93.4	85.5	101.7	100.5
	129.4	129.7	139.3	148.2	136.6	134.8	144.2	130.5	143.9	153.4	135.2	130.3	137.3	138.9	151.1
	168.0	169.3	170.1	162.3	161.0	158.7	162.3	151.1	162.7	164.5	144.8	134.7	129.9	120.7	133.1
	94.8	89.7	81.6	86.8	87.9	82.4	94.1	95.6	85.5	130.2	74.1	71.5	79.8	80.2	79.7
	94.8	90.5	106.9	113.7	83.5	92.6	75.6	81.7	78.8	84.5	74.5	81.6	79.1	78.4	93.7
	98.7	90.0	72.3	90.0	84.1	98.5	118.4	96.0	124.2	87.0	78.4	112.7	95.1	77.3	80.1
	127.3	140.7	151.5	150.6	141.9	75.1	99.2	110.4	107.1	131.7	103.0	116.2	93.3	93.6	107.9
E – 135°	127.8	143.4	136.9	112.4	112.5	121.2	119.4	127.1	137.3	131.4	124.9	137.1	129.8	132.0	129.6
	118.2	117.5	105.6	109.9	116.4	104.4	133.0	144.7	123.7	113.0	117.8	99.8	101.6	108.0	103.4
	151.9	138.1	148.1	145.4	144.7	149.9	144.9	147.6	139.2	144.9	150.7	149.1	144.5	161.2	163.4
	139.8	130.9	142.5	130.0	140.7	136.1	121.2	133.0	133.4	121.0	132.7	125.6	127.5	139.1	124.2
	159.2	166.7	138.1	123.1	144.8	152.4	155.2	142.2	136.8	146.9	145.0	144.1	137.8	138.7	149.9
	139.2	129.1	122.9	121.8	108.0	121.5	131.2	128.9	122.1	133.1	117.7	104.4	100.5	125.5	125.1
	127.9	125.6	106.6	96.5	138.4	117.4	151.0	148.1	139.0	125.2	122.1	114.0	96.6	119.9	109.1
I - 135°	163.0	149.5	151.7	151.7	137.9	131.6	110.4	159.9	159.9	147.2	127.6	145.1	130.0	148.8	132.4
	85.1	77.0	107.8	82.5	72.8	72.0	82.1	74.1	81.6	79.2	74.9	85.3	75.6	87.4	85.3
	161.4	144.1	137.2	150.4	136.5	135.7	149.0	150.1	150.8	153.1	148.5	157.7	140.8	143.1	155.1
	166.4	167.1	161.2	147.0	166.3	161.6	164.1	165.6	166.5	158.2	159.6	138.0	151.3	151.6	150.1
	137.4	119.3	111.9	126.9	112.0	116.5	117.1	124.6	113.5	116.0	125.3	118.9	118.4	130.6	115.7
	133.9	144.8	140.0	140.8	121.2	140.8	112.7	85.4	144.9	74.3	115.0	133.7	137.3	152.2	133.9
	135.6	142.2	143.3	136.5	128.3	130.1	128.4	112.6	101.5	154.6	134.5	157.9	131.3	114.6	126.5

Table 8. Mean Relative Phase Data – Day 2 (*Note. E= External focus of attention, I= Internal Focus of Attention)

Group	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	Trial 11	Trial 12	Trial 13	Trial 14	Trial 15
	128.3	109.3	100.8	99.0	93.8	99.3	99.2	105.2	107.3	101.9	106.5	113.9	113.9	100.0	97.7
	164.9	152.9	132.1	140.9	132.7	141.2	119.6	137.6	106.5	123.3	113.0	109.2	117.9	108.0	127.5
	103.4	92.8	97.3	98.4	94.3	91.0	94.4	100.7	98.0	101.5	100.2	95.3	91.9	78.3	80.5
E - 90°	82.6	83.8	89.7	85.7	84.3	89.0	92.8	93.3	93.0	92.7	91.6	95.3	97.0	100.0	100.1
	105.7	108.6	112.4	106.3	102.7	101.1	97.2	93.6	95.1	99.7	101.1	96.9	79.4	96.1	93.1
	83.5	86.7	101.3	86.8	87.7	93.1	78.5	89.5	85.7	82.2	86.3	95.0	92.6	98.1	89.2
	112.3	108.2	112.5	114.1	104.4	99.8	90.0	102.1	98.6	84.5	91.0	83.6	108.1	87.9	100.6
	98.4	93.4	95.3	91.0	95.3	80.8	99.2	105.2	99.7	99.3	90.0	82.9	85.4	95.7	95.6
	116.2	122.2	122.1	117.9	123.7	125.0	127.0	125.3	121.9	122.0	119.3	120.6	117.3	119.2	125.3
	158.4	158.1	155.1	138.9	154.6	146.5	148.3	135.3	137.8	141.1	137.7	142.0	135.8	139.9	134.6
I - 90°	77.5	75.1	69.5	79.1	92.2	90.4	84.1	83.7	74.9	82.4	80.5	78.3	91.4	73.2	67.1
	70.5	65.6	78.3	69.5	67.6	72.9	70.8	73.1	78.3	83.2	83.5	79.0	78.7	76.1	78.9
	63.6	69.1	73.2	70.3	83.8	91.4	73.8	92.0	73.4	78.2	83.0	93.6	82.3	67.3	99.6
	56.1	96.5	81.3	83.7	73.8	84.4	86.4	92.7	91.1	10.5	116.6	94.7	97.7	76.7	96.7
	145.2	152.0	139.9	128.0	116.3	131.1	137.5	125.8	122.7	127.9	136.2	129.1	137.1	118.8	130.8
	121.4	114.4	118.0	115.4	123.0	139.8	126.3	113.5	118.4	106.1	110.2	103.2	108.7	107.0	100.1
	148.9	145.0	151.4	144.6	144.0	157.3	152.1	149.4	159.9	149.1	140.9	143.7	138.6	128.5	143.1
E – 135°	118.5	122.5	126.7	133.3	126.0	124.7	129.9	134.1	132.6	133.2	129.1	134.6	132.6	131.6	136.7
	142.5	135.7	130.3	138.8	130.8	143.3	136.4	140.8	144.8	140.2	133.6	134.0	133.6	130.7	141.5
	144.7	145.3	150.9	145.2	142.6	142.5	143.2	137.0	140.3	126.5	127.9	130.3	133.2	129.2	135.7
	144.3	152.7	157.6	144.1	154.3	125.1	111.6	146.1	136.5	124.7	135.9	142.5	125.7	144.8	124.3
	121.0	128.7	101.6	107.2	117.2	135.2	153.0	142.7	148.9	147.6	153.0	105.4	109.1	106.0	108.1
	90.0	73.2	123.4	100.8	104.9	109.7	92.7	95.7	99.3	100.6	80.4	73.0	82.9	78.5	74.3
	157.6	145.6	138.8	150.0	138.8	138.6	143.1	147.1	149.3	158.0	159.8	149.9	137.3	152.9	152.2
I - 135°	120.5	120.2	120.9	119.9	116.4	126.8	117.4	118.2	124.3	110.4	131.6	121.7	122.4	105.4	117.6
	100.1	92.8	103.5	102.0	100.1	89.7	106.5	120.4	133.0	133.8	144.1	150.4	110.6	125.2	148.9
	99.4	69.9	89.2	91.2	79.9	82.3	70.5	90.4	84.5	76.3	95.1	73.1	100.9	82.2	86.3
	156.9	149.9	159.9	164.8	164.7	155.9	160.8	162.5	160.4	156.8	166.6	149.6	154.8	160.6	161.5

Table 8. Mean Relative Phase Data – Day 2 (continued) (*Note. E= External focus of attention, I= Internal Focus of Attention)

Group	Trial 16	Trial 17	Trial 18	Trial 19	Trial 20	Trial 21	Trial 22	Trial 23	Trial 24	Trial 25	Trial 26	Trial 27	Trial 28	Trial 29	Trial 30
E - 90°	103.9	104.3	115.0	95.6	83.4	79.6	81.8	71.3	96.4	83.7	100.4	99.6	95.5	79.6	106.6
	116.0	112.6	102.3	99.8	111.7	88.6	80.8	88.7	79.1	90.6	72.2	95.1	74.2	83.3	101.5
	92.5	92.0	76.0	97.5	93.0	93.3	95.3	104.5	99.7	95.6	93.6	98.9	84.0	95.6	82.7
	91.2	91.7	85.4	87.8	81.4	87.8	88.2	83.5	85.7	83.2	83.3	89.4	86.7	89.2	82.7
	99.2	101.9	107.2	106.2	108.8	97.0	102.2	96.4	100.2	91.1	84.7	85.6	99.9	92.4	96.3
	90.0	91.6	91.9	90.0	90.4	96.4	92.6	95.3	97.3	96.8	92.6	97.6	94.3	95.0	90.5
	79.4	82.4	108.3	101.5	98.1	84.4	81.3	89.2	86.1	85.2	62.3	98.2	98.2	97.5	83.4
I - 90°	96.4	89.5	105.8	96.9	110.0	87.4	98.5	97.6	94.3	89.0	83.8	99.6	88.3	87.4	86.2
	113.7	141.9	126.3	124.2	121.1	114.9	126.7	117.5	120.7	117.5	117.5	124.8	107.6	118.9	111.5
	108.8	96.0	86.9	67.8	113.0	131.6	115.5	105.7	112.4	88.5	111.6	76.6	108.0	89.7	88.4
	81.6	83.5	75.0	75.5	77.8	70.7	76.4	96.4	78.5	73.7	111.1	78.6	86.5	84.8	91.9
	83.8	82.4	72.1	77.2	75.7	82.8	72.8	72.9	71.9	70.6	81.9	89.0	90.1	89.9	78.7
	77.6	70.2	135.8	86.6	97.6	107.7	85.5	69.5	77.6	71.2	94.0	86.2	108.8	91.8	101.5
	100.8	115.5	107.2	102.9	95.0	75.9	76.2	95.3	101.9	96.5	98.9	87.4	89.3	99.1	93.7
E – 135°	117.8	130.2	135.0	138.4	129.1	125.7	130.1	131.4	118.8	122.7	127.8	130.0	126.2	120.7	127.6
	104.5	135.9	114.9	109.3	130.0	128.2	143.0	117.4	108.6	123.2	129.1	106.7	119.4	119.2	113.7
	131.4	148.7	138.3	133.7	134.8	136.3	137.0	124.5	135.7	136.0	140.5	127.3	132.0	133.0	125.3
	132.8	134.7	133.3	127.2	132.0	132.5	129.0	138.7	131.9	131.4	135.3	130.8	136.5	124.8	131.1
	143.7	131.2	132.6	138.8	135.6	132.0	135.0	126.8	132.5	134.1	129.3	143.3	135.1	141.6	134.7
	127.5	133.0	111.7	130.1	132.1	125.6	138.2	129.6	119.4	129.7	142.3	130.3	149.5	118.9	129.0
	125.8	141.6	134.2	144.3	136.0	141.9	133.9	120.7	139.3	138.5	139.2	133.0	124.4	124.3	129.6
I - 135°	121.2	148.8	136.0	124.0	138.0	141.1	138.2	133.7	141.1	161.7	152.9	123.7	116.1	119.9	130.4
	85.2	64.0	85.2	95.4	101.9	86.2	77.7	76.9	76.1	70.7	75.7	58.7	71.1	74.1	117.4
	153.6	153.3	149.4	154.0	152.7	151.5	154.0	151.1	154.9	152.9	151.2	157.9	151.0	156.6	149.3
	128.8	99.4	104.6	97.0	112.5	122.0	121.0	111.4	116.0	112.9	104.9	115.1	99.3	107.3	117.7
	153.6	142.7	148.3	104.6	118.3	109.9	106.7	100.1	112.6	95.6	96.5	99.6	119.2	101.5	103.6
	79.5	90.9	79.8	91.5	94.2	94.5	105.1	101.9	100.8	101.0	105.9	115.7	105.4	97.7	77.0
	165.0	157.6	163.1	145.4	152.6	160.0	167.2	146.7	148.3	141.1	141.7	134.1	142.9	141.6	140.3

Table 9. Mean Relative Phase Data – Day 3 (*Note. E= External focus of attention, I= Internal Focus of Attention)

Group	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	Trial 11	Trial 12	Trial 13	Trial 14	Trial 15
	150.1	150.7	144.2	134.5	138.7	133.8	137.6	138.6	130.3	141.9	142.3	143.1	136.6	135.7	130.5
	124.7	110.6	127.8	126.5	106.0	110.7	102.9	101.5	101.8	100.1	113.5	120.9	126.1	110.6	113.6
	115.6	115.2	120.3	122.0	125.0	124.0	123.7	124.3	123.5	124.4	125.4	127.0	122.2	124.5	127.9
E - 90°	88.7	124.7	119.3	113.7	113.4	112.5	111.8	118.2	119.0	117.1	122.6	123.5	126.0	120.0	120.0
	119.6	131.9	138.8	135.4	135.3	142.0	142.9	143.8	131.5	129.5	138.3	142.0	146.6	133.7	134.5
	99.5	129.3	129.5	129.6	140.4	135.8	132.0	132.1	133.1	130.6	134.4	135.5	137.5	140.2	131.0
	126.8	119.6	123.1	122.3	123.4	116.3	125.0	116.0	120.9	121.3	132.4	129.7	125.8	116.6	123.0
	95.8	95.1	121.4	97.6	97.6	99.3	104.8	120.9	128.7	134.9	141.0	136.3	125.0	113.0	125.3
	99.3	99.4	95.7	105.1	112.6	129.6	124.7	124.9	121.6	117.9	117.6	111.1	112.4	115.1	110.2
	110.8	75.9	124.4	113.1	100.0	97.2	85.7	81.6	128.1	119.5	127.4	131.3	121.7	129.6	104.9
I - 90°	56.5	62.8	87.9	145.6	148.8	122.6	121.6	109.4	108.9	118.2	124.3	124.8	85.6	96.0	103.5
	68.8	85.6	99.8	80.1	99.9	95.8	101.9	100.6	99.3	92.6	87.8	81.6	102.3	82.0	87.5
	111.8	98.6	118.4	101.4	99.7	88.1	89.9	117.1	129.0	98.0	101.6	101.1	103.6	117.2	122.9
	64.4	68.9	91.0	85.7	96.6	98.8	104.5	106.9	104.1	94.4	93.1	87.9	99.9	107.9	114.3
	144.8	129.9	129.8	135.4	133.9	130.3	135.4	128.4	132.2	135.0	136.5	130.6	128.3	135.8	130.4
	120.4	138.8	132.4	127.9	119.4	117.1	115.0	120.5	140.1	123.2	126.7	148.2	128.8	134.9	136.7
	124.3	137.5	137.1	134.4	136.9	149.7	137.4	140.9	130.1	129.6	132.0	133.8	130.6	134.8	137.7
E – 135°	128.8	130.3	131.8	132.9	128.0	130.8	134.4	129.5	128.2	129.3	133.6	131.8	135.0	133.9	134.4
	141.5	129.1	127.0	140.4	129.6	144.1	143.0	148.7	136.5	141.5	142.4	144.6	132.9	134.2	137.5
	138.0	131.0	124.4	123.3	134.2	134.6	124.3	125.4	133.0	134.0	140.9	127.7	140.1	140.8	136.5
	139.6	138.7	121.9	146.4	140.0	113.6	117.1	131.2	125.8	121.1	125.9	119.1	121.6	121.9	114.3
	99.1	94.0	111.0	114.6	136.6	89.1	91.1	93.4	105.1	107.0	126.9	119.2	147.9	116.0	116.3
	125.9	144.5	152.3	132.8	126.2	139.8	126.7	120.2	101.2	124.4	115.9	117.0	133.6	122.0	124.4
	162.0	153.4	144.3	136.4	132.5	137.1	145.7	152.2	148.9	154.6	165.0	162.9	169.5	155.6	158.8
I - 135°	95.0	96.9	95.2	97.5	103.0	110.6	103.0	99.3	105.4	99.2	90.6	103.1	103.5	99.5	122.9
	100.9	91.8	116.1	106.8	105.1	103.4	109.0	100.5	110.3	110.4	98.3	107.8	106.1	92.5	102.2
	86.7	76.3	82.7	80.9	63.9	69.8	92.4	112.7	112.8	105.0	104.6	100.7	95.0	97.3	88.1
	149.0	149.3	159.9	143.5	162.4	159.2	152.2	147.0	147.2	157.8	147.5	142.5	150.7	143.9	146.5

Table 9. Mean Relative Phase Data – Day 3 (continued) (*Note. E= External focus of attention, I= Internal Focus of Attention)

Group	Trial 16	Trial 17	Trial 18	Trial 19	Trial 20	Trial 21	Trial 22	Trial 23	Trial 24	Trial 25	Trial 26	Trial 27	Trial 28	Trial 29	Trial 30
E - 90°	130.0	135.9	130.8	138.4	143.1	134.7	134.7	144.7	142.1	142.7	150.4	136.7	140.7	138.3	143.4
	123.7	121.2	104.4	97.1	109.7	105.3	102.4	108.1	125.8	127.5	117.6	141.3	100.5	103.9	125.5
	126.1	126.2	129.2	131.2	125.7	109.8	121.6	121.4	124.0	130.5	125.6	129.1	128.3	128.3	132.4
	119.8	122.3	135.9	118.3	119.8	125.8	120.4	120.6	127.0	127.8	130.5	128.2	123.1	127.0	130.8
	136.8	140.6	136.4	135.3	139.1	134.9	142.6	140.0	138.9	144.0	135.4	135.4	122.1	128.1	133.9
	130.0	129.7	128.0	132.8	134.2	136.9	127.4	130.5	137.4	131.0	133.9	133.8	136.0	134.3	135.2
	130.5	120.8	126.5	114.5	115.5	130.1	124.6	126.0	131.5	129.1	124.3	134.9	134.9	132.7	123.4
I - 90°	124.9	104.2	138.5	137.1	156.3	120.7	126.8	121.2	99.6	119.6	110.6	136.7	113.1	119.7	117.2
	113.9	120.5	113.7	109.1	114.5	116.8	109.4	116.3	112.4	121.3	112.4	126.6	113.3	118.5	112.9
	100.9	100.7	92.1	69.8	96.7	116.4	91.2	89.2	107.3	100.6	112.6	116.5	88.8	110.6	127.8
	94.1	111.4	94.3	100.7	93.2	119.4	149.7	138.3	112.8	118.4	113.8	106.7	91.6	117.6	106.8
	84.9	82.3	94.3	82.0	85.2	122.2	100.2	90.2	91.2	94.4	81.9	91.7	88.2	87.8	121.0
	118.4	107.9	152.8	138.5	112.5	127.3	119.7	132.8	104.2	134.3	102.3	97.9	80.7	83.3	92.8
	96.9	116.2	107.3	112.5	102.2	109.4	123.1	107.0	99.9	100.0	90.4	100.4	89.0	106.6	103.7
E – 135°	130.0	126.8	138.1	129.1	131.2	126.6	123.9	130.2	140.3	124.1	135.9	127.7	129.3	125.4	125.9
	125.2	123.4	130.3	131.3	133.4	130.5	125.6	121.3	131.2	115.7	115.2	123.4	123.9	136.2	129.7
	138.1	135.1	130.2	144.1	137.9	137.5	139.0	136.9	132.6	136.3	141.6	134.2	143.0	145.2	147.5
	131.2	134.9	134.9	133.5	129.8	132.0	128.5	131.7	130.0	133.1	131.2	137.9	129.4	134.3	126.9
	140.6	134.5	139.1	139.7	133.0	140.7	137.2	136.8	138.7	139.0	143.2	140.9	136.5	139.2	142.4
	138.3	131.0	133.7	133.9	122.8	135.2	122.7	140.0	125.1	128.7	126.4	131.9	129.2	142.8	136.4
	127.8	121.4	120.5	126.3	119.5	116.0	127.5	125.7	129.3	114.4	121.3	130.1	121.2	119.4	116.2
I - 135°	99.1	118.9	130.0	123.7	133.0	141.2	130.5	123.3	119.8	125.6	116.3	158.2	119.3	123.8	127.5
	124.8	134.8	135.1	132.2	140.8	108.1	128.8	130.0	126.5	133.1	124.2	130.0	121.1	117.4	113.9
	152.9	158.5	163.6	148.0	148.0	154.0	149.9	137.6	154.9	139.5	149.9	149.5	131.1	137.3	139.6
	112.0	117.2	115.3	116.1	113.1	119.3	114.8	108.7	109.2	116.1	112.4	104.1	102.9	114.7	119.5
	110.2	108.4	123.6	131.9	130.3	139.5	147.6	155.4	158.1	100.2	106.5	103.4	124.9	96.5	102.0
	77.9	82.3	84.5	87.0	87.3	95.6	106.7	113.9	115.1	121.9	112.8	108.6	112.4	112.1	102.3
	149.6	147.5	133.4	146.8	142.2	152.4	140.9	131.9	141.7	138.7	145.1	127.1	147.0	148.0	141.7

Table 10. Standard Deviation Data – Day 1 (*Note. E= External focus of attention, I= Internal Focus of Attention)

Group	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	Trial 11	Trial 12	Trial 13	Trial 14	Trial 15
	43.310	24.322	27.025	32.558	33.943	43.460	55.717	50.553	47.980	51.033	36.898	16.249	21.324	44.580	37.801
	12.188	8.068	16.554	17.611	24.037	17.587	33.819	31.423	34.035	28.762	27.091	19.450	23.056	15.479	9.866
	12.386	15.205	25.818	17.632	20.057	17.329	25.388	20.000	20.156	25.841	24.500	28.265	22.647	43.115	15.602
E - 90°	34.900	34.400	14.398	14.952	15.679	16.751	14.250	10.270	13.777	20.232	11.196	11.941	15.487	17.628	9.864
	32.737	32.591	31.479	20.487	17.050	24.025	21.670	20.006	35.748	18.261	20.889	18.160	14.888	24.073	15.202
	15.260	10.951	14.596	10.654	13.744	16.299	11.407	13.953	11.820	16.508	18.937	11.464	12.392	12.051	16.718
	29.722	27.091	19.048	15.273	21.521	40.264	40.703	25.602	24.609	18.319	22.667	20.696	18.561	16.004	20.669
	19.886	7.589	29.012	21.071	25.833	26.067	24.428	28.114	18.136	18.864	23.332	21.778	34.032	26.997	13.211
	24.806	6.162	6.416	9.683	15.204	8.835	9.922	11.673	10.286	11.543	14.254	12.205	19.111	15.784	17.020
	11.781	11.546	16.561	18.472	21.922	16.964	24.790	17.103	17.496	15.745	9.422	10.650	9.977	7.810	9.519
I - 90°	18.153	42.782	36.991	8.488	31.662	23.532	23.209	14.989	14.198	13.014	12.044	10.731	11.129	17.336	31.824
	15.318	20.455	17.374	14.090	13.107	13.639	15.135	14.797	10.911	20.237	9.876	25.029	14.895	20.444	25.898
	29.085	33.555	19.827	30.737	30.988	28.337	21.067	37.430	37.751	27.259	28.319	32.296	17.488	27.917	22.500
	44.624	23.628	11.818	13.526	29.079	19.438	19.111	14.633	14.624	16.140	17.461	11.663	25.805	8.330	17.070
	13.494	16.589	16.760	15.828	29.178	44.187	50.538	17.932	17.216	18.966	22.855	17.405	20.646	17.891	22.602
	22.463	10.004	15.161	13.484	10.288	19.153	11.864	14.312	19.002	10.272	16.136	13.379	11.657	11.133	19.909
	26.427	11.669	18.050	11.354	13.168	18.842	15.695	9.808	20.166	21.204	40.750	11.144	19.879	16.024	13.015
E – 135°	19.825	24.069	15.908	18.103	16.669	17.246	32.363	22.886	20.391	22.876	17.279	18.765	18.255	20.259	18.313
	15.373	18.425	7.087	13.988	10.795	11.699	11.479	6.389	11.655	13.128	13.546	12.878	46.770	14.963	12.414
	29.335	12.907	15.567	32.625	23.869	19.060	32.508	13.804	24.066	16.061	20.464	18.954	18.219	20.123	25.370
	9.162	9.707	7.378	17.586	23.950	18.585	22.868	24.807	24.226	21.133	22.436	10.104	16.361	13.874	19.395
	39.281	12.688	23.863	29.436	16.087	23.678	22.224	19.049	8.904	21.773	14.502	41.937	39.907	18.954	12.387
	12.365	10.001	8.235	23.541	17.714	12.213	11.659	11.251	11.103	10.613	11.909	16.016	13.773	12.831	8.498
	14.127	12.337	12.869	18.639	9.661	15.239	18.362	12.985	13.916	13.099	12.506	12.184	15.360	14.445	16.751
I - 135°	20.003	9.187	20.147	20.761	15.400	15.356	33.416	15.720	15.736	18.051	13.922	8.280	15.118	15.887	11.960
	9.221	14.137	15.084	12.120	9.004	20.810	16.545	21.343	14.605	14.003	16.420	22.279	16.162	24.668	19.768
	22.458	7.687	11.642	20.341	18.960	19.414	17.507	13.806	31.169	16.689	24.051	24.494	26.947	23.406	25.856
	12.068	22.804	14.691	13.346	11.064	14.390	15.640	14.233	14.023	14.875	16.692	20.385	19.513	14.612	16.976

Table 10. Standard Deviation – Day 1 (continued) (*Note. E= External focus of attention, I= Internal Focus of Attention)

Group	Trial 16	Trial 17	Trial 18	Trial 19	Trial 20	Trial 21	Trial 22	Trial 23	Trial 24	Trial 25	Trial 26	Trial 27	Trial 28	Trial 29	Trial 30
	33.243	31.694	18.305	12.188	33.223	38.581	26.301	14.648	15.387	22.509	15.063	21.094	8.209	17.301	15.531
	10.197	18.971	20.723	14.051	17.453	20.996	23.158	25.034	25.181	27.428	21.141	25.222	32.608	20.628	17.301
	18.467	22.497	26.153	31.600	15.029	23.618	17.878	15.754	25.523	19.383	24.747	15.501	24.048	21.830	25.549
E - 90°	12.875	8.993	10.595	15.830	13.936	9.332	12.687	11.037	14.192	16.567	10.240	9.185	12.672	17.705	9.346
	16.665	31.139	24.680	20.789	25.826	17.274	22.638	22.129	27.054	20.356	12.915	19.090	18.481	18.085	15.465
	11.726	16.115	14.570	14.187	20.787	15.593	11.086	12.737	9.913	21.108	16.211	12.412	15.123	10.345	12.515
	40.968	37.647	21.011	26.048	41.194	39.555	38.733	21.593	20.357	34.467	22.976	15.276	20.406	26.250	26.583
	18.364	18.604	16.712	13.637	18.763	25.614	16.343	12.034	13.972	22.467	18.671	14.533	18.117	19.822	15.341
	19.163	18.898	31.658	24.875	26.724	20.402	23.521	18.674	33.438	20.689	17.619	17.118	19.521	21.792	22.352
	11.876	7.139	7.677	16.632	12.728	16.268	13.786	17.394	11.441	13.843	18.158	19.792	25.434	26.777	21.074
I - 90°	16.984	10.300	15.313	12.606	12.533	14.091	9.053	21.206	11.612	25.384	12.358	20.718	12.165	18.387	11.623
	17.166	16.485	24.598	35.170	15.593	17.274	14.112	15.319	11.705	15.648	20.492	10.670	9.152	10.952	17.082
	34.351	14.819	22.123	20.866	25.688	26.944	29.184	28.441	31.037	24.515	23.369	33.869	26.085	17.418	19.203
	16.005	11.721	14.831	16.958	22.663	15.573	18.368	16.542	18.379	8.336	19.477	18.774	21.664	13.750	15.493
	13.760	18.502	16.861	23.667	34.026	28.804	25.625	22.297	19.045	22.018	26.414	26.207	28.179	21.221	24.332
	15.378	12.024	26.453	13.993	24.601	24.458	10.664	17.685	13.694	13.016	13.695	13.109	12.188	17.366	13.907
	14.974	17.818	11.729	9.027	13.004	16.390	17.541	15.326	28.149	14.110	13.761	16.852	18.657	10.360	11.698
E – 135°	19.854	21.448	17.623	28.303	19.792	19.639	15.763	21.116	18.981	15.950	12.371	14.063	11.373	11.612	15.576
	14.285	9.089	29.706	12.750	13.228	22.137	16.302	20.007	14.315	10.281	11.527	10.258	15.701	14.919	15.857
	20.557	23.773	20.635	19.874	17.510	30.920	20.125	13.853	12.679	17.010	21.167	36.019	18.620	12.913	21.208
	16.408	20.432	25.025	45.442	16.177	15.577	15.481	13.645	17.724	15.071	16.144	23.517	25.612	14.097	22.976
	13.865	22.799	21.363	18.304	26.156	30.520	44.573	17.372	17.191	26.992	26.799	28.599	36.592	23.324	34.662
	11.766	10.676	19.670	14.256	14.999	14.885	13.209	12.614	15.839	11.672	15.163	16.303	17.159	10.803	13.865
	13.035	16.670	17.643	14.585	13.487	12.403	10.317	16.473	13.836	11.627	14.056	15.736	41.540	17.016	12.413
I - 135°	9.766	11.118	14.955	40.175	9.862	15.525	11.182	10.900	11.709	17.083	19.474	25.826	18.860	17.791	22.422
	23.214	18.095	13.903	19.547	14.747	16.540	16.067	19.001	16.303	23.835	15.291	13.559	16.463	14.565	17.897
	39.451	24.991	33.777	27.465	27.513	19.636	20.766	24.842	27.495	27.849	19.457	18.672	15.284	16.765	21.805
	26.662	18.342	22.358	22.487	19.550	17.114	17.532	25.838	24.076	12.743	22.065	14.764	14.040	41.754	13.722

Table 11. Standard Deviation Data – Day 2 (*Note. E= External focus of attention, I= Internal Focus of Attention)

Group	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	Trial 11	Trial 12	Trial 13	Trial 14	Trial 15
	18.422	15.988	10.525	11.548	17.547	24.755	13.354	21.826	21.190	12.326	17.785	13.953	21.431	10.632	19.436
	11.754	15.106	16.163	11.816	26.900	20.469	21.661	14.447	19.427	17.782	15.948	19.537	22.888	16.195	29.656
	18.948	24.746	18.348	21.153	23.089	14.560	21.491	13.113	18.817	17.718	15.385	14.070	15.695	14.827	23.653
E - 90°	12.159	14.300	13.043	14.523	11.305	8.378	9.830	14.093	10.801	10.900	10.925	12.703	9.453	10.973	17.950
	15.995	19.840	19.340	16.915	15.963	21.107	13.223	20.850	20.371	16.143	13.790	18.599	26.667	16.994	17.539
	10.726	8.143	10.221	9.249	8.089	13.358	8.887	12.510	10.309	10.503	13.201	9.460	9.296	13.232	8.917
	13.537	13.750	16.244	15.232	13.352	11.352	15.359	19.538	18.770	20.676	16.634	36.342	18.608	15.205	25.110
	16.212	11.831	13.769	10.815	14.020	13.643	11.795	21.826	9.219	8.249	10.445	10.764	11.278	12.169	10.054
	17.547	18.447	18.243	19.338	19.207	19.578	18.660	23.753	21.018	17.183	20.218	20.266	13.392	14.148	28.144
	16.966	14.018	20.358	17.740	14.699	23.014	21.542	21.281	15.914	17.929	23.063	16.818	14.626	16.083	13.051
I - 90°	13.024	11.400	16.764	7.564	7.757	11.672	10.713	10.414	11.618	10.800	10.426	10.051	13.692	14.524	10.762
	9.812	9.346	10.965	12.957	9.246	11.675	11.205	9.437	10.414	9.719	1.443	12.282	9.873	8.993	9.916
	14.466	14.183	12.980	15.337	15.117	18.853	22.189	33.064	16.232	25.376	14.570	20.090	24.036	26.027	28.452
	11.509	13.212	19.044	19.021	14.290	17.563	13.974	13.037	17.158	13.561	14.823	11.723	16.999	12.283	11.320
	11.802	10.999	11.231	17.234	12.263	24.223	12.991	15.284	23.109	17.620	16.975	15.471	17.020	17.044	17.507
	17.828	17.038	15.586	19.096	15.264	18.734	23.560	18.012	23.131	14.411	14.800	14.105	18.488	17.964	24.585
	17.909	13.337	12.959	14.829	14.293	10.187	11.122	14.039	14.218	18.359	11.488	11.954	15.040	20.289	16.052
E – 135°	19.771	10.069	14.185	13.000	14.684	16.112	13.622	13.400	17.691	14.596	16.537	13.510	12.106	14.380	15.805
	13.014	9.153	18.959	19.116	12.508	11.886	17.295	11.810	14.363	17.605	12.905	12.651	10.397	12.609	14.889
	10.083	9.540	11.565	13.483	9.162	12.092	9.804	10.751	16.856	14.284	15.834	17.866	9.265	21.373	14.085
	11.990	11.282	13.551	14.703	14.087	14.664	23.871	15.443	16.599	16.568	13.485	18.188	18.370	19.270	15.613
	37.808	38.691	25.269	34.610	24.743	28.619	20.384	26.215	20.912	33.238	30.563	34.036	36.799	31.251	41.738
	11.758	9.698	8.235	13.358	13.099	21.245	20.228	12.317	16.116	17.153	9.066	12.026	12.935	12.219	9.885
	16.747	11.286	1.893	12.347	12.823	8.696	12.373	9.753	15.765	13.783	18.958	16.190	13.405	12.777	17.744
I - 135°	17.179	12.375	13.785	14.465	19.775	20.439	12.443	12.958	16.436	21.103	17.382	17.163	15.734	19.182	15.914
	8.842	15.802	15.787	16.435	12.080	12.803	14.105	18.368	21.553	21.561	21.567	14.109	17.695	19.005	15.975
	11.123	13.182	15.840	9.444	21.143	20.045	21.872	22.513	24.859	18.437	19.200	20.589	17.708	12.702	15.140
	12.809	15.178	12.880	7.573	10.992	11.026	12.370	11.394	12.159	15.633	12.198	19.178	16.558	14.533	10.817

Table 11. Standard Deviation Data – Day 2 (continued) (*<u>Note.</u> E= External focus of attention, I= Internal Focus of Attention)

Group	Trial 16	Trial 17	Trial 18	Trial 19	Trial 20	Trial 21	Trial 22	Trial 23	Trial 24	Trial 25	Trial 26	Trial 27	Trial 28	Trial 29	Trial 30
	15.922	16.817	17.657	10.266	10.669	11.940	15.990	15.016	11.290	10.386	14.989	9.014	18.400	19.234	15.446
	29.822	19.796	27.651	22.772	24.747	30.743	18.824	24.425	25.514	28.100	20.721	25.892	22.022	27.504	21.561
	23.879	16.287	27.355	16.542	11.934	15.462	15.532	17.867	15.174	11.635	15.985	15.917	11.607	14.635	17.301
E - 90°	12.201	12.398	11.627	10.719	9.213	7.522	9.633	8.599	8.546	13.219	10.444	11.389	12.729	16.105	10.356
	16.390	18.738	21.531	13.141	20.983	18.384	19.244	17.878	22.231	17.966	20.268	23.909	20.516	20.405	20.120
	8.081	7.428	6.314	11.253	9.457	8.044	9.284	11.801	10.942	8.603	7.212	5.857	8.370	9.434	10.929
	29.940	33.726	16.440	29.661	15.838	20.799	17.967	18.966	33.934	16.165	20.978	21.189	19.085	11.381	21.246
	13.279	13.839	9.586	10.357	16.288	8.889	11.649	10.607	10.329	14.416	10.745	14.942	11.997	12.571	14.001
	17.742	18.426	19.912	17.293	18.323	18.394	18.464	16.543	13.014	15.469	15.081	17.162	16.324	15.126	13.208
	20.797	23.432	17.770	19.435	19.911	16.530	22.557	19.350	22.438	21.057	23.760	24.164	27.058	17.586	20.627
I - 90°	13.953	12.149	11.005	18.823	11.345	22.086	15.575	21.539	12.743	16.694	13.516	20.448	15.125	14.551	18.278
	11.926	10.335	11.330	11.005	11.817	10.388	15.144	12.070	13.613	11.635	13.029	12.510	8.926	9.028	10.757
	25.595	21.878	22.129	16.529	25.292	35.261	17.524	17.280	17.357	17.460	18.495	19.514	26.986	15.928	17.320
	21.607	19.502	11.464	17.654	15.508	12.672	14.205	13.909	9.332	16.727	14.352	13.986	11.584	14.807	10.049
	17.299	19.086	11.178	26.338	16.027	22.061	21.147	15.250	13.170	18.885	19.507	11.674	21.685	17.685	24.572
	19.309	20.060	27.569	21.560	22.883	15.086	19.524	23.716	22.167	17.804	16.795	17.469	18.476	15.035	14.064
	13.925	10.454	15.440	15.182	9.710	13.869	13.258	15.221	8.282	12.494	14.099	13.076	17.951	12.965	11.149
E – 135°	12.471	12.821	8.680	12.902	10.752	12.924	10.333	10.780	16.918	13.549	15.613	13.064	12.162	11.624	15.495
	9.389	12.674	13.902	17.272	13.077	14.001	10.354	13.415	13.975	13.071	9.985	15.854	13.818	14.145	11.110
	15.786	20.304	12.888	14.432	14.626	12.724	14.461	13.844	15.584	10.502	13.192	11.826	11.943	16.501	11.570
	16.589	13.919	16.907	18.392	19.872	13.633	17.637	23.523	17.394	17.860	14.928	18.447	23.633	23.095	15.702
	36.098	26.863	27.980	29.172	22.982	51.990	23.871	28.736	21.249	16.181	24.835	17.397	47.348	31.257	29.248
	13.715	11.889	13.377	12.915	9.971	11.002	11.774	8.485	12.432	16.385	14.011	11.120	17.281	11.668	23.287
	21.187	23.990	16.918	12.191	12.638	16.436	16.827	12.292	13.270	17.334	16.449	13.072	18.047	15.481	16.557
I - 135°	23.107	19.216	17.782	16.987	14.591	13.719	14.897	18.521	18.617	15.577	20.414	12.914	24.850	23.181	19.662
	16.538	17.591	17.476	17.937	12.161	16.413	17.540	13.534	11.698	13.058	14.819	15.738	18.669	17.079	13.955
	24.590	21.238	19.124	11.054	16.428	9.906	14.019	10.167	13.040	14.807	12.445	15.222	21.207	13.614	14.330
	12.060	13.646	10.959	13.582	13.972	15.556	8.766	11.231	12.587	20.055	20.618	22.557	14.850	23.493	14.630

Table 12. Standard Deviation Data – Day 3 (*Note. E= External focus of attention, I= Internal Focus of Attention)

Group	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	Trial 11	Trial 12	Trial 13	Trial 14	Trial 15
	12.730	14.430	21.390	13.996	18.423	15.552	16.332	13.161	12.160	16.748	15.095	14.027	15.981	11.217	15.776
	16.625	21.894	19.400	22.427	19.723	25.535	18.090	19.534	22.010	15.596	29.156	18.797	26.302	19.360	19.730
	15.048	15.751	19.714	12.556	14.898	20.137	16.108	16.001	15.549	16.284	17.451	21.361	16.473	15.057	15.468
E - 90°	23.110	20.965	11.166	10.855	11.592	12.630	12.034	12.609	10.259	13.009	12.148	10.990	12.698	12.245	13.091
	17.366	16.644	22.584	20.129	25.120	19.051	19.293	23.725	22.771	25.587	19.681	19.343	15.517	18.815	22.100
	11.686	14.681	14.531	12.183	11.903	11.267	10.249	12.512	13.501	8.698	13.697	12.975	14.021	11.718	10.434
	12.106	14.787	12.950	9.859	13.530	14.931	7.001	14.931	17.076	16.885	11.918	12.998	14.539	11.629	12.616
	19.487	18.297	14.336	15.296	16.396	18.091	22.323	17.510	12.607	13.265	17.691	13.960	9.942	13.547	10.947
	15.437	16.812	17.740	12.610	15.333	19.589	15.458	17.470	13.770	14.732	14.768	19.670	15.441	20.739	12.521
	11.262	16.143	13.290	21.778	11.929	19.354	16.774	15.789	9.691	7.844	16.316	13.420	15.569	13.741	18.880
I - 90°	15.392	12.964	25.536	17.901	20.037	17.855	22.350	26.280	13.940	22.451	28.210	22.891	18.696	14.328	25.433
	9.180	12.306	12.478	11.300	17.274	13.964	26.371	12.953	15.288	11.326	8.812	10.315	14.849	17.005	11.760
	39.749	17.773	25.275	28.998	17.955	17.956	19.177	20.681	21.237	25.005	17.265	17.506	17.058	18.814	19.756
	12.022	11.410	18.994	11.321	9.840	13.914	13.056	16.819	14.557	14.349	13.378	15.706	16.207	19.421	17.269
	13.613	11.468	9.240	12.300	12.143	8.713	14.432	9.592	12.104	10.138	14.256	12.601	10.198	13.369	14.157
	14.325	14.645	16.491	20.063	14.593	18.968	15.321	21.636	14.000	12.226	18.755	14.132	16.447	19.711	17.949
	13.974	12.910	14.316	13.959	15.907	12.372	17.027	16.953	13.641	11.554	17.452	10.149	17.894	14.776	13.038
E – 135°	11.166	9.041	11.376	11.802	12.960	17.824	14.024	9.396	9.953	13.743	13.886	9.213	18.213	11.537	9.932
	16.301	14.616	12.465	13.808	18.177	18.237	10.960	15.891	10.710	12.464	9.753	10.697	14.680	11.579	11.122
	9.748	12.040	11.289	9.642	13.407	16.836	12.766	10.788	13.548	13.640	12.776	12.459	11.050	13.174	10.525
	14.583	14.772	14.339	21.616	16.248	14.853	15.698	18.225	18.214	18.480	20.307	19.682	14.170	11.871	18.086
	18.824	20.604	19.247	15.635	22.505	16.909	14.546	19.519	19.539	36.726	19.258	20.947	15.766	27.920	19.290
	16.851	6.901	9.413	12.998	15.567	9.226	10.034	8.985	11.531	10.040	11.600	11.080	8.309	10.990	13.153
	10.550	11.573	14.534	15.198	11.354	20.957	18.146	19.247	17.422	13.228	9.709	13.229	7.074	14.158	17.075
I - 135°	14.686	14.234	18.983	12.519	15.695	19.060	15.891	18.016	15.303	17.659	14.420	11.234	15.292	15.875	14.126
	13.507	9.649	15.048	14.954	19.029	14.816	12.695	16.967	14.139	18.574	13.698	18.618	15.804	13.903	16.544
	11.153	17.093	20.750	20.297	12.925	13.572	14.108	14.448	11.975	13.781	9.174	10.858	14.268	10.316	10.885
	13.240	11.514	12.880	19.392	12.416	11.839	15.293	12.039	14.328	12.669	14.641	15.163	18.081	15.803	23.593

Table 12. Standard Deviation Data – Day 3 (continued) (*Note. E= External focus of attention, I= Internal Focus of Attention)

Group	Trial 16	Trial 17	Trial 18	Trial 19	Trial 20	Trial 21	Trial 22	Trial 23	Trial 24	Trial 25	Trial 26	Trial 27	Trial 28	Trial 29	Trial 30
	11.776	14.995	13.344	11.754	13.010	10.080	12.444	15.165	11.991	8.787	11.832	13.112	14.548	10.965	14.816
	20.908	14.506	31.500	17.439	22.124	23.392	25.502	23.225	21.406	21.014	24.381	19.262	22.119	15.580	21.549
	21.345	14.184	16.664	12.264	20.485	25.202	19.850	21.234	16.691	25.315	13.836	16.311	15.859	18.299	21.079
E - 90°	12.749	13.662	13.191	13.974	13.680	14.254	12.577	13.971	14.099	14.284	15.432	10.944	8.587	9.488	11.236
	18.924	16.101	17.114	20.873	17.838	19.779	20.453	25.188	25.015	15.709	19.372	24.045	14.976	20.093	19.480
	13.567	15.222	13.376	11.631	14.365	11.682	8.189	10.072	15.269	7.560	9.199	9.781	7.429	6.584	9.896
	18.076	15.999	14.430	14.423	17.044	17.410	16.415	15.932	16.482	16.455	16.643	16.732	15.460	12.922	14.954
	13.807	10.976	15.545	16.256	18.542	14.031	15.891	10.529	13.478	13.235	10.574	14.157	9.270	16.302	9.750
	13.296	16.727	14.610	15.568	17.603	18.901	14.739	21.891	16.258	16.488	16.278	13.974	12.903	12.822	10.121
	21.099	16.477	14.378	21.457	12.492	18.557	14.432	16.630	15.212	18.151	11.852	16.214	17.825	12.447	17.050
I - 90°	10.302	19.237	14.760	10.696	11.533	25.315	20.263	19.435	19.114	29.284	18.661	13.791	13.740	24.923	19.107
	13.649	11.793	15.775	14.562	14.913	14.187	14.841	15.592	13.878	12.026	11.637	14.644	12.777	12.379	13.004
	17.307	22.630	18.635	25.409	16.650	12.711	17.446	22.306	17.745	22.817	28.356	27.087	18.346	22.712	18.655
	23.708	16.665	19.309	12.058	14.213	29.439	17.722	17.302	14.647	23.104	10.797	14.015	14.118	19.459	13.785
	19.012	15.430	15.371	12.962	7.063	12.496	12.852	12.392	11.810	20.754	18.965	10.726	16.677	14.549	13.498
	19.039	16.215	19.428	17.207	17.915	23.432	15.735	15.925	25.880	13.754	20.132	9.291	13.208	11.269	12.427
	15.230	14.103	14.864	14.711	14.092	13.897	10.975	9.953	13.136	11.405	12.266	8.421	7.280	15.173	10.294
E – 135°	9.764	10.046	11.284	15.171	7.863	12.735	10.726	11.693	8.040	10.266	17.609	8.435	10.786	8.374	8.590
	13.945	11.787	13.105	9.571	7.868	10.630	11.758	10.787	9.197	12.288	11.132	12.141	12.387	9.425	12.090
	11.978	15.136	12.895	12.888	12.096	11.544	9.216	11.118	15.918	1.046	15.428	13.579	10.893	13.464	9.662
	16.442	19.034	22.717	16.736	13.064	11.191	16.596	13.485	14.928	18.456	19.270	14.865	16.689	17.115	29.108
	13.994	16.356	21.796	29.210	19.587	18.780	18.420	48.801	19.902	19.319	16.170	22.138	22.196	14.779	25.474
	11.820	8.139	10.554	12.368	10.393	14.791	9.576	9.834	10.526	8.988	8.151	7.793	10.236	12.321	8.307
	16.119	10.782	11.305	12.752	11.328	13.638	16.448	19.464	16.953	22.818	19.954	13.069	13.476	20.061	12.018
I - 135°	14.098	15.757	15.873	14.055	16.328	15.707	17.191	15.601	19.812	16.809	16.640	15.732	19.486	16.203	13.214
	21.191	16.328	23.096	11.074	21.216	13.361	15.275	14.063	16.918	10.384	14.578	20.494	14.170	16.482	20.352
	10.390	10.551	9.655	13.386	12.697	17.050	15.012	9.866	14.239	13.560	12.608	16.026	20.323	13.119	18.807
	19.686	14.471	13.794	15.102	21.278	17.372	12.538	16.577	13.307	14.163	17.262	15.142	15.245	15.671	14.891

Table 13. Absolute Constant Error – Day 1 (*Note. E= External focus of attention, I= Internal Focus of Attention)

Group	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	Trial 11	Trial 12	Trial 13	Trial 14	Trial 15
	16.9	47.4	50.3	32.5	14.9	11.4	3.0	2.4	18.3	29.9	17.1	35.5	13.3	9.2	5.4
	73.4	79.7	65.9	68.1	70.1	59.3	53.9	48.1	39.3	64.6	57.1	69.9	64.0	71.5	74.7
	73.8	59.4	50.3	69.8	50.3	39.8	43.4	38.7	52.4	33.8	38.6	54.3	39.0	45.7	30.7
E - 90°	27.4	5.8	19.6	17.5	5.1	14.8	10.6	15.5	8.5	13.4	5.2	21.5	27.5	17.7	2.5
	50.3	34.7	36.1	16.9	12.5	40.7	23.9	18.5	18.4	11.3	17.7	19.0	17.9	18.3	29.4
	62.0	34.2	17.3	25.1	14.4	19.8	39.6	23.0	11.7	24.5	25.0	34.7	44.4	44.7	24.6
	68.8	66.9	31.0	27.3	45.1	23.4	0.6	61.8	36.6	56.1	43.5	49.2	24.3	11.5	19.3
	66.0	77.5	34.6	59.7	49.8	42.8	54.8	4.5	15.0	0.7	19.3	11.1	23.6	19.8	1.0
	60.9	82.2	81.1	75.7	67.9	80.2	75.7	71.4	73.1	75.4	68.9	73.0	61.6	64.9	66.1
	74.3	77.3	69.0	60.3	56.4	72.9	53.5	67.5	69.4	65.0	74.1	75.0	74.4	78.0	78.2
I - 90°	74.8	29.4	28.7	80.5	7.1	1.3	5.9	7.2	11.8	7.7	10.7	2.9	5.4	8.2	26.6
	2.9	2.0	12.2	17.4	18.6	17.2	19.3	11.4	10.3	3.7	13.6	15.9	10.3	21.0	8.3
	6.4	30.3	32.9	10.0	29.9	8.9	31.4	21.2	10.3	13.8	37.3	5.9	1.4	10.3	18.0
	37.0	2.1	73.0	67.1	14.1	44.4	19.1	49.2	6.2	49.7	34.3	19.4	44.4	15.6	5.6
	31.5	31.5	21.5	15.4	24.3	47.6	24.3	16.8	15.6	15.6	9.5	0.3	20.4	7.5	10.4
	22.0	22.0	26.2	15.7	26.4	20.1	11.3	14.1	3.1	0.8	2.4	1.7	14.9	6.1	1.8
	3.6	3.6	6.8	4.0	17.8	15.2	10.6	9.8	29.6	15.4	16.4	22.9	19.5	7.1	12.6
E – 135°	12.8	12.8	0.4	1.5	13.4	9.1	0.6	4.7	3.1	3.3	1.3	3.2	7.0	0.6	4.9
	18.2	18.2	22.5	36.0	17.0	30.5	25.2	24.5	32.7	27.8	29.4	19.7	22.1	0.0	18.3
	37.0	37.0	14.1	37.7	63.2	6.2	22.4	22.3	16.1	5.7	9.6	4.3	3.8	5.7	11.7
	30.2	30.2	30.0	32.9	24.0	0.3	0.2	32.1	6.2	8.4	24.9	35.7	21.5	25.9	3.6
	9.4	9.4	13.0	3.1	15.3	27.4	20.2	19.1	24.4	31.9	11.8	25.8	3.1	1.6	20.7
	14.4	14.4	6.7	11.6	5.5	14.2	18.4	26.4	30.9	29.2	39.3	40.3	38.8	40.3	41.1
	25.0	25.0	27.1	27.0	18.6	32.6	19.3	19.9	20.3	22.5	25.7	18.0	19.6	13.6	17.3
I - 135°	24.2	24.2	29.3	22.1	21.3	22.8	25.4	17.8	29.4	31.6	22.5	28.2	30.4	26.5	24.7
	33.7	33.7	27.0	25.9	27.5	30.1	0.5	0.6	4.6	4.8	1.7	12.5	12.6	26.3	6.1
	8.6	8.6	35.5	30.8	23.4	21.5	8.5	25.5	24.3	6.1	20.3	8.5	4.2	10.7	10.6
	27.6	27.6	12.3	20.9	20.4	25.9	22.6	18.5	24.3	24.1	13.9	15.7	6.5	2.6	22.2

Table 13. Absolute Constant Error Data – Day 1 (continued) (*Note. E= External focus of attention, I= Internal Focus of Attention)

Group	Trial 16	Trial 17	Trial 18	Trial 19	Trial 20	Trial 21	Trial 22	Trial 23	Trial 24	Trial 25	Trial 26	Trial 27	Trial 28	Trial 29	Trial 30
	23.6	1.1	23.7	17.2	10.8	14.2	46.2	13.3	20.3	21.7	23.0	12.3	19.7	3.3	21.2
	78.5	58.9	31.0	67.3	51.0	54.4	57.8	40.7	41.0	63.6	55.1	42.6	20.3	47.1	44.4
	34.7	35.8	18.0	31.6	22.3	18.0	19.0	14.6	19.4	6.8	9.0	1.5	14.3	10.7	6.0
E - 90°	6.3	16.8	12.2	1.8	9.4	11.5	4.3	10.9	13.6	6.3	1.1	9.5	4.5	1.9	4.8
	16.5	6.8	14.4	21.7	33.8	25.5	12.5	30.1	25.2	13.3	6.1	10.2	11.4	16.5	21.2
	23.7	14.6	14.7	13.9	13.6	16.5	8.6	7.9	19.9	4.1	26.3	16.2	8.6	10.5	12.2
	32.5	17.5	35.7	24.3	21.2	2.3	33.5	18.9	12.7	18.6	24.6	34.5	29.5	40.1	40.5
	3.2	15.9	1.1	24.7	7.0	47.1	16.2	13.9	10.1	22.1	9.8	3.4	4.5	11.7	10.5
	39.4	39.7	49.3	58.2	46.6	44.8	54.2	40.5	53.9	63.4	45.2	40.3	47.3	48.9	61.1
	78.0	79.3	80.1	72.3	71.0	68.7	72.3	61.1	72.7	74.5	54.8	44.7	39.9	30.7	43.1
I - 90°	4.8	0.3	8.4	3.2	2.1	7.6	4.1	5.6	4.5	40.2	15.9	18.5	10.2	9.8	10.3
	4.8	0.5	16.9	23.7	6.5	2.6	14.4	8.3	11.2	5.5	15.5	8.4	10.9	11.6	3.7
	8.7	0.0	17.7	0.0	5.9	8.5	28.4	6.0	34.2	3.0	11.6	22.7	5.1	12.7	9.9
	37.3	50.7	61.5	60.6	51.9	14.9	9.2	20.4	17.1	41.7	13.0	26.2	3.3	3.6	17.9
	3.5	7.2	8.4	1.9	22.6	22.5	13.8	15.6	7.9	2.3	3.6	10.1	2.1	5.2	3.0
	11.4	16.8	17.5	29.4	25.1	18.6	30.6	2.0	9.7	11.3	22.0	17.2	35.2	33.4	27.0
	12.1	16.9	3.1	13.1	10.4	9.7	14.9	9.9	12.6	4.2	9.9	15.7	14.1	9.5	26.2
E – 135°	1.2	4.8	4.1	7.5	5.0	5.7	1.1	13.8	2.0	1.6	14.0	2.3	9.4	7.5	4.1
	19.9	24.2	31.7	3.1	11.9	9.8	17.4	20.2	7.2	1.8	11.9	10.0	9.1	2.8	3.7
	0.8	4.2	5.9	12.1	13.2	27.0	13.5	3.8	6.1	12.9	1.9	17.2	30.6	34.5	9.5
	24.3	7.1	9.4	28.4	38.5	3.4	17.6	16.0	13.1	4.0	9.8	12.9	21.0	38.4	15.1
	31.7	28.0	14.5	16.7	16.7	2.9	3.4	24.6	24.9	24.9	12.2	7.4	10.1	5.0	13.8
	56.7	49.9	58.0	27.2	52.5	62.2	63.0	52.9	60.9	53.4	55.8	60.1	49.7	59.4	47.6
	17.2	26.4	9.1	2.2	15.4	1.5	0.7	14.0	15.1	15.8	18.1	13.5	22.7	5.8	8.1
I - 135°	29.8	31.4	32.1	26.2	12.0	31.3	26.6	29.1	30.6	31.5	23.2	24.6	3.0	16.3	16.6
	12.7	2.4	15.7	23.1	8.2	23.0	18.5	17.9	10.4	21.5	19.0	9.7	16.1	16.6	4.4
	15.2	1.1	9.8	5.0	5.8	13.8	5.8	22.3	49.6	9.9	60.7	20.0	1.3	2.3	17.2
	4.0	0.6	7.2	8.3	1.5	6.7	4.9	6.6	22.4	33.5	19.6	0.5	22.9	3.7	20.4

Table 14. Absolute Constant Error Data – Day 2 (*Note. E= External focus of attention, I= Internal Focus of Attention)

Group	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	Trial 11	Trial 12	Trial 13	Trial 14	Trial 15
	38.3	19.3	10.8	9.0	3.8	9.3	9.2	15.2	17.3	11.9	16.5	23.9	23.9	10.0	7.7
	74.9	62.9	42.1	50.9	42.7	51.2	29.6	47.6	16.5	33.3	23.0	19.2	27.9	18.0	37.5
	13.4	2.8	7.3	8.4	4.3	1.0	4.4	10.7	8.0	11.5	10.2	5.3	1.9	11.7	9.5
E - 90°	7.4	6.2	0.3	4.3	5.7	1.0	2.8	3.3	3.0	2.7	1.6	5.3	7.0	10.0	10.1
	15.7	18.6	22.4	16.3	12.7	11.1	7.2	3.6	5.1	9.7	11.1	6.9	10.6	6.1	3.1
	6.5	3.3	11.3	3.2	2.3	3.1	11.5	0.5	4.3	7.8	3.7	5.0	2.6	8.1	0.8
	22.3	18.2	22.5	24.1	14.4	9.8	0.0	12.1	8.6	5.5	1.0	6.4	18.1	2.1	10.6
	8.4	3.4	5.3	1.0	5.3	9.2	9.2	15.2	9.7	9.3	0.0	7.1	4.6	5.7	5.6
	26.2	32.2	32.1	27.9	33.7	35.0	37.0	35.3	31.9	32.0	29.3	30.6	27.3	29.2	35.3
	68.4	68.1	65.1	48.9	64.6	56.5	58.3	45.3	47.8	51.1	47.7	52.0	45.8	49.9	44.6
I - 90°	12.5	14.9	20.5	10.9	2.2	0.4	5.9	6.3	15.1	7.6	9.5	11.7	1.4	16.8	22.9
	19.5	24.4	11.7	20.5	22.4	17.1	19.2	16.9	11.7	6.8	6.5	11.0	11.3	13.9	11.1
	26.4	20.9	16.8	19.7	6.2	1.4	16.2	2.0	16.6	11.8	7.0	3.6	7.7	22.7	9.6
	34.0	6.5	8.7	6.3	16.2	5.6	3.6	2.7	1.1	20.5	26.6	4.7	7.7	13.3	6.7
	10.2	17.0	4.9	7.0	18.7	3.9	2.5	9.2	12.3	7.1	1.2	5.9	2.1	16.2	4.2
	13.6	20.6	17.0	19.6	12.0	4.8	8.7	21.5	16.6	28.9	24.8	31.8	26.3	28.0	34.9
	13.9	10.0	16.4	9.6	9.0	22.3	17.1	14.4	24.9	14.1	5.9	8.7	3.6	6.5	8.1
E – 135°	16.5	12.5	8.3	1.7	9.0	10.3	5.1	0.9	2.4	1.8	5.9	0.4	2.4	3.4	1.7
	7.5	0.7	4.7	3.8	4.2	8.3	1.4	5.8	9.8	5.2	1.4	1.0	1.4	4.3	6.5
	9.7	10.3	15.9	10.2	7.6	7.5	8.2	2.0	5.3	8.5	7.1	4.7	1.8	5.8	0.7
	9.3	17.7	22.6	9.1	19.3	9.9	23.4	11.1	1.5	10.3	0.9	7.5	9.3	9.8	10.7
	14.0	6.3	33.4	27.8	17.8	0.2	18.0	7.7	13.9	12.6	18.0	29.6	25.9	29.0	26.9
	45.0	61.8	11.6	34.2	30.1	25.3	42.3	39.3	35.7	34.4	54.6	62.0	52.1	56.5	60.7
	22.6	10.6	3.8	15.0	3.8	3.6	8.1	12.1	14.3	23.0	24.8	14.9	2.3	17.9	17.2
I - 135°	14.5	14.8	14.1	15.1	18.6	8.2	17.6	16.8	10.7	24.6	3.4	13.3	12.6	29.6	17.4
	34.9	42.2	31.5	33.0	34.9	45.3	28.5	14.6	2.0	1.2	9.1	15.4	24.4	9.8	13.9
	35.6	65.1	45.8	43.8	55.1	52.7	64.5	44.6	50.5	58.7	39.9	61.9	34.1	52.8	48.7
	21.9	14.9	24.9	29.8	29.7	20.9	25.8	27.5	25.4	21.8	31.6	14.6	19.8	25.6	26.5

Table 14. Absolute Constant Error Data – Day 2 (continued) (*Note. E= External focus of attention, I= Internal Focus of Attention)

Group	Trial 16	Trial 17	Trial 18	Trial 19	Trial 20	Trial 21	Trial 22	Trial 23	Trial 24	Trial 25	Trial 26	Trial 27	Trial 28	Trial 29	Trial 30
	13.9	14.3	25.0	5.6	6.6	10.4	8.2	18.7	6.4	6.3	10.4	9.6	5.5	10.4	16.6
	26.0	22.6	12.3	9.8	21.7	1.4	9.2	1.3	10.9	0.6	17.8	5.1	15.8	6.7	11.5
	2.5	2.0	14.0	7.5	3.0	3.3	5.3	14.5	9.7	5.6	3.6	8.9	6.0	5.6	7.3
E - 90°	1.2	1.7	4.6	2.2	8.6	2.2	1.8	6.5	4.3	6.8	6.7	0.6	3.3	0.8	7.3
	9.2	11.9	17.2	16.2	18.8	7.0	12.2	6.4	10.2	1.1	5.3	4.4	9.9	2.4	6.3
	0.0	1.6	1.9	0.0	0.4	6.4	2.6	5.3	7.3	6.8	2.6	7.6	4.3	5.0	0.5
	10.6	7.6	18.3	11.5	8.1	5.6	8.7	0.8	3.9	4.8	27.7	8.2	8.2	7.5	6.6
	6.4	0.5	15.8	6.9	20.0	2.6	8.5	7.6	4.3	1.0	6.2	9.6	1.7	2.6	3.8
	23.7	51.9	36.3	34.2	31.1	24.9	36.7	27.5	30.7	27.5	27.5	34.8	17.6	28.9	21.5
	18.8	6.0	3.1	22.2	23.0	41.6	25.5	15.7	22.4	1.5	21.6	13.4	18.0	0.3	1.6
I - 90°	8.4	6.5	15.0	14.5	12.2	19.3	13.6	6.4	11.5	16.3	21.1	11.4	3.5	5.2	1.9
	6.2	7.6	17.9	12.8	14.4	7.2	17.2	17.1	18.1	19.4	8.1	1.0	0.1	0.1	11.3
	12.4	19.8	45.8	3.4	7.6	17.7	4.5	20.5	12.4	18.8	4.0	3.8	18.8	1.8	11.5
	10.8	25.5	17.2	12.9	5.0	14.1	13.8	5.3	11.9	6.5	8.9	2.6	0.7	9.1	3.7
	17.2	4.8	0.0	3.4	5.9	9.3	4.9	3.6	16.2	12.3	7.2	5.0	8.8	14.3	7.4
	30.5	0.9	20.1	25.7	5.0	6.8	8.0	17.6	26.4	11.8	5.9	28.3	15.6	15.8	21.3
	3.6	13.7	3.3	1.3	0.2	1.3	2.0	10.5	0.7	1.0	5.5	7.7	3.0	2.0	9.7
E – 135°	2.2	0.3	1.7	7.8	3.0	2.5	6.0	3.7	3.1	3.6	0.3	4.2	1.5	10.2	3.9
	8.7	3.8	2.4	3.8	0.6	3.0	0.0	8.2	2.5	0.9	5.7	8.3	0.1	6.6	0.3
	7.5	2.0	23.3	4.9	2.9	9.4	3.2	5.4	15.6	5.3	7.3	4.7	14.5	16.1	6.0
	9.2	6.6	0.8	9.3	1.0	6.9	1.1	14.3	4.3	3.5	4.2	2.0	10.6	10.7	5.4
	13.8	13.8	1.0	11.0	3.0	6.1	3.2	1.3	6.1	26.7	17.9	11.3	18.9	15.1	4.6
	49.8	71.0	49.8	39.6	33.1	48.8	57.3	58.1	58.9	64.3	59.3	76.3	63.9	60.9	17.6
	18.6	18.3	14.4	19.0	17.7	16.5	19.0	16.1	19.9	17.9	16.2	22.9	16.0	21.6	14.3
I - 135°	6.2	35.6	30.4	38.0	22.5	13.0	14.0	23.6	19.0	22.1	30.1	19.9	35.7	27.7	17.3
	18.6	7.7	13.3	30.4	16.7	25.1	28.3	34.9	22.4	39.4	38.5	35.5	15.8	33.5	31.4
	55.5	44.1	55.2	43.5	40.8	40.5	29.9	33.1	34.2	34.1	29.1	19.3	29.6	37.3	58.0
	30.0	22.6	28.1	10.4	17.6	25.0	32.2	11.7	13.3	6.1	6.7	0.9	7.9	6.6	5.3

Table 15. Absolute Constant Error Data – Day 3 (*Note. E= External focus of attention, I= Internal Focus of Attention)

Group	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	Trial 11	Trial 12	Trial 13	Trial 14	Trial 15
	15.1	15.7	9.2	0.5	3.7	1.2	2.6	3.6	4.7	6.9	7.3	8.1	1.6	0.7	4.5
	10.3	24.4	7.2	8.5	29.0	24.4	32.1	33.5	33.2	34.9	21.5	14.1	8.9	24.4	21.4
	19.4	19.8	14.7	13.0	10.0	11.0	11.3	10.7	11.5	10.6	9.6	8.1	12.8	10.5	7.1
E - 90°	46.3	10.3	15.7	21.3	21.6	22.5	23.2	16.8	16.0	17.9	12.4	11.5	9.0	15.0	15.0
	15.4	3.1	3.8	0.4	0.3	7.0	7.9	8.8	3.5	5.5	3.3	7.0	11.6	1.3	0.5
	35.5	5.7	5.5	5.4	5.4	0.8	3.0	2.9	1.9	4.4	0.6	0.5	2.5	5.2	4.0
	8.2	15.4	11.9	12.7	11.6	18.7	10.0	19.0	14.1	13.7	2.6	5.3	9.2	18.4	12.0
	39.2	39.9	13.6	37.4	37.4	35.7	30.2	14.1	6.3	0.1	6.0	1.3	10.0	22.0	9.7
	35.7	35.6	39.3	29.9	22.4	5.4	10.3	10.1	13.4	17.1	17.4	23.9	22.6	19.9	24.8
	24.2	59.1	10.6	21.9	35.0	37.8	49.3	53.4	6.9	15.5	7.6	3.8	13.3	5.4	30.1
I - 90°	78.5	72.2	47.1	10.6	13.8	12.4	13.4	25.6	26.1	16.8	10.7	10.2	49.4	39.0	31.5
	66.2	49.4	35.2	54.9	35.1	39.2	33.1	34.4	35.7	42.4	47.2	53.4	32.7	53.0	47.5
	23.2	36.4	16.6	33.6	35.3	46.9	45.1	17.9	6.1	37.0	33.4	33.9	31.4	17.8	12.1
	70.6	66.1	44.0	49.3	38.4	36.2	30.5	28.1	30.9	40.6	41.9	47.1	35.1	27.1	20.7
	9.8	5.1	5.2	0.4	1.1	4.7	0.4	6.6	2.8	0.0	1.5	4.4	6.7	0.8	4.6
	14.6	3.8	2.6	7.1	15.6	17.9	20.0	14.5	5.1	11.8	8.3	13.2	6.2	0.1	1.7
	10.7	2.4	2.1	0.6	1.9	14.7	2.4	5.9	4.9	5.4	3.0	1.2	4.4	0.2	2.7
E – 135°	6.2	4.7	3.2	2.1	7.0	4.2	0.6	5.5	6.8	5.7	1.4	3.2	0.0	1.1	0.6
	6.5	5.9	8.0	5.4	5.4	9.1	8.0	13.7	1.5	6.5	7.4	9.6	2.1	0.8	2.5
	3.0	4.0	10.6	11.7	0.8	0.4	10.7	9.6	2.0	1.0	5.9	7.3	5.1	5.8	1.5
	4.6	3.7	13.1	11.4	5.0	21.4	17.9	3.8	9.2	13.9	9.1	15.9	13.4	13.1	20.7
	35.9	41.0	24.0	20.4	1.6	45.9	43.9	41.6	29.9	28.0	8.1	15.8	12.9	19.0	18.7
	9.1	9.5	17.3	2.2	8.8	4.8	8.3	14.8	33.8	10.6	19.1	18.0	1.4	13.0	10.6
	27.0	18.4	9.3	1.4	2.5	2.1	10.7	17.2	13.9	19.6	30.0	27.9	34.5	20.6	23.8
I - 135°	40.0	38.1	39.8	37.5	32.0	24.4	32.0	35.7	29.6	35.8	44.4	31.9	31.5	35.5	12.1
	34.1	43.2	18.9	28.2	29.9	31.6	26.0	34.5	24.7	24.6	36.7	27.2	28.9	42.5	32.8
	48.3	58.7	52.3	54.1	71.1	65.2	42.6	22.3	22.2	30.0	30.4	34.3	40.0	37.7	46.9
	14.0	14.3	24.9	8.5	27.4	24.2	17.2	12.0	12.2	22.8	12.5	7.5	15.7	8.9	11.5

Table 15. Absolute Constant Error Data – Day 3 (continued) (*Note. E= External focus of attention, I= Internal Focus of Attention)

Group	Trial 16	Trial 17	Trial 18	Trial 19	Trial 20	Trial 21	Trial 22	Trial 23	Trial 24	Trial 25	Trial 26	Trial 27	Trial 28	Trial 29	Trial 30
	5.0	0.9	4.2	3.4	8.1	0.3	0.3	9.7	7.1	7.7	15.4	1.7	5.7	3.3	8.4
	11.3	13.8	30.6	38.0	25.3	29.7	32.6	26.9	9.2	7.5	17.4	6.3	34.5	31.1	9.5
	8.9	8.8	5.8	3.8	9.3	25.2	13.4	13.6	11.1	4.5	9.4	5.9	6.7	6.7	2.6
E - 90°	15.2	12.7	0.9	16.7	15.2	9.2	14.7	14.4	8.0	7.2	4.5	6.8	11.9	8.0	4.2
	1.8	5.6	1.4	0.3	4.1	0.1	7.6	5.0	3.9	9.0	0.4	0.4	12.9	6.9	1.1
	5.0	5.3	7.0	2.2	0.8	1.9	7.6	4.5	2.4	4.0	1.1	1.2	1.0	0.7	0.2
	4.5	14.2	8.5	20.5	19.5	4.9	10.4	9.0	3.5	5.9	10.8	0.1	0.1	2.3	11.6
	10.1	30.8	3.5	2.1	21.3	14.3	8.2	13.8	35.4	15.4	24.4	1.7	21.9	15.3	17.8
	21.1	14.5	21.3	25.9	20.5	18.2	25.6	18.7	22.6	13.7	22.6	8.4	21.7	16.5	22.1
	34.1	34.3	42.9	65.2	38.3	18.7	43.8	45.8	27.7	34.4	22.4	18.5	46.2	24.4	7.2
I - 90°	40.9	23.6	40.7	34.3	41.8	15.6	14.7	3.3	22.2	16.6	21.2	28.3	43.4	17.4	28.2
	50.1	52.7	40.7	53.0	49.8	12.8	34.8	44.8	43.8	40.6	53.1	43.3	46.8	47.2	14.0
	16.6	27.1	17.8	3.5	22.5	7.7	15.3	2.2	30.8	0.7	32.7	37.1	54.3	51.7	42.2
	38.1	18.8	27.7	22.5	32.8	25.6	11.9	28.0	35.1	35.0	44.6	34.6	46.0	28.4	31.3
	5.0	8.2	3.1	5.9	3.8	8.4	11.1	4.8	5.3	10.9	0.9	7.3	5.7	9.6	9.1
	9.8	11.6	4.7	3.7	1.6	4.5	9.4	13.7	3.8	19.3	19.8	11.6	11.1	1.2	5.3
	3.1	0.1	4.8	9.1	2.9	2.5	4.0	1.9	2.4	1.3	6.6	0.8	8.0	10.2	12.5
E – 135°	3.8	0.1	0.1	1.5	5.2	3.0	6.5	3.3	5.0	1.9	3.8	2.9	5.6	0.7	8.1
	5.6	0.5	4.1	4.7	2.0	5.7	2.2	1.8	3.7	4.0	8.2	5.9	1.5	4.2	7.4
	3.3	4.0	1.3	1.1	12.2	0.2	12.3	5.0	9.9	6.3	8.6	3.1	5.8	7.8	1.4
	7.2	13.6	14.5	8.7	15.5	19.0	7.5	9.3	5.7	20.6	13.7	4.9	13.8	15.6	18.8
	35.9	16.1	5.0	11.3	2.0	6.2	4.5	11.7	15.3	9.4	18.7	23.2	15.7	11.2	7.5
	10.2	0.2	0.1	2.8	5.8	26.9	6.2	5.0	8.5	1.9	10.8	5.0	13.9	17.6	21.1
	17.9	23.5	28.6	13.0	13.0	19.0	14.9	2.6	19.9	4.5	14.9	14.5	3.9	2.3	4.6
I - 135°	23.0	17.8	19.7	18.9	21.9	15.7	20.2	26.3	25.8	18.9	22.6	30.9	32.1	20.3	15.5
	24.8	26.6	11.4	3.1	4.7	4.5	12.6	20.4	23.1	34.8	28.5	31.6	10.1	38.5	33.0
	57.1	52.7	50.5	48.0	47.7	39.4	28.3	21.1	19.9	13.1	22.2	26.4	22.6	22.9	32.7
	14.6	12.5	1.6	11.8	7.2	17.4	5.9	3.1	6.7	3.7	10.1	7.9	12.0	13.0	6.7

Table 16. Root Mean Square Error Data – Day 1

Group	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	Trial 11	Trial 12	Trial 13	Trial 14	Trial 15
	46.5	53.3	57.1	46.0	37.1	44.9	55.8	50.6	51.4	59.2	40.7	39.0	25.1	45.5	38.2
	74.4	80.1	67.9	70.3	74.1	61.8	63.7	57.5	52.0	70.7	63.2	72.6	68.0	73.1	75.4
	74.8	61.3	56.6	72.0	54.2	43.4	50.3	43.6	56.2	42.5	45.7	61.2	45.1	62.9	34.5
E - 90°	44.3	34.9	24.4	23.0	16.5	22.4	17.8	18.6	16.2	24.2	12.3	24.6	31.5	25.0	10.2
	60.0	47.6	47.9	26.6	21.1	47.3	32.3	27.3	40.2	21.5	27.3	26.3	23.3	30.2	33.1
	63.8	35.9	22.6	27.3	19.9	25.7	41.2	26.9	16.6	29.5	31.4	36.6	46.1	46.3	29.8
	75.0	72.1	36.3	31.3	49.9	46.6	40.7	66.9	44.1	59.0	49.0	53.4	30.6	19.7	28.3
	68.9	77.8	45.2	63.3	56.1	50.1	60.0	28.5	23.5	18.9	30.3	24.5	41.4	33.5	13.2
	65.8	82.4	81.4	76.4	69.6	80.7	76.4	72.3	73.8	76.3	70.3	74.0	64.5	66.8	68.2
	75.3	78.1	71.0	63.1	60.5	74.8	59.0	69.6	71.6	66.8	74.7	75.7	75.1	78.4	78.8
I - 90°	77.0	51.9	46.8	81.0	32.4	23.6	23.9	16.6	18.5	15.1	16.1	11.1	12.4	19.2	41.5
	15.6	20.6	21.2	22.4	22.8	21.9	24.5	18.6	15.0	20.6	16.8	29.7	18.1	29.3	27.2
	29.8	45.2	38.4	32.3	43.0	29.7	37.8	43.0	39.1	30.5	46.9	32.8	17.5	29.7	28.8
	58.0	23.7	73.9	68.4	32.3	48.5	27.0	51.3	15.9	52.3	38.5	22.6	51.3	17.7	18.0
	34.2	35.6	27.3	22.1	38.0	64.9	56.1	24.5	23.2	24.6	24.7	17.4	29.0	19.4	24.9
	31.4	24.1	30.3	20.7	28.3	27.8	16.4	20.1	19.2	10.3	16.3	13.5	18.9	12.7	20.0
	26.7	12.2	19.3	12.0	22.2	24.2	18.9	13.9	35.8	26.2	43.9	25.5	27.8	17.5	18.1
E – 135°	23.6	27.3	15.9	18.2	21.4	19.5	32.4	23.4	20.6	23.1	17.3	19.0	19.5	20.3	19.0
	23.9	25.9	23.6	38.6	20.2	32.6	27.7	25.3	34.7	30.8	32.4	23.6	51.7	15.0	22.1
	47.2	39.2	21.0	49.9	67.5	20.1	39.5	26.2	28.9	17.0	22.6	19.4	18.6	20.9	27.9
	31.5	31.7	30.9	37.3	33.9	18.6	22.9	40.6	25.0	22.8	33.5	37.1	27.0	29.3	19.7
	40.4	28.0	27.2	29.6	22.2	36.2	30.0	27.0	25.9	38.7	18.7	49.2	40.0	19.0	24.2
	19.0	17.5	10.6	26.3	18.5	18.7	21.8	28.7	32.8	31.1	41.1	43.4	41.2	42.3	42.0
	28.7	27.8	30.0	32.8	20.9	36.0	26.6	23.8	24.6	26.0	28.6	21.7	24.9	19.9	24.0
I - 135°	31.4	25.9	35.5	30.3	26.3	27.5	42.0	23.7	33.3	36.4	26.5	29.4	33.9	30.9	27.4
	34.9	36.6	30.9	28.6	29.0	36.6	16.6	21.4	15.3	14.8	16.5	25.5	20.5	36.1	20.7
	24.1	11.6	37.3	36.9	30.1	29.0	19.5	29.0	39.5	17.8	31.5	25.9	27.3	25.7	27.9
	30.1	35.8	19.1	24.8	23.2	29.7	27.5	23.3	28.1	28.3	21.8	25.7	20.6	14.8	27.9

Table 16. Root Mean Square Error Data – Day 1 (continued)

Group	Trial 16	Trial 17	Trial 18	Trial 19	Trial 20	Trial 21	Trial 22	Trial 23	Trial 24	Trial 25	Trial 26	Trial 27	Trial 28	Trial 29	Trial 30
	40.8	31.7	29.9	21.1	34.9	41.1	53.2	19.8	25.5	31.3	27.5	24.4	21.3	17.6	26.3
	79.1	61.8	37.3	68.8	53.9	58.3	62.3	47.8	48.1	69.3	59.0	49.5	38.4	51.4	47.7
	39.3	42.2	31.7	44.7	26.9	29.7	26.1	21.4	32.1	20.5	26.3	15.6	28.0	24.3	26.3
E - 90°	14.3	19.1	16.1	15.9	16.8	14.8	13.4	15.5	19.7	17.7	10.3	13.2	13.5	17.8	10.5
	23.4	31.9	28.6	30.0	42.6	30.8	25.9	37.3	37.0	24.3	14.3	21.6	21.7	24.5	26.2
	26.5	21.7	20.7	19.8	24.8	22.7	14.1	15.0	22.2	21.5	30.9	20.4	17.4	14.8	17.4
	52.3	41.5	41.4	35.6	46.3	39.6	51.2	28.7	24.0	39.2	33.6	37.8	35.9	47.9	48.4
	18.6	24.5	16.7	28.2	20.0	53.6	23.0	18.4	17.2	31.5	21.1	14.9	18.7	23.0	18.6
	43.8	44.0	58.6	63.3	53.7	49.3	59.0	44.6	63.5	66.7	48.5	43.7	51.2	53.5	65.0
	78.9	79.6	80.4	74.2	72.1	70.6	73.6	63.5	73.6	75.7	57.7	48.9	47.3	40.8	48.0
I - 90°	17.7	10.3	17.5	13.0	12.7	16.0	9.9	21.9	12.4	47.5	20.1	27.8	15.9	20.8	15.6
	17.8	16.5	29.8	42.4	16.9	17.5	20.1	17.4	16.2	16.6	25.7	13.6	14.2	15.9	17.5
	35.4	14.8	28.3	20.9	26.4	28.2	40.7	29.1	46.1	24.7	26.1	40.8	26.6	21.5	21.6
	40.6	52.0	63.2	62.9	56.7	21.5	20.6	26.3	25.1	42.5	23.4	32.3	21.9	14.2	23.7
	14.2	19.9	18.8	23.7	40.9	36.6	29.1	27.2	20.6	22.1	26.7	28.1	28.3	21.9	24.5
	19.2	20.7	31.7	32.6	35.1	30.7	32.4	17.8	16.8	17.2	25.9	21.6	37.2	37.6	30.4
	19.2	24.6	12.1	15.9	16.7	19.0	23.0	18.2	30.8	14.7	17.0	23.0	23.4	14.1	28.7
E – 135°	19.9	22.0	18.1	29.3	20.4	20.4	15.8	25.2	19.1	16.0	18.7	14.2	14.8	13.8	16.1
	24.5	25.8	43.4	13.1	17.8	24.2	23.8	28.4	16.0	10.4	16.5	14.3	18.1	15.2	16.3
	20.6	24.1	21.5	23.2	21.9	41.1	24.3	14.4	14.1	21.3	21.3	39.9	35.8	36.8	23.2
	29.3	21.6	26.7	53.6	41.7	16.0	23.5	21.1	22.0	15.6	18.9	26.8	33.1	40.9	27.5
	34.6	36.1	25.8	24.8	31.0	30.7	44.7	30.1	30.2	36.7	29.4	29.6	38.0	23.9	37.3
	57.9	51.0	61.3	30.7	54.6	63.9	64.4	54.4	63.0	54.7	57.8	62.3	52.6	60.3	49.6
	21.6	31.2	19.8	14.8	20.5	12.5	10.3	21.6	20.5	19.6	22.9	20.7	47.3	18.0	14.8
I - 135°	31.4	33.3	35.4	48.0	15.6	34.9	28.9	31.1	32.8	35.9	30.3	35.7	19.1	24.1	27.9
	26.5	18.3	20.9	30.2	16.8	28.3	24.5	26.1	19.3	32.1	24.4	16.7	23.0	22.1	18.4
	42.3	25.0	35.2	27.9	28.1	24.0	21.5	33.4	56.7	29.6	63.8	27.4	15.3	16.9	27.8
	27.0	18.4	23.5	24.0	19.6	18.4	18.2	26.7	32.9	35.8	29.5	14.8	26.9	41.9	24.6

Table 17. Root Mean Square Error Data – Day 2

Group	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	Trial 11	Trial 12	Trial 13	Trial 14	Trial 15
	42.5	25.0	15.1	14.6	17.9	26.4	16.2	26.6	27.4	17.1	24.3	27.7	32.1	14.6	20.9
	75.8	64.7	45.0	52.2	50.5	55.2	36.7	49.8	25.5	37.7	28.0	27.4	36.1	24.2	47.8
	23.2	24.9	19.7	22.7	23.5	14.6	21.9	17.0	20.5	21.1	18.5	15.0	15.8	18.9	25.5
E - 90°	14.3	15.6	13.0	15.1	12.6	8.4	10.2	14.5	11.2	11.2	11.0	13.8	11.8	14.9	20.6
	22.4	27.2	29.6	23.5	20.4	23.9	15.0	21.2	21.0	18.8	17.7	19.8	28.7	18.1	17.8
	12.5	8.8	15.3	9.8	8.4	13.7	14.5	12.5	11.2	13.1	13.7	10.7	9.7	15.5	9.0
	26.1	22.8	27.7	28.5	19.6	15.0	15.4	23.0	20.6	21.4	16.7	36.9	26.0	15.3	27.2
	18.3	12.3	14.7	10.9	15.0	16.5	15.0	26.6	13.4	12.4	10.4	12.9	12.2	13.4	11.5
	31.5	37.1	36.9	34.0	38.8	40.1	41.5	42.6	38.2	36.3	35.6	36.7	30.4	32.4	45.1
	70.5	69.5	68.2	52.0	66.2	61.0	62.2	50.1	50.4	54.1	52.9	54.6	48.1	52.4	46.5
I - 90°	18.0	18.8	26.5	13.2	8.1	11.7	12.2	12.2	19.1	13.2	14.1	15.4	13.8	22.2	25.3
	21.8	26.1	16.0	24.2	24.2	20.7	22.2	19.3	15.7	11.8	13.1	16.5	15.0	16.6	14.9
	30.1	25.3	21.2	25.0	16.3	18.9	27.5	33.1	23.2	28.0	16.2	20.4	25.2	34.5	30.0
	35.8	14.7	20.9	20.0	21.6	18.4	14.4	13.3	17.2	24.6	30.5	12.6	18.6	18.1	13.1
	15.6	20.3	12.3	18.6	22.4	24.5	13.2	17.8	26.2	19.0	17.0	16.6	17.1	23.5	18.0
	22.4	26.7	23.0	27.3	19.4	19.3	25.1	28.1	28.5	32.3	28.9	34.8	32.2	33.3	42.7
	22.7	16.7	20.9	17.7	16.9	24.5	20.4	20.1	28.7	23.2	12.9	14.8	15.5	21.3	18.0
E – 135°	25.7	16.0	16.4	13.1	17.2	19.1	14.5	13.4	17.9	14.7	17.5	13.5	12.3	14.8	15.9
	15.0	9.2	19.5	19.5	13.2	14.5	17.4	13.1	17.4	18.3	13.0	12.7	10.5	13.3	16.2
	14.0	14.1	19.7	16.9	11.9	14.2	12.8	10.9	17.7	16.6	17.4	18.5	9.4	22.1	14.1
	15.2	21.0	26.3	17.3	23.9	17.7	33.5	19.0	16.7	19.5	13.5	19.7	20.6	21.6	18.9
	40.3	39.2	41.9	44.4	30.5	28.6	27.2	27.3	25.1	35.6	35.5	45.1	45.0	42.6	49.7
	46.6	62.5	14.3	36.7	32.8	33.1	46.9	41.2	39.2	38.4	55.3	63.2	53.7	57.8	61.5
	28.1	15.5	4.2	19.5	13.4	9.4	14.8	15.6	21.3	26.8	31.2	22.0	13.6	22.0	24.7
I - 135°	22.5	19.3	19.7	20.9	27.1	22.0	21.6	21.2	19.6	32.4	17.7	21.7	20.1	35.3	23.6
	36.0	45.0	35.2	36.9	36.9	47.0	31.8	23.4	21.6	21.6	23.4	20.9	30.2	21.4	21.2
	37.3	66.4	48.5	44.8	59.0	56.4	68.1	49.9	56.3	61.5	44.3	65.2	38.4	54.3	51.0
	25.4	21.3	28.0	30.7	31.7	23.6	28.6	29.7	28.2	26.8	33.9	24.1	25.8	29.4	28.6

Table 17. Root Mean Square Error Data – Day 2 (continued)

Group	Trial 16	Trial 17	Trial 18	Trial 19	Trial 20	Trial 21	Trial 22	Trial 23	Trial 24	Trial 25	Trial 26	Trial 27	Trial 28	Trial 29	Trial 30
E - 90°	21.2	22.1	30.6	11.7	12.5	15.8	18.0	24.0	13.0	12.2	18.2	13.1	19.2	21.9	22.7
	39.6	30.0	30.2	24.8	32.9	30.8	20.9	24.5	27.7	28.1	27.3	26.4	27.1	28.3	24.4
	24.0	16.4	30.7	18.2	12.3	15.8	16.4	23.0	18.0	12.9	16.4	18.2	13.0	15.7	18.8
	12.3	12.5	12.5	11.0	12.6	7.8	9.8	10.8	9.6	14.9	12.4	11.4	13.1	16.1	12.7
	18.8	22.2	27.5	20.8	28.2	19.7	22.8	19.0	24.5	18.0	20.9	24.3	22.8	20.6	21.1
	8.1	7.6	6.6	11.3	9.5	10.3	9.6	12.9	13.1	11.0	7.7	9.6	9.4	10.7	10.9
	31.8	34.6	24.6	31.8	17.8	21.5	20.0	19.0	34.2	16.9	34.7	22.7	20.8	13.6	22.2
I - 90°	14.8	13.8	18.5	12.5	25.8	9.3	14.4	13.0	11.2	14.5	12.4	17.8	12.1	12.8	14.5
	29.6	55.1	41.4	38.3	36.1	30.9	41.1	32.1	33.3	31.5	31.4	38.8	24.0	32.6	25.2
	28.0	24.2	18.0	29.5	30.4	44.7	34.0	24.9	31.7	21.1	32.1	27.7	32.5	17.6	20.7
	16.3	13.8	18.6	23.8	16.7	29.3	20.7	22.5	17.1	23.3	25.1	23.4	15.5	15.5	18.4
	13.4	12.8	21.2	16.9	18.6	12.6	22.9	20.9	22.7	22.6	15.3	12.5	8.9	9.0	15.6
	28.4	29.5	50.9	16.9	26.4	39.4	18.1	26.8	21.3	25.7	18.9	19.9	32.9	16.0	20.8
	24.2	32.1	20.6	21.9	16.3	19.0	19.8	14.9	15.1	17.9	16.9	14.2	11.6	17.4	10.7
E – 135°	24.4	19.7	11.2	26.6	17.1	23.9	21.7	15.7	20.9	22.5	20.8	12.7	23.4	22.7	25.7
	36.1	20.1	34.1	33.6	23.4	16.5	21.1	29.5	34.5	21.4	17.8	33.2	24.2	21.8	25.6
	14.4	17.2	15.8	15.2	9.7	13.9	13.4	18.5	8.3	12.5	15.1	15.2	18.2	13.1	14.8
	12.7	12.8	8.9	15.1	11.2	13.2	11.9	11.4	17.2	14.0	15.6	13.7	12.3	15.5	16.0
	12.8	13.2	14.1	17.7	13.1	14.3	10.4	15.7	14.2	13.1	11.5	17.9	13.8	15.6	11.1
	17.5	20.4	26.6	15.2	14.9	15.8	14.8	14.8	22.0	11.8	15.1	12.7	18.8	23.0	13.1
	18.9	15.4	16.9	20.6	19.9	15.3	17.7	27.5	17.9	18.2	15.5	18.6	25.9	25.4	16.6
I - 135°	38.6	30.2	28.0	31.2	23.2	52.3	24.1	28.8	22.1	31.2	30.6	20.7	51.0	34.7	29.6
	51.6	72.0	51.5	41.6	34.6	50.0	58.5	58.7	60.2	66.4	60.9	77.1	66.2	62.0	29.2
	28.2	30.2	22.2	22.6	21.8	23.3	25.4	20.3	23.9	24.9	23.1	26.4	24.1	26.6	21.9
	23.9	40.5	35.2	41.7	26.8	18.9	20.4	30.0	26.6	27.0	36.4	23.7	43.5	36.1	26.2
	24.9	19.2	22.0	35.3	20.7	30.0	33.3	37.4	25.3	41.5	41.2	38.8	24.4	37.6	34.4
	60.7	48.9	58.4	44.9	43.9	41.7	33.0	34.6	36.6	37.1	31.7	24.6	36.4	39.7	59.7
	32.3	26.4	30.1	17.1	22.4	29.4	33.3	16.2	18.3	21.0	21.7	22.6	16.8	24.4	15.6

Table 18. Root Mean Square Error Data – Day 3

Group	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10	Trial 11	Trial 12	Trial 13	Trial 14	Trial 15
	19.8	21.3	23.3	14.0	18.8	15.6	16.5	13.6	13.0	18.1	16.8	16.2	16.1	11.2	16.4
	19.6	32.8	20.7	24.0	35.1	35.3	36.8	38.8	39.8	38.2	36.2	23.5	27.8	31.2	29.1
	24.6	25.3	24.6	18.1	18.0	22.9	19.7	19.2	19.3	19.4	19.9	22.8	20.9	18.4	17.0
E - 90°	51.7	23.4	19.3	23.9	24.5	25.8	26.2	21.0	19.0	22.1	17.3	15.9	15.6	19.4	19.9
	23.2	16.9	22.9	20.1	25.1	20.3	20.9	25.3	23.0	26.2	20.0	20.6	19.4	18.9	22.1
	37.4	15.7	15.5	13.3	13.1	11.3	10.7	12.8	13.6	9.8	13.7	13.0	14.2	12.8	11.2
	14.6	21.4	17.6	16.1	17.8	23.9	12.2	24.2	22.2	21.7	12.2	14.0	17.2	21.8	17.4
	43.8	43.9	19.8	40.4	40.8	40.1	37.6	22.5	14.1	13.3	18.7	14.0	14.1	25.9	14.6
	38.9	39.3	43.1	32.5	27.2	20.3	18.6	20.2	19.2	22.5	22.8	31.0	27.4	28.7	27.8
	26.7	61.3	17.0	30.9	37.0	42.5	52.1	55.7	11.9	17.3	18.0	13.9	20.5	14.8	35.6
I - 90°	80.0	73.3	53.5	20.8	24.4	21.7	26.0	36.7	29.6	28.0	30.2	25.1	52.8	41.6	40.5
	66.8	50.9	37.4	56.0	39.2	41.6	42.3	36.8	38.9	43.9	48.0	54.4	36.0	55.7	48.9
	46.0	40.5	30.3	44.4	39.6	50.2	49.0	27.3	22.1	44.7	37.6	38.1	35.7	25.9	23.2
	71.6	67.1	47.9	50.6	39.6	38.8	33.2	32.8	34.1	43.0	44.0	49.6	38.7	33.3	27.0
	16.8	12.5	10.6	12.3	12.2	9.9	14.4	11.6	12.4	10.1	14.3	13.3	12.2	13.4	14.9
	20.4	15.1	16.7	21.3	21.4	26.1	25.2	26.1	14.9	17.0	20.5	19.3	17.6	19.7	18.0
	17.6	13.1	14.5	14.0	16.0	19.2	17.2	18.0	14.5	12.7	17.7	10.2	18.4	14.8	13.3
E – 135°	12.8	10.2	11.8	12.0	14.7	18.3	14.0	10.9	12.0	14.9	14.0	9.7	18.2	11.6	10.0
	17.6	15.8	14.8	14.8	19.0	20.4	13.5	21.0	10.8	14.1	12.3	14.4	14.8	11.6	11.4
	10.2	12.7	15.5	15.2	13.4	16.8	16.6	14.5	13.7	13.7	14.1	14.4	12.2	14.4	10.6
	15.3	15.2	19.5	24.4	17.0	26.1	23.8	18.6	20.4	23.1	22.3	25.3	19.5	17.6	27.5
	40.5	45.9	30.8	25.7	22.6	48.9	46.3	45.9	35.7	46.2	20.9	26.2	20.4	33.8	26.9
	19.1	11.7	19.7	13.2	17.9	10.4	13.1	17.3	35.7	14.6	22.4	21.2	8.4	17.1	16.9
	29.0	21.7	17.3	15.3	11.6	21.1	21.1	25.8	22.3	23.7	31.5	30.9	35.2	25.0	29.3
I - 135°	42.6	40.7	44.1	39.6	35.6	30.9	35.7	40.0	33.3	39.9	46.7	33.8	35.0	38.9	18.6
	36.7	44.2	24.1	31.9	35.4	34.9	28.9	38.4	28.4	30.8	39.2	32.9	33.0	44.7	36.7
	49.6	61.1	56.3	57.8	72.2	66.6	44.9	26.6	25.2	33.0	31.8	35.9	42.5	39.1	48.1
	19.3	18.4	28.0	21.2	30.1	26.9	23.0	17.0	18.8	26.1	19.2	16.9	23.9	18.1	26.3

Table 18. Root Mean Square Error Data – Day 3 (continued)

Group	Trial 16	Trial 17	Trial 18	Trial 19	Trial 20	Trial 21	Trial 22	Trial 23	Trial 24	Trial 25	Trial 26	Trial 27	Trial 28	Trial 29	Trial 30
	12.8	15.0	14.0	12.2	15.3	10.1	12.4	18.0	13.9	11.7	19.4	13.2	15.6	11.4	17.0
	23.8	20.0	43.9	41.8	33.6	37.8	41.4	35.6	23.3	22.3	30.0	20.3	40.9	34.8	23.5
	23.1	16.7	17.7	12.8	22.5	35.6	23.9	25.2	20.0	25.7	16.7	17.3	17.2	19.5	21.2
E - 90°	19.9	18.7	13.2	21.8	20.4	17.0	19.3	20.1	16.2	16.0	16.1	12.9	14.7	12.4	12.0
	19.0	17.0	17.2	20.9	18.3	19.8	21.8	25.7	25.3	18.1	19.4	24.0	19.8	21.2	19.5
	14.5	16.1	15.1	11.8	14.4	11.8	11.1	11.0	15.5	8.6	9.3	9.9	7.5	6.6	9.9
	18.6	21.4	16.8	25.0	25.9	18.1	19.4	18.3	16.8	17.5	19.8	16.7	15.5	13.1	18.9
	17.1	32.7	15.9	16.4	28.3	20.1	17.9	17.3	37.9	20.3	26.6	14.3	23.8	22.4	20.3
	24.9	22.1	25.9	30.2	27.0	26.2	29.5	28.8	27.9	21.4	27.9	16.3	25.2	20.9	24.3
	40.1	38.0	45.2	68.6	40.3	26.3	46.1	48.8	31.6	38.9	25.3	24.6	49.6	27.4	18.5
I - 90°	42.2	30.5	43.3	35.9	43.4	29.7	25.0	19.7	29.3	33.7	28.3	31.5	45.5	30.4	34.0
	51.9	54.0	43.6	55.0	52.0	19.1	37.8	47.4	45.9	42.4	54.4	45.7	48.6	48.8	19.1
	24.0	35.3	25.8	25.6	28.0	14.9	23.2	22.4	35.6	22.8	43.3	45.9	57.3	56.5	46.1
	44.9	25.1	33.8	25.5	35.7	39.0	21.3	32.9	38.0	42.0	45.9	37.4	48.1	34.4	34.2
	19.7	17.5	15.7	14.2	8.0	15.0	17.0	13.3	12.9	23.4	19.0	13.0	17.6	17.4	16.3
	21.4	19.9	20.0	17.6	18.0	23.9	18.3	21.0	26.2	23.7	28.2	14.8	17.2	11.3	13.5
	15.5	14.1	15.6	17.3	14.4	14.1	11.7	10.1	13.4	11.5	14.0	8.5	10.8	18.3	16.2
E – 135°	10.5	10.0	11.3	15.2	9.4	13.1	12.5	12.1	9.5	10.4	18.0	8.9	12.2	8.4	11.8
	15.0	11.8	13.7	10.7	8.1	12.1	12.0	10.9	9.9	12.9	13.8	13.5	12.5	10.3	14.2
	12.4	15.7	13.0	12.9	17.2	11.5	15.3	12.2	18.7	6.4	17.7	13.9	12.4	15.6	9.8
	17.9	23.4	26.9	18.9	20.3	22.0	18.2	16.4	16.0	27.7	23.6	15.7	21.6	23.2	34.7
	38.5	23.0	22.4	31.3	19.7	19.8	19.0	50.2	25.1	21.5	24.7	32.1	27.2	18.6	26.6
	15.6	8.1	10.6	12.7	11.9	30.7	11.4	11.0	13.6	9.2	13.5	9.3	17.3	21.5	22.7
	24.1	25.8	30.7	18.2	17.3	23.4	22.2	19.6	26.1	23.3	24.9	19.5	14.0	20.2	12.9
I - 135°	27.0	23.8	25.3	23.6	27.3	22.2	26.5	30.6	32.6	25.3	28.1	34.6	37.5	25.9	20.4
	32.6	31.2	25.8	11.5	21.7	14.1	19.8	24.8	28.6	36.3	32.0	37.7	17.4	41.9	38.8
	58.0	53.7	51.4	49.8	49.4	42.9	32.0	23.3	24.5	18.8	25.5	30.9	30.4	26.4	37.7
	24.5	19.1	13.9	19.1	22.5	24.6	13.9	16.9	14.9	14.6	20.0	17.1	19.4	20.4	16.3

Appendix A

Instructions to Participants

External-90° group:

Instructions to Participants

You will be practicing a movement task that requires you to grasp the blue handles on the slides in front of you, and to move them continually in a specific pattern or *relative phase*. Relative phase refers to the position of the left hand in relation to the position of the right hand. You will be asked to perform 3 relative phase patterns.

For all of these patterns you will slide the handles so that the red indicators move back and forth between the limits of the two outer lines marked on the base of each slide. Your movements should be smooth, rhythmical, and continuous.

During each trial a white outline will be present on the computer screen in front of you. A black target cursor will be moving around the outline in time with an auditory metronome. Another yellow cursor will represent your own movements, and will make a red tracing on the screen. It is your goal to try to keep your yellow cursor as close as possible to the black target cursor at all times. Try to pay as much attention as possible to minimizing the distance between your cursor and the target cursor. Focusing on this display during each practice trial will help to improve your performance.

For each relative phase pattern you will begin with the red indicators positioned in specific locations:

1. In Phase pattern (0° relative phase)
    - Begin with both indictors at the IN position
2. Anti Phase Pattern (180° relative phase)
    - Begin with the left indicator at the IN position, and the right indicator at the OUT position
3. 90° relative phase
    - Begin with the left indicator at the IN position, and the right indicator at the 90° mark

Internal-90° group:

Instructions to Participants

You will be practicing a movement task that requires you to grasp the blue handles on the slides in front of you, and to move them continually in a specific pattern, or *relative phase*. Relative phase refers to the position of the left hand in relation to the position of the right hand. You will be asked to perform 3 relative phase patterns.

For all of these patterns you will slide the handles so that the red indicators move back and forth between the limits of the two outer lines marked on the base of each slide. Your movements should be smooth, rhythmical, and continuous.

During each trial, pay close attention to your movements to ensure that they are producing the correct relative phase. Each pattern can be represented by a specific line or shape. Following each trial, you will have 5 seconds to lift the cover from the computer screen in front of you and see how close your movements were to producing the correct shape. On the screen you will see a white target shape, which represents a "perfect" trial, as well a red tracing representing your own movements will be shown.

Feel free to briefly practice the described movements as you read through the following instructions.

1. In Phase pattern (0° relative phase)
    - Begin with both indictors at the "IN" position
    - One arm will mirror the other, so that the indicators always reach the "OUT" position simultaneously, and the "IN" position simultaneously
    - Both arms should return complete one cycle (from IN to OUT and back to IN) with each beat of the metronome

2. Anti Phase Pattern (180° relative phase)
    - Begin with the left indicator at the IN position, and the right indicator at the OUT position
    - Your arms will always be moving in the opposite direction, so that as the left indicator reaches the OUT position, the right indicator reaches the IN position
    - complete one cycle of the movement with every beat of the metronome

3. 90° relative phase
    - Begin with the left indicator at the IN position, and the right indicator at the 90° mark
    - The movement of the right arm will mirror that of the left arm, but it will always follow the left by ¼ of a full cycle
    - Complete one cycle of the movement with every beat of the metronome

External-135° group:

Instructions to Participants

You will be practicing a movement task that requires you to grasp the blue handles on the slides in front of you, and to move them, continually, in a specific pattern, or *relative phase*. Relative phase refers to the position of the left hand in relation to the position of the right hand. You will be asked to perform 3 relative phase patterns.

For all of these patterns you will slide the handles so that the red indicators move back and forth between the limits of the two outer lines marked on the base of each slide. Your movements should be smooth, rhythmical, and continuous.

During each trial, a white outline will be present on the computer screen in front of you. A black target cursor will be moving around the outline in time with an auditory metronome. Another yellow cursor will represent your own movements, and will make a red tracing on the screen. It is your goal to try to keep your yellow cursor as close as possible to the black target cursor at all times. Try to pay as much attention as possible to minimizing the distance between your cursor and the target cursor. Focusing on this display during each practice trial will help to improve your performance.

For each relative phase pattern you will begin with the red indicators positioned in specific locations:

1. In Phase pattern (0° relative phase)
    - Begin with both indictors at the "IN" position
2. Anti Phase Pattern (180° relative phase)
    - Begin with the left indicator at the IN position, and the right indicator at the OUT position
3. 135° relative phase
    - Begin with the left indicator at the IN position, and the right indicator at the 135° mark

Internal-135° group:

Instructions to Participants

You will be practicing a movement task that requires you to grasp the blue handles on the slides in front of you, and to move them continuously (without stopping), in a specific pattern, or *relative phase*. Relative phase refers to the position of the left hand in relation to the position of the right hand. You will be asked to perform 3 relative phase patterns.

For all of these patterns you will slide the handles so that the red indicators move back and forth between the limits of the two outer lines marked on the slides. Your movements should be smooth, rhythmical, and continuous.

During each trial, pay close attention to your movements to ensure that they are producing the correct relative phase. Each pattern can be represented by a specific line or shape. Following each trial, you will have 5 seconds to lift the cover from the computer screen in front of you and see how close your movements were to producing the correct shape. On the screen you will see a white target shape, which represents a "perfect" trial, as well a red tracing representing your own movements will be shown.

Feel free to briefly practice the described movements as you read through the following instructions.

1. In Phase pattern (0° relative phase)
   - Begin with both indictors at the "IN" position
   - One arm will mirror the other, so that the indicators always reach the "OUT" position simultaneously, and the "IN" position simultaneously
   - Both arms should return complete one cycle (from IN to OUT and back to IN) with each beat of the metronome

2. Anti Phase Pattern (180° relative phase)
   - Begin with the left indicator in the IN position, and the right indicator in the OUT position
   - Your arms will always be moving at the opposite direction, so that as the left indicator reaches the OUT position, the right indicator reaches the IN position
   - Complete one cycle of the movement with every beat of the metronome

3. 135° relative phase
    - Begin with the left indicator in the IN position, and the right indicator at the 135° mark
    - The movement of the right arm will mirror that of the left arm, but it will always follow the left by ¾ of a half cycle
    - Complete one cycle of the movement with every beat of the metronome

Appendix B

ANOVA Tables

Table B-1

Root Mean Square Error – All Learning Sessions

Effect	DF Effect	MS Effect	DF Error	MS Error	F	p-level
Pattern	1	2519.781	24	916.281	2.750	0.110
AF	1	9976.172	24	916.281	10.888	0.003*
Day	2	4145.103	48	359.357	11.534	0.001*
Block	5	481.776	120	34.675	13.894	0.001*
Pattern X AF	1	413.221	24	916.281	0.451	0.508
Pattern X Day	2	2374.407	48	359.357	6.607	0.003*
AF X Day	2	1001.661	48	359.357	2.787	0.071
Pattern X Block	5	285.290	120	34.676	8.227	0.001*
AF X Block	5	15.996	120	34.676	0.461	0.804
Day X Block	10	60.737	240	33.375	1.820	0.058
P X AF X D	2	521.189	48	359.357	1.450	0.245
P X AF X B	5	21.601	120	34.676	.623	0.683
P X D X B	10	104.867	240	33.375	3.142	0.001*
AF X D X B	10	58.225	240	33.375	1.744	0.072
P X AF X D X B	10	28.950	240	33.375	0.867	0.564

Note. P= Pattern, AF= Attentional Focus, D= Day, B= Block

Table B-2

Mean Relative Phase – All Learning Sessions

Effect	DF Effect	MS Effect	DF Error	MS Error	F	p-level
Pattern	1	47965.41	24	3016.834	15.899	0.001*
AF	1	4762.642	24	3016.834	1.578	0.221
Day	2	10216.73	48	904.402	11.296	0.001*
Block	5	647.683	120	93.439	6.932	0.001*
Pattern X AF	1	11.193	24	3016.834	0.004	0.952
Pattern X Day	2	4361.713	48	904.402	4.822	0.012*
AF X Day	2	2426.656	48	904.402	2.683	0.078
Pattern X Block	5	39.189	120	93.439	0.419	0.834
AF X Block	5	128.761	120	93.439	1.378	0.237
Day X Block	10	705.561	240	75.103	9.394	0.001*
P X AF X D	2	1110.509	48	904.402	1.228	0.301
P X AF X B	5	43.699	120	93.439	0.467	0.800
P X D X B	10	60.287	240	75.103	0.802	0.626
AF X D X B	10	110.935	240	75.103	1.477	0.149
P X AF X D X B	10	125.109	240	75.103	1.667	0.089

Note. P= Pattern, AF= Attentional Focus, D= Day, B= Block

Table B-3

Root Mean Square Error – Day 3 Final Block

Effect	DF Effect	MS Effect	DF Error	MS Error	F	p-level
Pattern	1	571.441	24	357.944	1.596	0.218
AF	1	955.465	24	357.944	2.669	0.115
Trial	4	17.883	96	31.439	0.569	0.686
Pattern X AF	1	119.602	24	357.944	0.344	0.569
Pattern X Trial	4	10.217	96	31.439	0.324	0.861
AF X Trial	4	77.656	96	31.439	2.470	0.049*
P X AF X T	4	51.741	96	31.439	1.646	0.169

Note. P = Pattern, AF = Attentional Focus, T = Trial

Table B-4

Mean Relative Phase – Day 3 Final Block

Effect	DF Effect	MS Effect	DF Error	MS Error	F	p-level
Pattern	1	10727.33	24	1669.318	6.426	0.018*
AF	1	4205.834	24	1669.318	2.519	0.126
Trial	4	41.886	96	98.785	0.424	0.791
Pattern X AF	1	863.856	24	1669.318	0.517	0.479
Pattern X Trial	4	114.429	96	98.785	1.158	0.334
AF X Trial	4	84.729	96	98.785	0.858	0.492
P X AF X T	4	59.489	96	98.785	0.602	0.662

Note. P = Pattern, AF = Attentional Focus, T = Trial

Table B-5

Absolute Constant Error – Day 3 Final Block

Effect	DF Effect	MS Effect	DF Error	MS Error	F	p-level
Pattern	1	721.533	24	566.559	1.274	0.270
AF	1	2251.936	24	566.559	3.975	0.058
Trial	4	24.048	96	54.829	0.439	0.780
Pattern X AF	1	83.379	24	566.559	0.147	0.705
Pattern X Trial	4	7.333	96	54.829	0.134	0.970
AF X Trial	4	118.377	96	54.829	2.159	0.079
P X AF X T	4	108.097	96	54.829	1.972	0.105

Note. P = Pattern, AF = Attentional Focus, T = Trial

Table B-6

Root Mean Square Error – Effect of Prior Learning

Effect	DF Effect	MS Effect	DF Error	MS Error	F	p-level
Pattern	1	955.510	24	135.778	7.037	0.014*
AF	1	1998.456	24	135.778	14.719	0.001*
Block	5	303.521	120	38.727	7.837	0.001*
Pattern X AF	1	216.405	24	135.778	1.594	0.219
Pattern X Block	5	320.157	120	38.727	8.267	0.001*
AF X Block	5	186.665	120	38.727	4.820	0.001*
P X AF X B	5	41.629	120	38.727	1.075	0.378

Note. P = Pattern, AF = Attentional Focus, B = Block

Table B-7

Mean Relative Phase – Effect of Prior Learning

Effect	DF Effect	MS Effect	DF Error	MS Error	F	p-level
Pattern	1	12187.34	24	1134.581	10.741	0.003*
AF	1	2406.969	24	1134.581	2.128	0.158
Block	5	165.161	120	82.054	2.013	0.082
Pattern X AF	1	4478.519	24	1134.581	3.947	0.058
Pattern X Block	5	706.629	120	82.054	8.612	0.001*
AF X Block	5	84.056	120	82.054	1.024	0.406
P X AF X B	5	251.909	120	82.054	3.070	0.012*

Note. P = Pattern, AF = Attentional Focus, B = Block

Table B-8

Root Mean Square Error – Intrinsic Pattern Probe Trial Performance

Effect	DF Effect	MS Effect	DF Error	MS Error	F	p-level
Pattern	1	11.778	24	27.618	0.426	0.520
AF	1	3.078	24	27.618	0.111	0.741
Day	2	64.138	48	8.574	7.486	0.001*
IP	1	2804.843	24	24.936	112.480	0.001*
Time	1	3.346	24	6.198	0.540	0.470
Pattern X AF	1	57.803	24	27.618	2.092	0.161
Pattern X Day	2	5.053	48	8.574	0.589	0.559
AF X Day	2	0.711	48	8.574	0.083	0.921
Pattern X IP	1	14.712	24	24.936	0.590	0.450
AF X IP	1	10.185	24	24.936	0.408	0.529
Day X IP	2	69.925	48	6.481	10.789	0.001*
Pattern X Time	1	8.388	24	6.198	1.353	0.256
AF X Time	1	1.552	24	6.198	0.250	0.621
Day X Time	2	5.690	48	7.534	0.755	0.475
IP X Time	1	3.522	24	5.978	0.589	0.450
P X AF X D	2	18.333	48	8.574	2.138	0.129
P X AF X IP	1	1.084	24	24.936	0.043	0.837
P X D X IP	2	9.301	48	6.481	1.435	0.248
AF X D X IP	2	1.322	48	6.481	0.204	0.816
P X AF X T	1	28.425	24	6.198	4.586	0.042*
P X D X T	2	2.669	48	7.534	0.354	0.704
AF X D X T	2	1.295	48	7.534	0.172	0.843
P X IP X T	1	0.831	24	5.978	0.139	0.712
AF X IP X T	1	0.069	24	5.978	0.012	0.915
D X IP X T	2	21.266	48	6.203	3.428	0.041*
P X AF X D X IP	2	.632	48	6.481	0.098	0.907
P X AF X D X T	2	8.540	48	7.534	1.134	0.330
P X AF X IP X T	1	28.713	24	5.978	4.803	0.038*
P X D X IP X T	2	6.357	48	6.203	1.023	0.367
AF X D X IP X T	2	3.849	48	6.203	0.620	0.542
PxAFxDxIPxT	2	0.980	48	6.203	0.158	0.854

Note. P= Pattern, AF= Attentional Focus, D= Day, IP= Intrinsic Pattern, T= Trial