Right Hemisphere Activation to Rotary Stress in High and Low Hostile Men

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ABSTRACT

Several lines of research on converge for the conclusion that high and low hostile men differ with respect to autonomic regulation of stress. The functional cerebral systems approach has provided a theoretical framework to account for this finding across the individual sensory, motor, and premotor modalities. The current experiment extends and elaborates upon a functional cerebral systems based model that posits a role for the right frontal region in regulation of sympathetic tone after stress. The experiment builds upon prior work illustrating the utility of this model to stress by positing mild dizziness as a potential frontal lobe stressor demonstrating hostility group differences in sympathetic arousal. Dizziness was induced by brief clockwise angular rotation about the vertical neuroaxis. Consistent with vestibular research indicating clockwise rotation impacts the right hemisphere (relative to counterclockwise rotation), it was expected that hostile individuals would exhibit higher skin conductance levels after rotation compared with low hostile individuals. The experiment also included a dichotic listening task both before and after rotation to examine the effects of rotary stress on dichotic phoneme identification. The experiment was conducted in three blocks: A dichotic listening task comprised the first block, followed by application of rotary stress as the second block, and a follow-up dichotic listening task post- rotary stress. It was predicted that rotation would induce an auditory perceptual shift towards the left ear. Results confirmed expected group differences in sympathetic response to rotary stress. High hostiles had greater overall skin conductance immediately following rotation. High hostiles failed to habituate skin conductance levels to mild rotation 7 minutes post-rotary stress. Lateralized effects of skin conductance remain unconfirmed at this time. No group differences were found for either block of the dichotic listening task. Overall, results are interpreted to support a model of frontal region capacity limitation for regulation of stress, including vestibular dysfunction.

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Introduction

Cardiovascular Disease (CVD) threatens the health and well-being of men, women and children across the United States and across the world and has been the leading cause of death since 1900. In 2002 alone, it accounted for 38% of all deaths in the United States (American Heart Association, 2005). Moreover CVD is expected to garner a direct and indirect expense of over 393.5 billion dollars in 2005 (American Heart Association, 2005). This figure includes the cost of physicians and other professionals, hospital and nursing home services, the cost of medications, home health care and lost productivity resulting from morbidity and mortality. Many factors have been positively correlated with the incidence of CVD, including smoking, obesity, high blood pressure, and physical inactivity. It is now agreed that hostility is not only associated with an increased risk of cardiovascular disease, but also with many other negative outcomes as well (Miller et al., 1996; Shapiro, Goldstein, & Jammer, 1995). Hostility has been correlated with smoking (Lipkus et al., 1994), physical inactivity (Siegler, 1994), high alcohol consumption (Lee, Mendes deLeon, & Markides, 1988), and obesity (Carmody, Brunner, & St Jeor, 1999). As such, it is imperative to gain a better understanding of the factors that contribute to the hostility construct and to develop approaches that may be useful for prevention.

The term "hostility" is used to denote a construct that involves behavior, affect, and cognitions. Specifically, it concerns negative beliefs and attitudes towards others, with the effects of this being heightened cynicism and mistrust. Smith (1994) states that hostility is a trait indicating "a devaluation of the worth and motives of others, an expectation that others are likely sources of wrongdoing, a relational view of being in opposition to others, and a desire to inflict harm or to see others harmed" (Smith, 1994, pp. 26). While this definition may be sufficient in describing hostility in terms of dispositional traits, it fails to acknowledge the fundamental neuropsychological and physiological underpinnings of increased or diminished levels of hostility**.**

Smith acknowledges the research behind cardiovascular reactivity and high hostile individuals, but his explanations emphasize the role of internalized social structures and cognitive stressors as factors leading to cardiovascular lability in hostile individuals. Neuropsychological models of lateralized cerebral activation and functional neural systems theory are not addressed in his research. Other authors sidestep the relationship between trait hostility and cardiovascular lability by characterizing hostility as a “general risk factor” that increases vulnerability to psychosocial stressors (Williams, 2002; Shapiro, Goldstein, & Jammer, 1995). Past psychobiological research has indicated differences in cholesterol, catecholamine, and cortisol reactivity as a function of hostility levels (Suarez, Williams, Kuhn, Zimmerman, & Schanberg, 1991), as well as links to dysregulated serotonergic systems (Volavka, Citrome, & Huertas, 2006; Williams, 1994; 2002). Neuropsychological models offer conceptual perspectives distinct from strict social-cognitive models in that the emphasis relies on a framework for processing and regulatory capabilities of specialized anatomical, physiological, and metabolic processes within the brain as opposed to cognitive structures alone.

Past research has indicated that trait hostility serves as a moderator of autonomic regulation and has distinct lateralized effects across the cerebral hemispheres. Functional asymmetry amongst cerebral regions has been exemplified in explorations of the autonomic divisions of the nervous system, sensory/perceptual systems of vision (Herridge, Harrison, Mollet, & Shenal, 2004) and visual learning (Harrison & Gorelczenko, 1990), audition (Demaree & Harrison, 1997b) and auditory learning (Mollet & Harrison, in press-b), and somaesthesis (pertaining to tactile and kinesthetic sensation) and somatosensory learning (Herridge, Harrison, & Demaree, 1997; Rhodes, Harrison, & Demaree, 2002). Moreover, asymmetry has been explored within the executive systems to include motor (Demaree, Higgins, Williamson, & Harrison, 2002; Harrison & Pauley, 1991) and premotor systems (Foster & Harrison, 2004; Mollet, Walters, Harrison, & Holland, 2005; Walters & Harrison, 2006; Williamson & Harrison, 2003).

This lab has not yet directly investigated the cerebral effects of vestibular processing as a function of hostility, although the literature on the vestibular system has been shown to be pertinent to states of heightened physiological arousal and sympathetic activation in other trait disorders. At this point the conceptual understanding of the vestibular system in behavior, cognition and autonomic arousal remains unclear. It is well-known that overstimulation of the vestibular system may result in symptoms of nausea, dizziness, and sweating (for a succinct review see Lackner & Di Zio, 2005). Reciprocally, evidence exists suggesting that trait dispositions may impact vestibular activation correlates, though the clinical literature incorporating the vestibular system has been sparse. As an example, dysregulation of the vestibular system yielding dizziness and nausea have been reported with trait anxiety, a condition commonly associated with excessive sympathetic activation (Eagger et al., 1992; Eckhardt-Henn, 2003), and also for individuals prone to panic attacks (Jacob et al., 1996; Harrison, Carmona, & Foster, submitted). Yet the literature has not fully addressed the vestibular modality with regard to hostility and physiological arousal. Due to a lack of a clear systematic understanding, the role of the vestibular system in motion has all but been neglected in past research.

The present experiment will continue the systematic investigation of the laterality of functional neural systems involved in hostility through investigation of vestibular processing. There is much evidence that the cerebral hemispheres contribute to the regulation of the autonomic system. Within our lab, we have used a functional cerebral systems perspective to investigate the neuropsychological profile of trait hostility. This perspective appreciates the localized and interdependent nature of sensory and motor systems in activation of the cerebral hemispheres.

Hostility and Lateralization of the Autonomic Nervous System

The autonomic nervous system, comprised of the sympathetic and parasympathetic branch, is designed to regulate the stress response in the viscera and to maintain internal stability through oppositional systems. Generally, the sympathetic nervous system is associated with heightened arousal, such as increased heart rate, cardiovascular reactivity, sweat, and enhanced production of blood insulin among other indicators. The parasympathetic system, conversely, traffics in functions related to the attenuation of arousal, and the conservation (and possibly absorption) of energy resources with regards to metabolic glucose regulation.

Some research has supported the view that the right hemisphere is specialized for sympathetic arousal, while the left hemisphere is purported to be specialized for parasympathetic arousal (Wittling, Block, Schweiger, & Genzel, 1998). Zamrini et al. (1990) conducted an experiment that isolated the relative contributions of each hemisphere to cardiac tone. In this project, 25 epileptic subjects underwent intracarotid amobarbital procedures (WADA test) prior to surgical evaluation. Results showed that amobarbital introduction in the left internal carotid artery resulted in an increase in heart rate (HR). Conversely, amobarbital injection in the right internal carotid artery resulted in a decrease in HR. It was proposed that anesthesia of the respective hemispheres allowed for disinhibition of the intact hemisphere. Oppenheimer et al.

(1992) elicited cardiovascular changes directly by stimulating the medial temporal region of epileptic patients during a craniotomy. He found that right sided stimulation reliably elicited tachycardia and pressor effects. Conversely, left hemisphere stimulation elicited bradycardia and depressor effects.

Hemispheric asymmetry favoring the right hemisphere control of autonomic functioning has been demonstrated in peripheral systems as well. Evidence in the past has suggested that the physiological changes in the Galvanic skin response (GSR) reflect the sympathetic components of autonomic arousal (see Berntson, Cacioppo, & Quigley, 1991 for a discussion on the complex variations of autonomic control altogether). Heilman, Schwartz, & Watson (1978) recorded GSR in right and left hemisphere lesioned patients who received electrical stimulation on the arm ipsilateral to the lesion. The right hemisphere damaged patients had left hemispatial neglect and flattened emotional expression. The ipsilateral arm was stimulated to insure that both types of patients could be said to detect the sensory stimulus. Right hemisphere damaged patients had decreased GSR relative to left hemisphere. Furthermore they also had a higher threshold of resistance compared to left hemisphere damaged and normal subjects. In contrast left hemisphere damaged patients exhibited higher GSR. The results indicate that brain, autonomic activation dynamics are differentially moderated by the left and the right hemispheres. Relatedly, Morrow et al. (1981) found that right hemisphere damaged patients showed decreased GSR to emotionally charged slides compared to left hemisphere damaged patients.

In the past, hostility has reliably been shown to be associated with dysregulation of sympathovagal tone. The classic work of Alexander (1939) posited a relationship between hostility and repressed anger with deleterious cardiovascular activation during stress. Later research established a link between Type A behavior and cardiovascular reactivity. The Type-A concept proved to be too broad to have predictive utility, however, since it involved traits of impatience, competitiveness, and degree of job involvement (Kawachi et al., 1998; Matthews and Haynes, 1986).

Importantly, trait hostility became the independent factor most associated with cardiovascular reactivity to stress. Myrtek (1995) analyzed 93 studies from 1983 to 1992 relating Type A Behavior Pattern (TABP) to blood pressure and heart rate. When segregating the hostility component of TABP, they found that systolic blood pressure was prominently associated with high hostility. Within our lab, as well as others, high hostile men and women have been shown to have heightened sympathetic reactivity to stressor tasks both in the laboratory and in daily life (Christensen & Smith, 1993; Demaree, Harrison, & Rhodes, 2000; Emerson & Harrison, 1990; Gallo, Smith, & Kircher, 2000; Guyll & Contrada, 1998; Harrison & Gorelzcenko, 1990; Rhodes, Harrison, & Demaree, 2002; Suarez and Williams, 1992) and have demonstrated decreased parasympathetic tone using measures of heart rate variability (Demaree & Everhart, 2004; Schweiger et al., 1998).

The Functional Cerebral Systems Approach and Hostility

A theoretical framework is needed to elucidate the brain's vast network and its tendency to replicate functions across multiple areas. In response, there has been a resurgence of interest in the works of Alexander Luria's hierarchical classification of function systems. Namely, his appreciation of distinct but cooperative functional areas of the brain and his organization of function into three distinct units has helped to provide a paradigm to guide exploration (Tupper, 1999). Luria's hierarchical model conceptualizes the brain into three distinct, but interdependent units: the brainstem system, specialized for arousal and maintenance of alertness; the posterior cerebral region, specialized for sensory reception, analysis, and comprehension; and the frontal cerebral region, specialized for inhibitory regulation and control of executive functions. The incorporation of localization and equipotentialism results in a model that predicts interaction effects amongst the functional discrete units, such that for example, disturbances in behavior could be the result of frontal, posterior, and/or brainstem systems. In effect, the model predicts inter- and intrahemispheric effects on behavior.

Using the functional systems approach to classifying the different interrelated and overlapping functions of the brain, we have replicated findings of increased cardiovascular reactivity indicative of sympathetic activation to stress in high hostile individuals across the individual sensory, motor, and premotor modalities. Furthermore, differential group effects in task performance between high and low hostile participants have been demonstrated as a function of right hemisphere activation (Everhart, Demaree, & Wuensch, 2003).

Vision. Harrison & Gorelczenko (1990) investigated the effects of cerebral asymmetry in the perception of affective faces (happy or angry) using a forced choice reaction time task ("choose whether the face that is happy or angry"). In the experiment, high hostiles detected facial displays of emotion less accurately than low hostiles. Results indicated that high hostiles misinterpreted facial expressions in a manner that was consistent with a hostile disposition.

Specifically, high hostiles exhibited a negative bias in the appraisal of neutral faces presented within the left visual field. That is to say, hostiles evidenced a tendency to identify neutral faces to be angry faces. Herridge et al. (2004) conducted a follow-up experiment investigating cardiovascular effects of cold pressor induced pain on facial affect perception of tachistoscopically presented faces. High hostiles displayed less accuracy in facial affect perception. Significantly, the experiment found that stress interfered with performance of the identification task in high hostiles, whereas stress enhanced performance in low hostiles. The results are consistent with prior findings of differential effects among low and high hostiles following right cerebral activation.

Audition. Diametrically opposite hemispheric activation patterns have been found in high and low hostiles following a stress inducing cold pressor task. In an experiment designed to evaluate the functional impact of a painful cold pressor on a dichotic listening task, Demaree & Harrison (1997b) demonstrated that exposure to stress differentially activated the right and left hemispheres of high and low hostiles. When exposed to the pain stimulus, high hostiles reliably increased heart rate and systolic blood pressure and evidenced heightened accuracy for sound recognition at the left ear. In contrast, cold pressor induced pain activated the left hemisphere in low hostiles, resulting in maintenance of stable blood pressure and improved accuracy at the right ear. The findings of increased cardiovascular lability, in addition to the heightened left ear advantage for sound recognition are indicative of right temporal activation to stress for high hostile men, whereas activation of the left hemisphere in low hostile men is reflected by heightened right ear advantage and stable blood pressure.

Extending the findings of Demaree and Harrison (1997b), Mollet & Harrison (in press-a; in press-b) demonstrated that stress impacted learning performance to verbally presented stimuli in high and low hostiles. Compared to low hostiles, high hostile participants were deficient in their learning performance for a positive and neutral word list on the Auditory Affective Verbal Learning Test. However, auditory verbal learning in the high hostile group was superior to low hostile participants when the word list was negatively valenced, indicative of right hemisphere bias for negative affect (Snyder & Harrison, 1997; Snyder, Harrison, & Shenal, 1998).

The results of these experiments detailing auditory lateralization are also relevant given the relative proximity of the entorrhinal systems with the auditory cortex. Essentially, the vestibular system and auditory systems closely occupy and share similar cerebral pathways within the brain and originates from shared peripheral receptor access via the statoacoustic nerve (cranial nerve VIII). Processes which draw on similar functional cerebral space are expected to experience similar interference or enhancement of performance (Kinsbourne & Hisock, 1983). Essentially, the findings of differential activation of the cerebral hemispheres are relevant to the current study beyond the auditory and vestibular analogues. This is due to the fact that the results of lateralization in the auditory modality may serve as a precursor to possible findings from the vestibular modality since both auditory and vestibular end-organs are involved via projections from the statoacoustic nerve or cranial nerve VIII, which carries both acoustic and vestibular signals to the cerebral hemispheres.

Somaesthesis. Somaesthis essentially refers to "sensations and sensory structures of the human body" (Venes, 2001).Herridge, Harrison, Demaree (1997) demonstrated marked sympathetic activation as indicated by GSR at the left hand in high hostile men when they were asked to contract facial muscles corresponding to that of an angry facial expression. Experimenters trained participants in the appropriate facial movements for each affective expression. Contraction of angry facial muscles consisted of flexion of the corrugator muscle. Happy facial expression consisted of flexion of the zygomatic muscles. Production of the happy expression resulted in a comparatively lower GSR for high hostiles. Moreover high hostiles were slow to habituate left hemibody GSR to angry facial muscle contractions whereas low hostiles were slow to habituate right hemibody GSR to facial configurations with response repetition.

Motor. Demaree Williams, Higgins, & Harrison (2002) investigated flexor strength and fatigue at the distal extremities in high and low hostile men. It was predicted that right frontal dysregulation in high hostile men would be characterized by heightened flexor tone at the left hand –antigravity posturing- resulting in increased flexor grip strength at the left hand. Utilizing a hand dynamometer to assess grip strength, the experiment demonstrated that left hand strength was amplified in high hostile men, whereas diametrically opposite performance was found for low hostile men at the right hand. Rhodes & Harrison (2005) have documented similar effects at the left lower facial muscles with increased bilateral facial motor tone apparent in hostile men using EMG recordings and especially at the left hemiface. Heightened left hemifacial flexor tone at the masseter muscle occurred with increased cardiovascular reactivity to pain using blood pressure and heart rate measures. The results are consistent with the proposed model of decreased right frontal regulatory control over the posterior sensory cerebral regions and for flexor synergy for the upper body regions in high hostiles when compared with low hostile participants.

Premotor. Williamson & Harrison (2003) used a concurrent fluency task sensitive to either the left or right frontal lobe activation (see also Foster & Harrison, 2004) with predicted parasympathetic and sympathetic correlates among high and low hostiles. High hostile men demonstrated an increased systolic blood pressure in response to a design fluency task challenging the capacity of the right frontal system (see also Demakis & Harrison, 1997; Williamson, Harrison, Walters, 2006), while a verbal fluency task challenging left frontal capacity (Benton & de Hamsher, 1976) resulted in decreased systolic pressure. High hostiles also evidenced more perseverative errors in the design fluency task, a common clinical finding with diminished right frontal capability. Within the context of the anterior-posterior model of right cerebral activation, the results indicate that a confrontation task which taxed right frontal resources reduced the capacity for inhibition or frontal regulation of more posterior localized areas involved in sympathetic cardiovascular tone.

Vestibular System and Autonomic Activation

Activation of the vestibular system involves an extensive and complex array of cortical and subcortical brain regions, which are densely involved with the autonomic nervous system. In fact, the vestibular system is complicit in gastrointestinal discomfort and nausea, as well as in psychological disorders of exaggerated sympathetic activation such as Panic Disorder, where the patient may experience autonomic activation correlates of profuse sweating and nausea (Meuret, White, Ritz, Roth, Hofmann, Brown, 2006).

There has been inconsistent evidence within the research literature for sympathetic arousal to vestibular system activation. Three notable methods for vestibular activation are angular rotation, optokinetic stimulation, and caloric irrigation. Methods for engaging vestibular system resources have had differing results according to whether activation occurred through actual motion, caloric stimulation or optokinetic stimulation.

For example, Graybiel & Lackner (1980) investigated changes in blood pressure, heart rate, and body temperature after whole-body rotation in 12 college students. They found no relationship between the report of nausea symptoms and changes in the sympathetic measures. However, both Cowings et al. (1986) and Stout, Toscano, & Cowings (1995) found quite different results in whole body rotation experiments where participants were rotated at progressively faster rates every five minutes from 6 rpm to 30 rpm until the subject requested termination. They found a marked increase in heart rate and skin conductance and a decrease in blood volume pulse (associated with vasoconstriction) with prolonged exposure to rotation. Importantly, in looking over the experiments it should be pointed out that in the Cowings and Stout experiments the rotation was in the clockwise direction, whereas in the Graybiel & Lackner study direction was counterbalanced.

Optokinetic stimulation has resulted in small, but reliably significant effects on autonomic dynamics. Optokinetic stimulation purportedly evokes sympathetic responses and motion sickness as a result of conflicted inputs from the visual and vestibular systems. Essentially, the visual system indicates movement within extrapersonal space, whereas the vestibular system indicates that the person is stationary (Biaggioni, Costa, & Kaufmann, 1998). Both Hu et al. (1991) and Himi et al. (2004) found that optokinetic stimulation produced sympathetic changes, but the focus of these studies concerned indices of motion sickness. Hu found increased skin conductance and gastric tachyarrhythmia, but only a slight increase in heart rate. Himi induced nausea through oscillating pictures on a television screen. In contrast to the Hu experiment, this project found significant changes in heart rate accompanied nausea. Subjects without nausea showed comparatively fewer changes in autonomic reactivity. Most recently, motion sickness to optokinetic stimulation was found to produce suppression of parasympathetic activity (measured by decreases in respiratory sinus arrhythmia) that correlated positively with length of exposure to stressful motion induced nausea (Gianaros et al., 2003). Respiratory sinus arrhythmia refers to the changes in heart rate due to respiratory cycle (Stern, Ray, & Quigley, 2001).

Vestibular System Lateralization and Rotation

For the vestibular cortex, cerebral lateralization has been documented, though not as robustly as for other sensory, motor, or premotor modalities. Lateralization research within the vestibular system has resulted in mixed findings, as stated before, since the vestibular system is comprised of many interrelated components. Natural vestibular stimulation is the product of gravitoinertial forces of linear and angular acceleration. Receptor cells within the maculae of the utricles and the ampullares of the semicircular canals transduce this force to neural energy. A simple method for activating the vestibular apparati is whole body rotation. Several experiments have used whole body rotation to induce vestibular evoked potentials and desynchrony (Salamy et. al.1975; Schneider et al., 1996; Spiegel, Szekely, & Moffet, 1968), motion sickness (Wood et al., 1994), and hemispatial neglect (Shuren, Hartley, & Heilman, 1998).

Electrophysiological findings of cortical asymmetry as a function of the direction of rotation have been mixed. Salamy et al. (1975) studied evoked responses after rotating subjects in a clockwise direction. Greater peak amplitude was found among event-related potential components (ERP) at various right hemisphere electrodes compared with left hemisphere electrodes. This asymmetry was greatest at the frontal region. Schnieder et al. (1996) analyzed the vestibular-induced ERP database of 300 people of mixed healthy and neurologically impaired populations that were rotated in the clockwise and counter clockwise direction. They found averaged ERP amplitude from all electrode sites to be higher after clockwise rotation with most pronounced activation at transverse posterior regions (electrodes T3-C3-CZ-C4-T4) and most prominently at the vertex electrode CZ. The highest amplitude in the frontal region was located at the right site F4. But direction specific differences were neglible with respect to counter versus clockwise direction and no latency differences were found with respect to laterality. With regard to anterior-posterior relationships the results indicated that the the temporal-parietal sites were active for the early components, followed by activation of frontal sites for the later components. Probst et al. (1997) found direction specific polarity changes in rotary evoked potentials. Reverse activation patterns were found corresponding to clockwise horizontal rotation depolarization of the right hemispheric electrode sites, and left hemispheric depolarization with counterclockwise rotation. However, in this project, comparisons of activation for the midline electrodes were nonsignificant in contrast to the Schnieder experiment.

In summary, given the disparity of findings, activation patterns vary depending on the design of the study and the timeframe for examining the data. Clearly the temporoparietal regions are involved in cerebral processing of rotary stress, but the role of the frontal region remains unclear. Laterality research potentially indicates right cerebral dominance. It is possible that the incongruency among studies simply emphasizes the complexity of the vestibular system.

Vestibular System Lateralization and Audition

Schueli, Henn & Brugger (1999) and Lewald & Karnath (2001) investigated the influence of directional spin on cerebral laterality using a dichotic listening task paradigm. While participants were rotated, they were bilaterally presented with functional words and non-words in each ear. Participants were asked to respond to the functional words and to ignore the non-words.

Both studies found reliable auditory laterality effects in the accuracy of word identification with a left ear advantage produced by clockwise rotation. Diametrically opposite effects were found with a right ear advantage resulting from counterclockwise rotation. The results provide indirect evidence for cerebral laterality of vestibular functions. Schueli et al. (1999) speculate that the shift in accuracy on the dichotic listening task to either ear as a function of the rotational direction may be partially accounted for by the close proximity of the cortical auditory systems with that of the vestibular system via projections from the statoacoustic nerve (VIII).

Motion Aftereffects and the Vestibular System

Many of the mixed findings in the vestibular literature may be a function of when the assessment of motion direction occurs after vestibular stimulation. After rotary stimulation, many subjects report an illusory egocentric sensation that either they or the surrounding environment is spinning, otherwise referred to as vection. Oftentimes reports note a sensation of vection that is contralateral to the direction of spin (Ercoline, Devilbiss, Yauch, & Brown, 2000). The illusion can be induced in optokinetic tasks by prolonged fixation on a unidirectionally moving pattern. For example, after prolonged fixation of an alternating pattern of black or white stripes moving rightward on a page, the subject may experience the brief sensation of the pattern moving in the opposite direction after the pattern is removed from sight.

For example, in his journal, Aristotle described a perceptual illusion, often referred to as motion aftereffects, that involves conflicts between vestibular and visual inputs. Aristotle noted that:

> "When persons turn away from looking at objects in motion (e.g. river currents) and especially those which flow very rapidly, they find that the visual stimulations still present themselves, for the things really at rest are then seen moving." (Wade, 1994, p. 1113)

Essentially, prolonged fixation on isolated movement of a stimulus within the visual field results in a sensation of bodily (egocentric) movement, oftentimes reported in the opposite direction of the viewed stimulus. Later studies investigated the direction of the aftermotion illusion, specifically attributing its effects to the vestibular system and to laterality effects across the cerebral hemispheres. Commonly found in day to day life, overstimulation of the vestibular system results in unpleasant sensations such as nausea or dizziness which are often a source of stress for the individual. To date, no studies have been conducted to discern a relationship between the effects of hostility, an emotional trait marked by altered cerebral laterality, on modulation of autonomic systems following stress induced vestibular stimulation.

Motion aftereffects to moving patterns are correlated with activity in the mid-temporal regions and in the striate regions (Tootell et al., 1995; Hautzel et al., 2001; Taylor et al., 2000). These areas appear to be specialized for perceiving repetitive unidirectional motion. Moreover, it is proposed that laterality is the basic commonality among the sensory projection pathways for each modality. Activation of a lateralized vestibular system is expected to yield contralateral vection because of the biomechanical interdependence of the vestibular and visual systems which subserve balance and spatial orientation. Essentially, a lateralized movement of the head in one plane of space, such as towards the left or right, will shift the endolymphatic fluid within the semicircular canals and otolith organs. In normal vestibular functioning the vestibulo-ocular reflex (VOR) with compensate for the lateralized rotation of the head by shifting the eyes in the opposite direction. Vestibular distress may be induced through whole-body rotation or caloric irrigation which disrupts the compensatory response of VOR to align with the canals. Following the lateralized vestibular stressor, residual bilateral nystagmus creates the sensation of vection in the direction opposite that of the rotation. The illusory sensation of self-motion is expected to interefere with normal balance and posture maintenance. Balance is expected in the absence of lateralized stress.

Asymmetry in stressful provocation of the vestibular systems should yield vection aftereffects based specifically on the functional regulatory capacity of the frontal lobes and specifically orbitofrontal and prefrontal regions within the left and right hemispheres. Functional imaging has shown motion aftereffects to be isolated in the right anterior dorsolateral prefrontal regions using PET (Hautzel et al., 2001) as well as MRI technologies (Taylor et al., 2000). The prefrontal region was interpreted to be specialized for the maintenance of sustained attention towards the aftereffect. Furthermore, the evidence supports a capacity limitation of the frontal regulation systems since a dual concurrent task can alter or disrupt the time span of the aftereffect (Chaudhuri, 1990).

Ultimately, aftereffects may result from desynchrony among vestibular and visual inputs. When this occurs the person may experience a sense of disorientation, confusion, and possibly nausea. Evidence for disrupted spatial orientation is reported by the Air Force, where the motion aftereffect is known to have potentially lethal consequences (Ercoline et al., 2000). In fact, disorientation secondary to motion aftereffects has been shown to be the largest single cause of aircraft accidents due to pilot error in the United States Air Force (Gillingham, 1992).

Hostility and Frontal Inhibition Over Posterior Regions

It is possible that motion aftereffects, when combined with sufficient stimulation, produce discomfort secondary to disorientation, implicating a primary role of the right hemisphere. Previously, we have posited a model of frontal lobe modulation of the posterior regions for aggression and hostility (Demaree, Everhart, Youngstrom, & Harrison, 2005; Demaree & Harrison, 1997a; Everhart and Harrison, 1995; Mollet & Harrison, in press-c). In monkeys, Morecraft, Geula, & Mesulam (1992) and Cavada et al. (2000) found that the orbitofrontal cortex had dense connections with the anterior temporal lobes and especially the amygdaloid bodies via the uncinate tract.

With respect to right hemispheric activation to negative affective stimulation, Demaree & Harrison (1997a) proposed that the orbitofrontal areas maintain an inverse relationship with the temporal areas in regulating autonomic responsivity via inhibitory connections including the uncinate and other longitudinal interhemispheric bundles connecting the frontal lobe with posterior brain regions. Accordingly, the orbitofrontal region is seen as inhibitory over the production of negative affect within the anterior temporal lobe. In a recent fMRI study by Levesque et al. (2003), findings in healthy individuals supported the notion of an inhibitory role for the right orbitofrontal region and the right dorsolateral prefrontal cortex to suppression of a response to a negative affective stimulus.

Although explicit evidence linking hostility and altered vagal tone with spatial disorientation is sparse, studies within this lab warrant the consideration of frontal dysregulation having effects on the vestibular system. In prior research, we found anterior-posterior relationships in hostile individuals that suggested frontal regulation of temporal region reactivity. (Everhart, Demaree, Harrison, & Williamson, 2001; Everhart, Demaree, & Harrison, 1995; Demaree, Harrison & Everhart, 1996). Everhart & Harrison (1995) described a high hostile patient with right parieto-temporal dysfunction who reported a sensation of unwillful movement through space. The patient reported concurrent feelings of explosive anger and frustration during these episodes. During a left arm oscillation procedure the patient reported sensations of spatial disorientation with leftward vection. Quantitative EEG recordings revealed fronto-posterior dysregulation. Specifically, as the model predicted, there was heightened delta, indicating slow wave frequency activity across the frontal electrode sites and pronounced beta, indicating high wave frequency activation over the right temporal sites. Similar cortical activation patterns were found in a case study of hostility and autonomic dysregulation by Harrison, Carmona,& Foster (submitted) with clinical correlates of sympathetic activation (profuse sweating), leftward vection, left facial synergy, anger and fear.

Furthermore, a case study by Friedberg (1987) described the successful treatment of a patient who experienced severe gastrointestinal discomfort in situations that induced anger and/or anxiety. Although the patient reported no dizziness, she reported stomach and eye muscle tension. Relaxation training and cognitive restructuring successfully reduced her physiological arousal and helped alleviate her nausea symptoms.

More recently in this lab, a pilot project was conducted to examine the cortical effects of rotation using EEG to evaluate scalp electrical activity after thirty clockwise rotations. The participant in the study reported a subjective feeling of vection (illusory self-motion) to the left after clockwise rotation. Lateralization effects were found with relatively greater beta activation in the right parieto-temporal regions. The findings were consistent with the results of Kahane et al.(2003) who found that electrical stimulation of the right temporal regions produced reports of leftward vection in patients during epileptic focal exploration, whereas counterdirectional vection (rightward) was experienced following left temporal lobe stimulation. The effects were more robust in the right temporal lobe stimulation.

Clockwise rotation resulted in ipsilateral cerebral activation effects and contralateral vection aftereffects. This finding may be explained as a result of the vestibular-ocular attempt to compensate for spatial disorientation, which produces motion aftereffects. Specifically, when an individual spins clockwise, oppositional saccades result in an attempt to realign environmental coordinates with vestibular set coordinates. In effect, when the "world" moves rightward, the eyes respond by quickly making reflexive leftward deviations. In our experiment, the right hemisphere involvement would be predicted based on the fact that leftward eye movements have been associated with emotional valence (Borod, Vingiano, & Cytryn, 1988) and with diminished left frontal eyefield inhibition of leftward saccades.

Rationale

The purpose of the current experiment is to integrate the research on vestibular functioning with research on autonomic sympathetic arousal, stressful experience, and trait hostility. In considering the multiple health risks associated with prolonged autonomic arousal it is important to advance the understanding of the autonomic system and hostility. In prior research, it was shown that high hostile men exhibit exaggerated sympathetic response as well as dynamic right cerebral activation to stress. Investigation of the sensory, motor, and premotor regions in hostile individuals have yielded findings of relative activation for the right hemisphere. More specifically, it is proposed that sympathetic reactivity to stress is regulated by the inhibitory capacity of the frontal region. Employing the anterior-posterior model of hostility, this systematic line of research has demonstrated increased right posterior activation and relatively diminished right frontal capacity for managing stress in hostile men.

Based on a review of the extant literature, the vestibular system has not yet been investigated with regard to differences in cerebral asymmetry as a function of hostility. As discussed previously hostility has been shown to have diffuse effects across a wide range of pathological and unhealthy behaviors. It remains to be seen whether trait hostility is a moderator of autonomic arousal following vestibular activation. The research linking hostility and the vestibular system can also have secondary clinical significance given that disorders of vestibular activation are prevalent in 17% of the general population, and in 39% of the elderly (Davis and Moorjani, 2003). To this end, the present experiment will investigate cognitive and sympathetic correlates of vestibular activation using GSR. The selection of GSR as the dependent measure of interest is based on the proposition that the electrodermal eccrine glands along the palmar and plantar surfaces are innervated primarily by sympathetic cholinergic pathways (Dawson, Schell, & Filion, 2000). The measure is considered to be reflective of sympathetic instead of parasympathetic due to the pathways arising directly from the sympathetic chain. As such the First, laterality differences in GSR will be examined among high and low hostile groups before and after a verbal processing (dichotic listening) task. In the next phase, laterality differences in GSR will be investigated as a function of clockwise rotational stress. Finally, laterality differences in dichotic listening will be investigated as a function of clockwise rotational stress.

Hypotheses

1. Participants will report motion aftereffects of leftward vection following clockwise rotation stress resulting from relative activation of the right hemisphere (i.e. temporal region). No reports of vection are expected to be noted during the baseline dichotic listening phase.

2. An interaction effect of group is expected after rotation, with greater skin conductance levels in high hostiles immediately following rotation.
3. Moreover, clockwise rotation will result in a significant interaction effect with increased left hand conductance in high hostiles as a function of the stressor. Clockwise rotary stress will increase left hand skin conductance levels for high hostiles due to right hemispheric modulation of the autonomic response.
4. An interaction of handedness and condition (pre- and post-task) is expected on the dichotic tasks, with verbal processing resulting in diminished left hand conductance after rotation.
5. A main effect of ear is expected on the dichotic task after clockwise rotary stress, which is expected to increase the probability of left ear detections on the dichotic listening task. This hypothesis is based on prior experiments detailing a shift in the auditory plane to the left with clockwise rotation in Schueli et al. (1999) and Lewald & Karnath (2001).
6. In accordance with Demaree & Harrison (1998) it is expected that clockwise rotation will result in a significant ear by group interaction effect with left ear detection greater in high hostiles as a function of the stressor.

Method

Participants

The research was approved by the Psychology Department Human Subjects Committee and by the Institutional Review Board of Virginia Polytechnic Institute and State University. Participants were recruited from the undergraduate psychology pool at Virginia Tech. They were granted extra credit in their courses for their participation. A total of 326 students completed the online survey for extra credit. From this selection, 34 participants agreed to participate in the experiment. Data for four participants were discarded due to changes in CHMS scores on the second completion. Specifically, three of the participants originally scored in the low hostile range including one individual whose second administration differed by 16 points. One high hostile participant was excluded due to changes in CHMS score. One participant in the high and one participant in the low hostile group reported a past history of major depression. They were included based on self-report of current health status and reports that the depression was not currently active. Altogether, the final group screening resulted in the categorization of 15 low hostile and 15 high hostile males per group (see below for discussion of hostility group inclusion criterion).

The exclusion of women was based on prior studies showing cortical laterality differences among men and woman. Laterality has been shown to differ as a function of sex, with women consistently showing reduced laterality (Coren, 1993; & Harrison, 1994; Everhart et al., 2001; Shucard, Maltz, & Shucard, 1995; Harrison, Gorelczenko, & Cook, 1990). A large consensus of the research indicates that men exhibit more cerebral lateralization than women.

Self Report Measures

Participants were administered the Medical History Questionnaire (see Appendix A), the Cook-Medley Hostility Scale (see Appendix B), the State Trait Anxiety Inventory (see Appendix C) and the Coren, Porac, and Duncan Laterality Inventory (see Appendix D). The Medical History Questionnaire screened for the purposes of excluding the following pathologies: disturbances of vestibular functioning, including dizziness, vertigo, ataxic gait, nystagmus, ear infections, inner ear problems, tinnitus, hearing aid use, headaches, Menieres Disease, pathology of the middle/inner ear, and other significant neurological disorders. No significant medical or neurological problems that could compromise the findings were noted in the medical questionnaire.

Hostility group assignment was based on scores on the Cook-Medley Hostility Scale (CMHS; Cook & Medley, 1954). The CMHS is a well-known 50- item self-report measure derived as a subscale of the MMPI (Hathaway & McKinley, 1943). The CMHS is the most widely used measure of hostility (Contrada & Jussim, 1992). It has been shown to correlate with elevated incidence and risk for cardiovascular disease (Barefoot, Dahlstrom, Williams, 1983; Scherwitz et al., 1991), as well as for psychological and interpersonal difficulties (Contrada & Jussim, 1992). The scale has been shown to have excellent test-retest reliability and internal consistency (Christensen et al., 1997; Smith and Frohm, 1985). Level of hostility was operationalized by cutoff scores on the CMHS. A score of 20 or below resulted into inclusion in the low hostile group. A score of 27 or above resulted in inclusion into the high hostile group. These cut-off scores have been shown to discern group differences in previous research on hostility (Demaree & Harrison, 1997; Demaree, et al., 2002; Harrison & Gorelczenko, 1990; Williamson & Harrison, 2003).

Participants' hemibody preference or "handedness" was assessed using the Coren, Porac, and Duncan Laterality Inventory (Coren, Porac, & Duncan 1979; CPD). This inventory examines hemibody preference through thirteen questions targeting participant's functional preference for use of the left or the right hand, foot, eye, and ear. Test-retest reliability yielded a 98% concordance between lateral preference and behavioral indicators over the course of one year (Coren, Porac, & Duncan, 1978). Right hemibody preference is assigned positive values while left hemibody preference is assigned negative values. The scores range from +13 (full right hemibody preference) to -13 (full left hemibody preference). A score of zero would indicate perfect ambidexterity. Participants were included if they meet the score requirement of +5 or above on this instrument.

In addition to the measures described above, the State Trait Anxiety Inventory, Form X-1 (STAI) (Speilberger, 1968) was included and used for descriptive purposes only. The STAI assesses an individual's current anxiety level and was included to more accurately describe the sample population given the high comorbidity between anxiety and vestibular complaints.

Apparatus

Laboratory. All testing was situated in a sound-attenuated room located in the Behavioral Neuroscience Laboratory at Virginia Tech. Following administration of the Informed Consent Forms and a review of medical history the participant was led into the lab room and seated in a black leather cushioned rotary-capable Engage™ Seating chair (Krueger International, Inc.) mounted on a 24 x 48 in. wooden platform with the base elevated 7.5 in. from the ground floor. The participant's total elevation from the ground floor was about 28 in. A 556CN dual timer oscillator circuit (Radioshack, Inc.) was configured with a 2 in. diameter speaker and attached unobtrusively to the back of the chair using Velcro attached to a plastic housing unit to protect the circuit. The circuit served as a digital timer that emitted a 50 db click every 3 seconds to guide the assistant in regulating rotary velocity (see Appendix E).

The rotary chair was enclosed by several white sheets mounted from the ceiling to create a 6 ft. circular enclosure in order to limit visual stimulation. A 2-ft. black stick located about .5 meters directly in front of the participant was hung vertically from the ceiling and served as the initial fixation point and starting/finishing point for rotation. The participant was seated upright and facing forward perpendicular to the black stick. The dichotic listening phonemes were displayed on an 11 x 3.5 in. white card located about .5 meters directly in front of the participant and attached to the stick.

The administration of all manipulations was controlled and double-blinded. Participants were unaware of group designation. In addition, the preparation and manipulation was administered by assistants who had no foreknowledge of the participant's group designation. All participant electrodermal preparation, rotary stress, and dichotic listening procedures were performed entirely by assistants. The role of the primary investigator was to supervise the operation of the polygraph. In addition, all instructions were standardized and recorded onto CD for playback via light-weight headphones [Koss model 4X/Plus] during the entire duration of the experiment in order to further minimize experimenter bias. Undergraduate assistants were trained in application and timed pacing of rotary stress using various weights and practice volunteers for one month prior to initial engagement in the experiment. Following seating of the participant in the chamber and supervision of electrode placement, both the experimenter and the polygraph were entirely out of view for the entirety of the experiment to control for experimenter bias effects. The participant was isolated within the curtain chamber for the duration of the experiment with the exception of the entry of the assistant for rotation and before each dichotic task in order to counterbalance the dichotic listening cards.

Electrodermal Recording. Safety precautions were exercised throughout the procedures. The experimenter used latex gloves during contact with the participants. Participants were instructed to wash hands with non-abrasive Ivory liquid soap (Procter & Gamble Co.) and warm water. Isotonic pre-gelled 1cm. diameter silver-silver chloride electrodes (Model EL507, Biopac Systems, Inc.) were placed on the volar surface of the medial phalanges of the left and right hand. Though prior literature has indicated sensitivity differences between distal and medial phalanges (Scerbo, Freedman, Raine, Dawson, & Venables, 1992), the selection of medial phalanges in this experiment was made in order to conform to the same placement used by Hu et al. (1991, 1999) in their vestibular study and also to avoid the possibility of calluses on the distal phalanges.

The preamplifiers, electrode leads, and cables were counterbalanced across all participants. Electrode cables were connected to the polygraph (Grass Instruments Model 7P3). The PGR circuit on the polygraph was designed so that pen deflection resulting from MV input was equal to a resistance change of 10,000 ohms. Thus, the pen deflection sensitivity was read in ohms/centimeters from the SENSITIVITY MV/CM switch by multiplying the reading by 10,000. The first 15 seconds of each recording block were earmarked to ensure calibration of all driver amplifiers and preamplifiers and were excluded from any analyses. Skin resistance was transformed to conductance readings (micromhos) according to the following formula: $\mu S = 1000/k\ \Omega$. A digital caliper (Ultra-Cal model, Fred V. Fowler Co.) was used to measure deviations from baseline. Skin conductance level was recorded for three trials: Immediately following calibration, 30 s. from onset, and 60 s. from onset.

Dichotic Listening Apparatus. The auditory stimuli consisted of 30 pairs of discordant consonant-vowel CV phonemes (ba, da, ga, ka, pa, ta) presented simultaneously (zero lag) in each channel. The phonemes were taken from a Kresge Hearing Research Laboratory computer-synthesized audiotape and were recorded beforehand onto a compact disk (CD) for ease of administration. Auditory stimuli were played by a portable CD player (Emerson PD 6411) and light-weight headphones [Koss model 4X/Plus]. Volume was maintained at 75 dB (A scale SPL; ref. 002 Dynes/cm^2). The interstimulus interval was 6 s. The six CVs were printed as 2 cm black uppercase letters on a 11 x 3.5 in. card displayed about .5 m in front of the participant. The presentation of the dichotic phonemes on two separate random order cards was counterbalanced within each participant so as to control for order effects. In order to assess for auditory acuity and for continued participation in the experiment, the participants were required to correctly identify 10 of 12 two-syllable words presented individually to each ear.

Experiment I Procedure: Dichotic Listening and GSR

All proeducres for the experiment were outlined in the Vestibular Experiment Script (see Appendix F). Participants had to complete the first informed consent form for the screening (see Appendix G). Following completion of the group screening, eligible participants were invited to participate in the experiment if they meet criterion (right hemibody preference, no significant medical history). To participate in the experiment they had to indicate consent to participate via a second informed consent form (see Appendix H). Shortly after arriving at the laboratory the participant was seated in the chair and prepared for electrodermal recording. The dichotic listening task procedures were similar to that of the "unfocused condition" used in prior research (Demaree & Harrison 1997b; Shenal and Harrison, 2003).

Following placement of the electrodes and preparation of the recording apparatus, the experimenter assistant left the enclosure. The experimenter entered the enclosure to ensure proper placement of electrodes and proper positioning of the chair in front of the black line. To put the participant at ease and to mitigate the risks of extreme dizziness and nausea associated with vestibular stimulation, the experimenter verbally informed the participants of their freedom to terminate the experiment at any time. The maximum duration of exposure was1 minute.

The participant was given two minutes to relax and to adjust to the surroundings. After two minutes the following instructions were provided via headphones to each participant:

> "Please try to sit as still as possible and face forward in your seat. Try to keep your fingers as still as possible so as not to interfere with the electrodes. It will be important to try to look straight ahead during the entire experiment. During the experiment try to avoid closing your eyes or looking down. Now please look at the black line in front of you. Sometimes after rotation the line may appear to be moving even thought it is actually not. For now, try to tell me whether you perceive it to be moving leftward, rightward, or not at all."

The participant's verbal responses were recorded by the assistant and a 1-minute baseline recording of skin conductance was obtained while the participant sat quietly.

Following GSR acquisition, the assistant entered the enclosure and attached the dichotic phoneme card to the vertical black line. Participants were presented the following instructions (Demaree, & Harrison, 1997; Shenal & Harrison, 2003):

"Look at the card in front of you. There are six syllables each with numbers underneath. You are going to hear the syllables. Say the number with the syllable you hear out loud." During the practice trial the participant must identify 10 out of 12 syllables correctly.

Immediately after completion of the practice session the participants heard the following instructions:

> "You are about to hear 30 trials of syllables. You will hear a syllable in the left ear and another syllable in the right ear at the same time. It will sound like two people talking at the same time. Your job is to listen carefully and say the number on the chart that corresponds to the syllable you hear most clearly. For example, if I thought I heard 'Ka' most clearly I would say 4 since that number goes with Ka. If I heard Ga most clearly I would say 3 since that number goes with Ga. Do you have any questions?"

Subsequent to completion of the dichotic listening task two minutes of electrodermal recordings were completed. The recordings began immediately upon task completion. One minute served as the post-stressor skin conductance measure and one minute served as pre stressor skin conductance measure.

Experiment II Procedure: Rotary Stress and GSR

The following instructions were presented: "You will now be rotated in the chair. Try to keep your eyes open and face forward as much as possible. When we stop, try to remain as still as possible, with eyes open and try not to move or clench your hands"

Each participant underwent angular rotation in the clockwise direction at a rate of approximately 120 °/s as paced by the timer circuit. Onset and cessation of rotation occured at a position facing the black stick. After 20 rotations, the participant was abruptly stopped.

Immediately following rotation the following instructions were heard via the headphones: "Please look at the black line in front of you and try to tell me whether you perceive it to be moving. If you think it is moving, can you tell me what direction the line seems to be moving, that is leftward, rightward, or not at all?" Following the participant's reply the experimenter initiated 2-minutes of electrodermal recordings (1-minute post-stress; 1-minute pre-stress).

Experiment III: Post-stress Dichotic Listening and GSR

The procedure for Phase III was the same as in Phase I (dichotic listening task and GSR). Following completion of Phase III, participants were thanked for their cooperation. A second administration of the CMHS was given to ensure reliable designation in the hostility group. Before leaving the lab, the participant was debriefed and provided the opportunity to have any questions answered about the experiment. At any time following participation they were able to have access to study website which included notice of Internal Review Board study approval (see Appendix I).

Results

An alpha level of .05 was used for all statistical tests. The first hypothesis concerned vection. No participants reported vection prior to rotation. Preliminary analyses indicated virtually no residual vection reports immediately following rotation. This may be due to the time lag in vection inquiry and response, at which point the motion aftereffects had subsided; therefore, vection was dropped from analyses. Hypothesis 1 remains unconfirmed at this time.

Questionnaires/ Group Descriptive Statistics

The ages of the participants ranged from 18-22 in both the low hostile group (M = 19.73, SD = .96), and in the high hostile group (M = 19.60, SD = .83). The scores on the CMHS ranged from 27-36 (*M* = 31.60, *SD* = 2.19) for the high hostile group and from 6-20 (*M* = 12.73, *SD* = 3.88) for the low hostile group. The scores on the CPD ranged from 5 to 13 (*M* = 9.27, *SD* = 2.87) for the low hostile group and from 6 to 13 (*M* = 8.93, *SD* = 2.60) for the high hostile group. A one-way between groups ANOVA was performed on the CPD to ensure statistical equivalence in laterality. Accordingly, there was no significant difference between group scores on the CPD, $F(1, 28) = .11$, $p = .741$.

For descriptive purposes only, a General Linear Model procedure was performed on the scores on the STAI. The results indicate group differences on this self-report measure that was administered after the rotation paradigm. A post-hoc pairwise comparison was made using Tukey's Honestly Significance Difference Test to control for Type I error (Winer, 1971). Essentially the high hostile group reported greater state anxiety after the experiment compared with the low hostile group $F(1, 23) = 10.34$, $p = .004$.

Skin Conductance

As stated previously, an alpha level of .05 was used for all statistical tests. Separate mixed design analyses of variance (ANOVAs) were performed using GSR (μmhos). Data were analyzed for each Block (Dichotic I, Rotation, Dichotic II) with the between groups factors of Hostility (high and low) and with the repeated measures of Hand (left and right), Condition (pre-stress and post-stress), and Trial (Trial 1. Immediately, Trial 2. 30 s. post-onset, and Trial 3.60 s. post-onset). All post-hoc pairwise comparisons were made using Tukey's Honestly Significance Difference Test to control for Type I error (Winer, 1971).

For Block 1 (Dichotic I), A significant main effect was found for Condition; $F(1, 28) = 10.53$, $p = .003$. Post-hoc comparisons revealed that participants' skin conductance increased significantly from Condition 1 (pre-stress) to Condition 2 (post-dichotic stress). In Condition 1 the mean skin conductance level was 4.75 μmhos, whereas in Condition 2 the mean skin conductance level was 5.31 μmhos (See Figure 1).

A significant main effect was found for Hand, $F(1, 28) = 5.13$, $p = .03$. Participants' skin conductance was greater at the right hand (*M* = 5.23) compared with the left hand (*M* = 4.83) (see Figure 2).

A significant two-way interaction was found for Group and Trial, $F(2, 56) = 4.16$, $p = .021$. The low hostile group exhibited a significant effect of decreasing skin conductance levels across trials, whereas skin conductance increased significantly across trials for the high hostile group. This crossed interaction effect is displayed in Figure 3.

It should be noted that a Hand x Trial interaction *approached* significance; $F(2, 56) = 3.08$, $p = .054$. Overall, the right hand exhibited higher skin conductance values compared with the left hand.

No other significant main or interaction effects were noted for Block 1. Hypothesis 4 was not confirmed as there was no significant interaction effect of handedness and condition. Consult Table 1 for the source ANOVA for Block 1.

For Block 2 (Rotary stress), a significant main effect was found for Condition, $F(1, 28) = 50.63$, $p < .0001$. As expected, participants' skin conductance increased significantly from pre-stress to post-stress. At pre-stress (Condition 1) the mean skin conductance level was 5.17 μmhos, whereas at rotary post-stress (Condition 2) the mean skin conductance level was 6.37 μmhos (see Figure 4).

A significant main effect was also noted for Trial; $F(2, 56) = 21.44$, $p < .0001$. Post-hoc comparisons revealed that all Trials were significantly different from each other (Trial 1 $M = 5.93$; Trial 2 $M = 5.78$; Trial 3 $M = 5.60$). Mean skin conductance levels decreased from Trials 1-3 (See Figure 5).

Analysis of skin conductance revealed an interaction effect of Group x Condition essentially confirming hypothesis 2; $F(1, 28) = 4.43$, $p = .044$. The interaction effect is displayed in Figure 6. At pre-stress (Condition 1), the groups were statistically equivalent to each other. As predicted, post-stress (Condition 2) skin conductance level in the high hostile group was significantly elevated relative to the low hostile group. Essentially, both groups exhibited significant increases in skin conductance level as a function of the stressor. However, high hostiles were more reactive to the stressor as reflected in GSR.

A significant two-way interaction was also found for Condition and Trial $F(2, 56) = 7.18$, $p = .002$. The interaction effect is displayed in Figure7. Skin conductance was greater for all three trials of Condition 2 compared with all three trials of Condition 1. Within both Condition 1 and Condition 2 skin conductance levels for all trials were significantly different.

No other significant main or interaction effects were noted for Block 2. Hypothesis 3 was not confirmed. No significant three-way interaction effect was noted for Group x Condition x Hand. Consult Table 2 for the source ANOVA for Block 2.

For Block 3 (Dichotic II), a significant main effect was found for Condition $F(1, 28) = 11.66$, $p = .002$. Participants' skin conductance decreased significantly from pre-stress to post-stress. In Condition 1 (pre-stress) the mean skin conductance level was 6.04 µmhos, whereas in Condition 2 (post-stress) the mean skin conductance level was 5.54 µmhos (see Figure 8).

A significant main effect was also noted for Trial $F(2, 56) = 3.93$, $p = .025$. Post-hoc comparisons revealed that all trials were significantly different from each other (Trial 1 $M = 5.85$; Trial 2 $M = 5.79$; Trial 3 $M = 5.72$). Skin conductance diminished as trials progressed from 1-3 (see Figure 9).

Analysis of skin conductance revealed an interaction effect of Group x Condition; $F(2, 112) = 4.85$, $p = .036$. The interaction effect is displayed in Figure 13. At Condition 1 (pre-stress), both groups' skin conductance levels were significantly different from each other. Differences subsided, however, for Condition 2 (post-Dichotic II). In addition, the low hostile group, unlike the high hostile group, did not differ between pre- and post-stress conditions (see Figure 10).

No other significant main or interaction effects were noted for Block 3. Consult Table 3 for the source ANOVA for Block 3. Hypothesis 4 was only partially supported; although the left hand saw a larger percentage drop (8%) in skin conductance than the right hand (3%) after the dichotic listening task, this difference did not reach significance. Furthermore, it is not certain whether the drop is due to the moderation of the task or because of residual effects of vestibular stimulation on skin conductance.

Dichotic Listening Task

Analyses of dichotic listening task were comprised of dichotic consonant vowel phonemes (DCV). As stated previously, an alpha level of .05 was used for all statistical tests. For all DCV analyses the 30 pairs of DCV phonemes were divided into two trials to explore positional effects of the list. For analysis of the dichotic listening task, Trial 1 consists of the first 15 phoneme pairs and Trial 2 consists of the latter 15 pairs. The rationale for the dissection of the list into two parts derives from the fact that vestibular effects tend to resolve fairly quickly and because prior literature using dichotic phonemes during sinusoidal rotation used an approximately equal number of pairs.

Separate mixed design analyses of variance (ANOVAs) were performed using number of DCV phonemes correct. Data were analyzed for each Block (Dichotic I, Rotation, Dichotic II) with the between groups factors of Hostility (high and low) and with the repeated measures of Ear (left and right), Condition (pre-stress and post-stress), and Trial (1-3). All post-hoc pairwise comparisons were made using Tukey's Honestly Significance Difference Test to control for Type I error (Winer, 1971).

For the Dichotic I block, a significant main effect was found for Ear $F(1, 28) = 29.50$, $p < .0001$. Participants' correctly identified a greater number of DCV phonemes at the right ear ($M = 7.60$) compared with the left ear ($M = 4.25$). The discrepancy is displayed in Figure 11.

A significant main effect was also found for Trial $F(1, 28) = 29.50$, $p = .0005$. Post-hoc comparisons indicate that participants were more likely to identify phonemes in Trial 2 correctly ($M = 6.25$) than in Trial 1 ($M = 5.60$). The results are displayed in Figure 12.

No other significant main or interaction effects were noted for the Dichotic I block. Consult Table 4 for the source ANOVA for Dichotic I block.

For the Dichotic II block a significant main effect was found for Ear $F(1, 28) =10.99$, $p = .0025$. As with the first block (Dichotic I), participants' correctly identified a greater number of DCV phonemes at the right ear ($M = 7.38$) compared with the left ear ($M = 4.78$). The discrepancy is displayed in Figure 13.

A significant main effect was also found for Trial $F(1, 28) = 34.99$, $p < .0001$. Post-hoc comparisons indicate that participants were more likely to identify phonemes in Trial 2 correctly ($M = 6.57$) than in Trial 1 ($M = 5.60$). The results are displayed in Figure 14.

A significant two-way interaction was evident for Ear and Trial $F(1, 28) = 5.89$, $p = .022$. Prior to rotation this interaction only approached significance. Essentially the right ear identified significantly more DCV phonemes than the left ear on both Trial 1 and 2. In addition, within modality, the right ear identified more phonemes on Trial 2 than on Trial 1 (see Figure 15).

No other significant main or interaction effects were noted for the Dichotic II block. Consult Table 5 for the source ANOVA for Dichotic II block. Hypothesis 5 was not supported. It was predicted that a main effect of ear would result, with a relative shift to left ear detection after rotation. Instead the results indicated a significant right ear advantage, which essentially replicated the activation pattern noted before rotation. Hypothesis 6 was also not confirmed.

Discussion

The experiment was designed to test the effects of vestibular activation on sympathetic arousal as a function of hostility level. As expected, both groups were more aroused after rotation than before. The primary finding of this experiment is that high hostile men develop heightened arousal after brief, whole-body rotation about the neuroaxis beyond that developed by the low hostile men. While no other experiment (at least to this author's knowledge) has demonstrated a relationship between hostility, autonomic arousal, and vestibular function, a prior experiment in this laboratory found a relationship with hostility and somaesthetic activation, congruent with the functional cerebral systems model where similar processes inhabit shared cortical space (e.g. Herridge, Harrison, & Demaree, 1997).

The primary finding of differential reaction to stress according to hostility level is significant given the prominent view in the psychological literature that the cardiovascular risk associated with stress and hostility is chiefly due to stress stemming from elements of social and interpersonal difficulties (Anderson, Linden, & Habra, 2006; Suarez, EC., Kuhn, C.M., Schanberg, S. M., Williams, Zimmermann, 1991; Suls & Wan, 1993). However findings in this laboratory have contradicted this viewpoint by demonstrating that high hostiles have shown increased sympathetic arousal to various stressors independent of interpersonal strain. High hostiles have shown physiological decompensation to thermal pain (cold water pressor) (Demaree & Harrison, 1997b; Rhodes, Harrison, & Demaree, 2002; Mollet, & Harrison, in press-b), unpleasant auditory stimulation (white noise) (Foster, 2004), and stressful cognitive demands (executive tests) (Walters & Harrison, 2006; Williamson & Harrison, 2003). In line with prior laboratory findings, the current experiment provides support for whole body rotation as a physiological stressor responsible for the differences in high and low hostile arousal irrespective of interpersonal stress.

In the past the term "stressors" has also been interpreted loosely to include either affective or pain components. Concomitants of excessive vestibular activation such as dizziness or nausea are not associated with pain research, but maintain an aversive aspect and share many of the neurological underpinnings. In fact, Muth, Stern, Thayer, & Koch (1996) removed anger and disgust from the Nausea Profile because of poor factor loadings on any of the primary dimensions associated with this construct. Admittedly, one of the problems with vestibular activation is the difficulty with adequately describing the phenomena. Anecdotally, in patient care it is often difficult to ascertain facets of vestibular dysfunction such as vection, nystagmus, syncopal episodes, dizziness, postural imbalance, positional disorientation, or motion sickness.

The hypothesis of lateralized effects according to hostility levels after rotary stress was not supported. That is to say, there was no Group x Condition x Hand laterality effects in skin conductance after passive rotation. The finding does not support the general model of right hemisphere activation after a vestibular stressor since there was no significant elevation of the contralateral hand skin conductance level. In the psychophysiological literature the association of skin conductance, hand literality, and hemispheric asymmetry remains tenuous (Hugdahl, 1984). Essentially Hugdahl concluded that lateralized skin conductance was reflective of asymmetrical cerebral activity, but that the lack of a significant lateralized skin conductance did not conclusively mean the absence of hemispheric speciality. Limitations of the experimental design may prohibit an unambiguous determination of hemispheric lateralization of cerebral vestibular components. The diffuse and heterogeneous innervations of vestibular pathways make it difficult to assert dominance of either hemisphere; however there is evidence implicating right hemisphere dominance at the cerebral level for right handed individuals (Dieterich et al. 2003; Karnath & Dieterich, 2006). Skin conductance recordings may not have been completed fast enough to capture the laterality effect because of the amount of time expended in assessing vection and ensuring proper calibration. The lateralized effect may have dissipated by the time skin conductance was sampled.

Alternately, the vestibular system pathways are also known to be diffusely projected throughout the cortical regions especially in a system that integrates visual, proprioceptive, and haptic signals. It is possible that the temporal parameters of the laterality effects are quick and difficult to define. This does not diminish the importance of the laterality effect, however, and further investigations should be pursued with more refinements in methodology.

The effects of vestibular distress on autonomic functioning persisted 7 minutes after the conclusion of the actual rotation especially for high hostile men. While there was no difference between groups during the first dichotic task, analyses of the second dichotic task yielded a Group x Condition interaction. In the Dichotic I block, the skin conductance levels increased significantly from baseline to post-stress for both groups. In the Dichotic II block, however, diametrically opposite effects occurred. Essentially, skin conductances for both groups *decreased* from baseline to post-stress. The Group x Condition interaction found that high hostile men were more aroused at pre-stress than at post-stress. The results may be attributed primarily due to the residual sympathetic system effects of the rotary stress from the previous block. This conclusion is somewhat congruent with the findings of Rhodes & Harrison (2002), which found continued pronounced heart rate perseveration in high hostiles after nine minutes post-cold pressor application, but no support for perserverative systolic or diastolic blood pressure effects. As a corollary, it should be noted that heart rate and blood pulse volume, in addition to skin conductance, have been better predictors of vestibular distress in past research on motion sickness compared with blood pressure (Cowings et al., 1986; Graybiel & Lackner, 1980; Hu et al., 1999; Stout, Toscano, & Cowings, 1994).

In addition to the investigation of the autonomic correlates of vestibular activation, the experiment explored the effects of rotation on dichotic listening task performance. In both the Dichotic I and II blocks, a right ear advantage was found for accuracy and detecting speech sounds. No effects of hostility were noted. Relative left ear activation was expected as an outcome of the rotation consistent with the results of Schueli et al., (1999), which indicated a left ear shift after rotation. In that experiment, however, the DCV phonemes were administered during rotation, whereas ours occurred after rotation so as not to confound the skin conductance results. Once again, the delay may have been too long to accurately detect differences.

The implications of this experiment are threefold: First, the experiment was designed to provide evidence that the impact of trait hostility could be significant and global enough to affect functioning even at the level of the vestibular system. In this manner, the present findings extend and complement the findings of prior experiments within this laboratory demonstrating significant differences between high and low hostiles within the auditory, visual, somaesthetic, motor, and executive domains. Traditionally, it has been the general medical consensus that the central vestibular apparatus is primarily localized in the brainstem and cerebellar region. The contribution of the cerebral hemispheres are still under speculation, especially with regards to the frontal regions.

The existence of a cortical vestibular region in the temporoparietal areas has been multiply supported in humans (Brandt & Dieterich, 1999; Bottini et al., 1994, 2001; Dieterich et al. 2003; Kahane et al. 2003), but the functional significance of these areas, and whether they are, in fact, ancillary or central to maintainance of vestibular functions, has met with some controversy. To this author's knowledge there has been no documentation that differences in trait hostility have been correlated with structural, functional, or metabolic differences in cerebellar or brainstem areas (though it should be noted that there is evidence that cerebellar and brainstem regions are lateralized). Most of this literature has focused on cortical and subcortical areas in models of anger, arousal, and hostility.

Secondly, the results of the experiment both extend and advance the Harrison model of frontal control over more posterior brain systems in regulation of sympathetic control. The proposed relation of the frontal regions is to retain control over the autonomic correlates of arousal even during the experience of dizziness and nausea. The model has advocated the role of the orbitofrontal connections with the temporal lobes. Conclusive physiological evidence linking the vestibular system and sympathetic arousal to frontal control remains to be seen. However, the results of the current model provide indirect support for frontocerebral regulation of sympathetic correlates of vestibular stimulation.

It is proposed that the relationship functions through the vestibulo-parabrachial pathway that connects the brainstem to the cortical apparati, especially to the amygdaloid bodies comprising the limbic cortex (Balaban, 2004). The model posits that excitation of libic structures specialized for processing global aversive stimulation will result in a reciprocal inhibitory response from the frontal region, which fuctions to attenuate the sympathetic response to negative stimulation. Specifically, during vestibular-induced stress, high hostiles are less functionally adaptive than low hostiles in maintaining sympathetic control secondary to diminished frontal regulatory capacity.

The results also provide further support for the influence of personality factors on cerebral mechanisms involved in processes that may not seem intuitively apparent. Specifically, in the current experiment trait hostility was related to higher skin conductance levels. In the context of vestibular processes some authors maintain that skin conductance, in addition to other psychophysiological measures such as heart rate variability, the electrogastrogram, and respiratory sinus arrhythmia, is a valid index of motion sickness, a common correlate of extreme vestibular distress, while other authors do not. In this experiment, skin conductance differed in hostiles as a result of mild rotation. While there have been some literatures mentioning anxiety and vestibular concommittants, none have mentioned hostility (as far as this author is aware of).

Vection, or the illusory sensation of motion, has received support for lateralization in prior studies manipulating vestibular sensory organs. However in this experiment, vection assessment was problematic. Bottini et al. (1994) found that caloric irrigation of the left ear induced vection to the left that was reflected both behaviorally, by subjects' tendency to point towards the left hemispace, as well as anatomically, with significantly increased regional cerebral blood flow (rCBF) in the right temporoparietal region, insula, and anterior cingulate cortex. Diametrically opposite results were found when the right ear was irrigated. It should be noted that rCBF was being recorded immediately after the movements, whereas in our experiment subjective vection identification was assessed through verbal means after a delay.

It is possible that the design of the experiment was not optimal for detecting vection in time. The sensation of vection has been difficult to describe quantitatively, especially in terms of physiological parameters, as it tends to resolve fairly quickly (Lidvall, 1961). As in our study, Warwick-Evans et al. (1987) made an attempt to detect changes in skin conductance level before and after rotation. In addition, most changes occurred within 30-45 seconds of the dizziness latency. Skin conductance measures were consistent with the verbal report of dizziness but the correlation was weak. In the current experiment, by the time the participants were prompted to orient to the black line, receive and comprehend instructions, and make a decision, the vection had probably subsided. Like Warwick-Evans (1987) the nonverbal indicator of dizziness was more robust than the verbal report. They too noted the inefficiency of verbal report in dizziness. This may have important implications for dizziness assessment in the future. Many hospital intakes regard dizziness as a “symptom,” rather than as part of a “syndrome” (Salles, Kressig, & Michele, 2003). The difference has to do with the level of rigor with which examiners probe the nature of the dizziness to inform diagnoses. Critically, the understanding of the vestibular system is behind many of the other modalities and with the rising elderly population it is imperative that standards of care address all aspects of brain-behavior relationships that impact functional status.

Warwick-Evans et al. (1987) note that self-report questionnaires are inaccurate because of the categorical design which cannot objectively assess the magnitude of the dizziness. The nausea questionnaire alone proved unreliable depending on the various factors of the experiment. Essentially, incorporation of physiological indicators provides a more reliable estimate of dizziness and nausea.

Electrode site selection may also have affected the results as there is widespread disagreement as to the standard sites for placement. The psychophysiological literature is rife with studies purporting significant skin conductance results despite varying electrode placements across differing regions of the hand. Scerbo et al. (1992) examined placement differences in the skin conductance levels of individuals after presenting tones and white noise of varying volume levels to evoke an orienting response. Recordings of skin conductance levels were twice as high when recorded at distal sites when compared with medial phalanges sites. Skin conductance responses were over three times larger at distal phalanges. One hypothesis proffered concerned the potentially greater sensitivity of the distal phalanges when compared with the medial phalanges. In fact historically, Edelberg (1961) noted that higher tactile sensitivity correlates with more robust electrodermal activity. Nevertheless, several authors have advocated the use of the medial phalanges possibly to forestall the possibility of calluses, abrasions, and scars. (Stern, Ray, Quigley, 1992; Boucsein, 1992; Venables & Christie, 1973).

In a previous skin conductance study performed in this lab, Herridge et al. (1997) chose the thenar and hypothenar surfaces though no clear rationalization was given for this choice. In contrast to that experiment, the current paradigm potentially involved some physical discomfort. In effect, to avoid the possibility that subjects gripped the seat the medial phalanges were used. One reason why the medial phalanges were used instead of the distal phalanges was that laterality of the hands was a factor in the study. If one hand was differed from the other (via scarring, abrasions, etc.) this might affect the results. The other reason concerned our intention of maintaining consistency with prior research noting differences using the middle phalanges.

In this experiment, we have focused on sympathetic nervous system indices of arousal, but it is worth noting that research on autonomic arousal may be ignoring the role of the parasympathetic system as well in mechanisms of personality mediated arousal (Thayer, Friedman, & Berkovec, 1996; Friedman & Thayer, 1998). This concern is of paramount importance for the vestibular system, because of the diffuseness, multiply interdependent and complicit involvement of this system within all other systems of the brain. At present, there is wide dissension as to the interplay of the two autonomic systems in producing vestibular disorder phenomena of flushing, sweating, and somatic thermal fluctuation which indicate sympathetic contributions to the disordered state with nausea, orthostatic dysregulation, and fainting, which indicate parasympathetic contributions. In this experiment we have maintained a focus on the SNS for pragmatic purposes. But it may be worthwhile to explore an autonomic profile that incorporates vagal tone and spectral analysis much as Friedman & Thayer (1998) did for chronic panic attack patients.

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Figure 1. Mean skin conductance as a function of Condition during Block 1 (Dichotic 1).

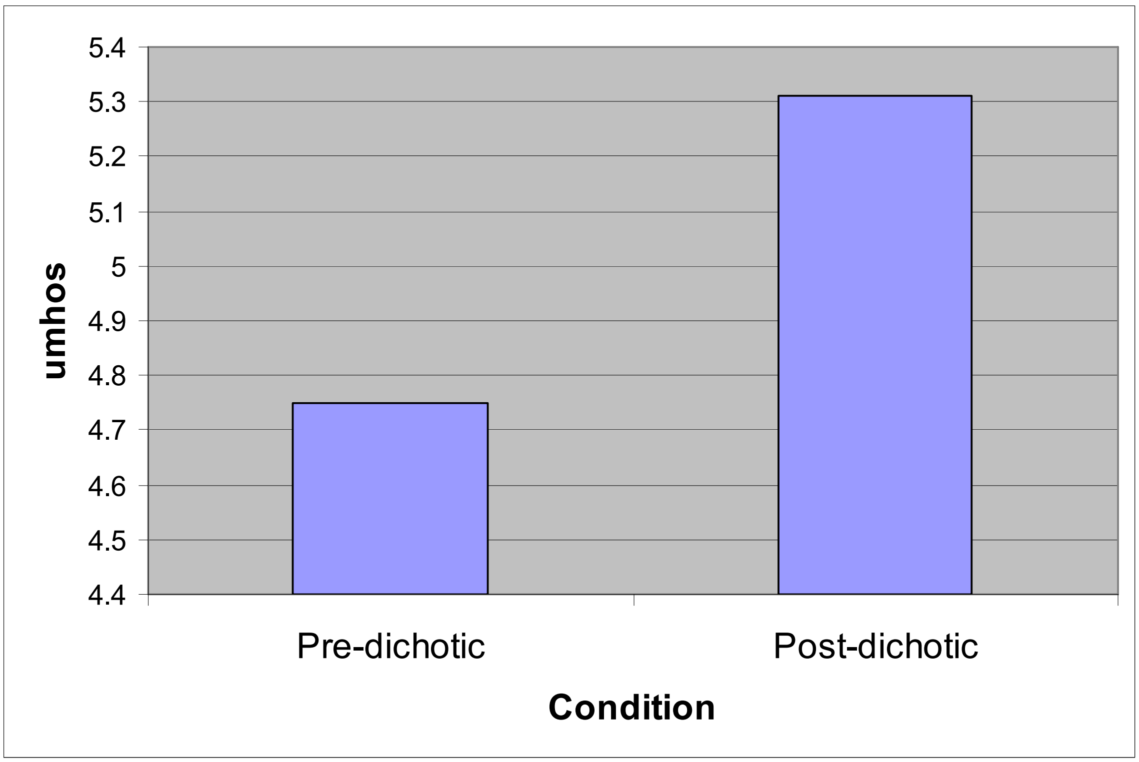


Figure 2. Mean skin conductance as a function of Hand during Block 1 (Dichotic I).

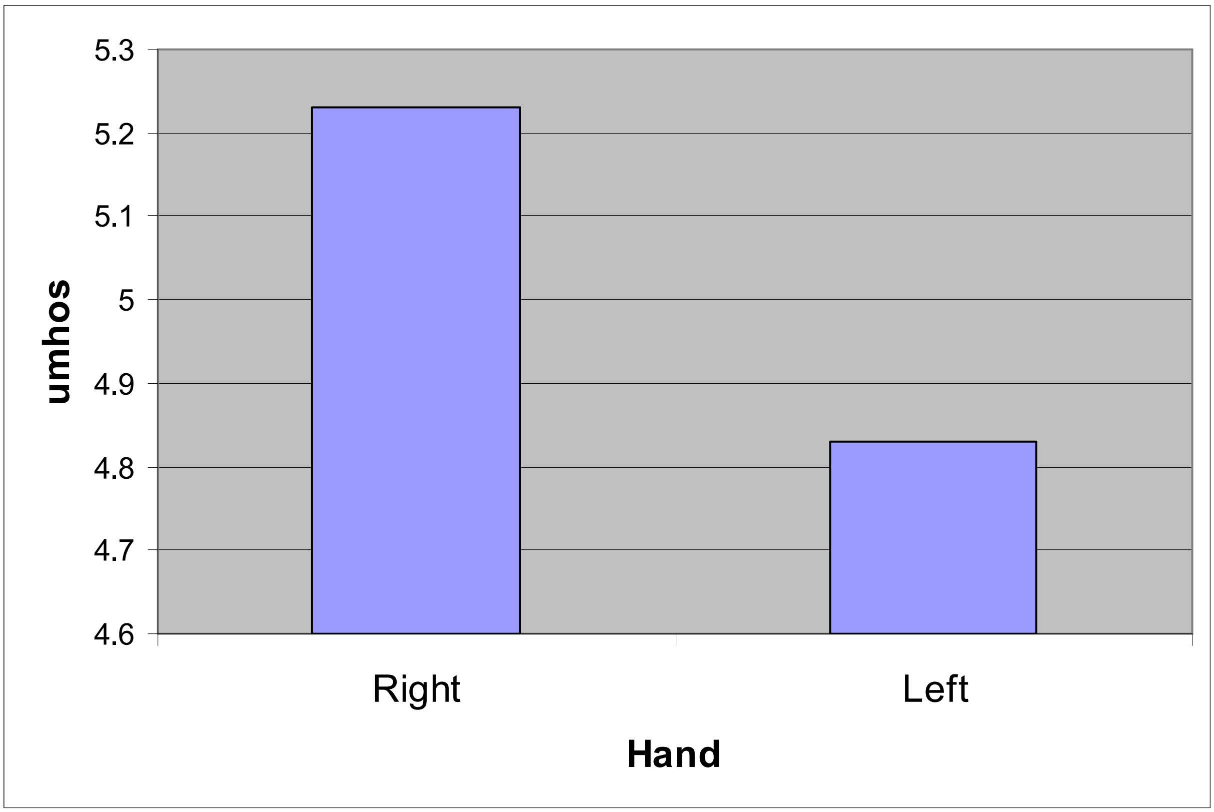


Figure 3. Mean skin conductance as a function of Group and Trial during Block 1 (Dichotic I).

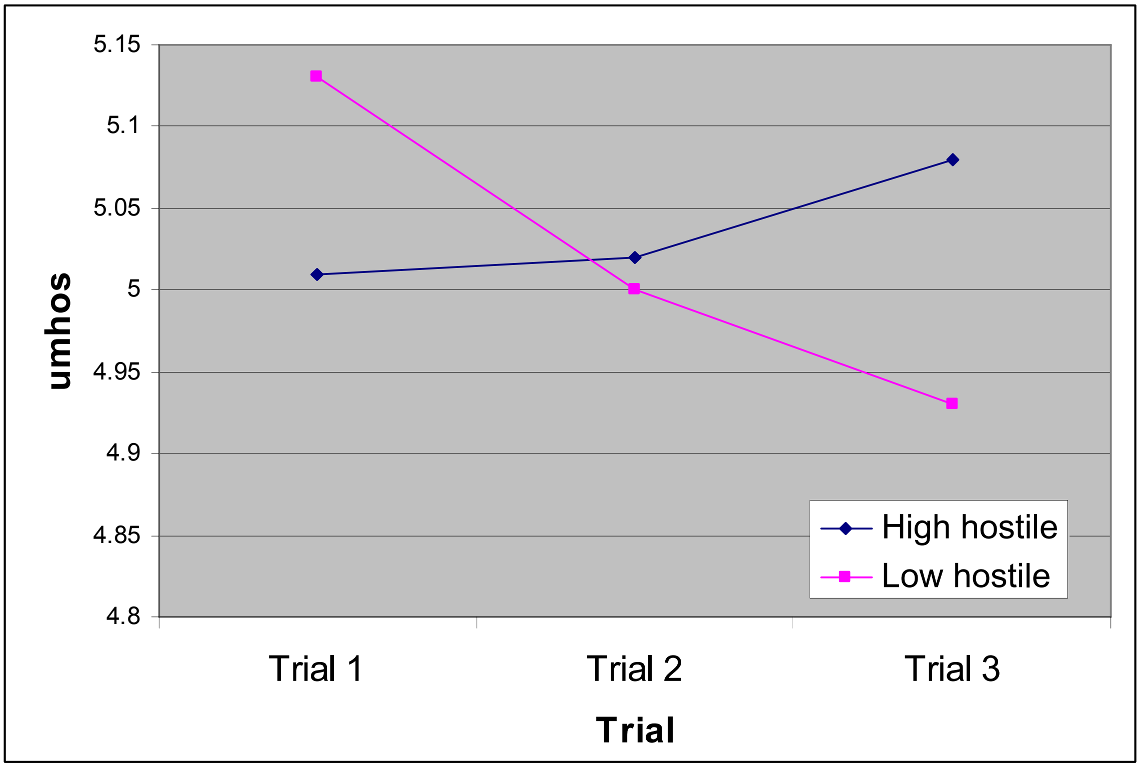


Figure 4. Mean skin conductance as a function of Condition during Block 2 (Rotation).

Figure 5. Mean skin conductance as a function of Trial during Block 2 (Rotation).

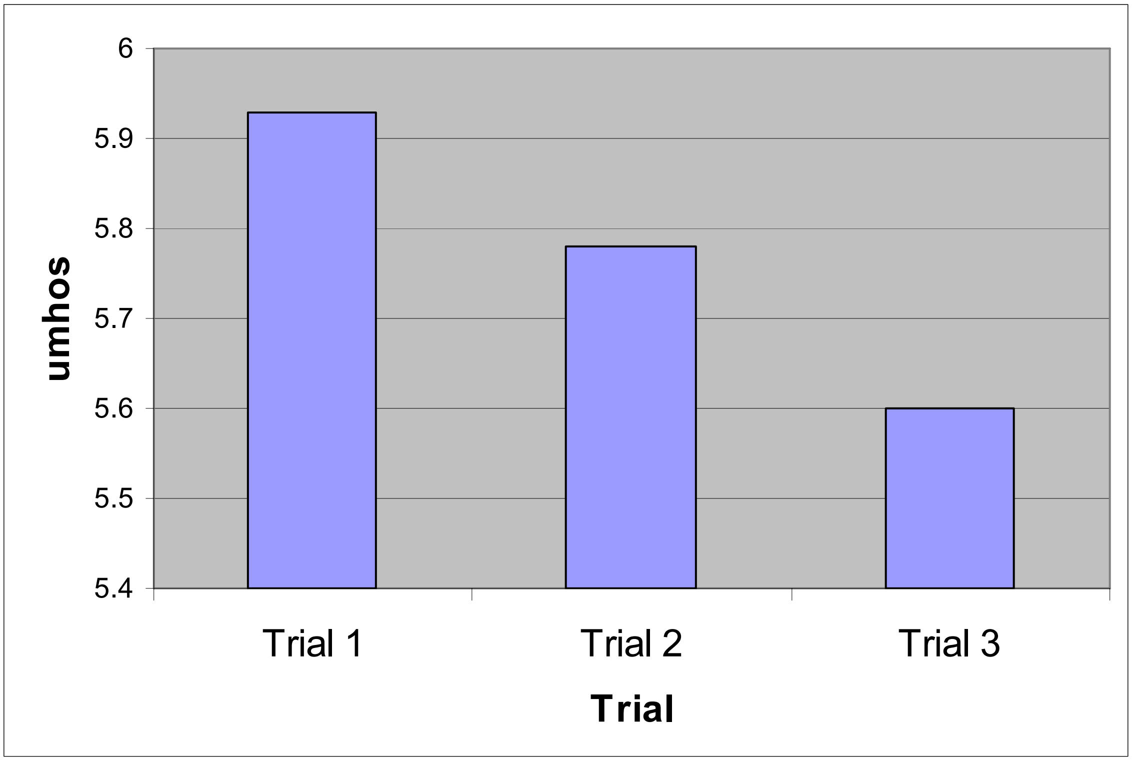


Figure 6. Mean skin conductance as a function of Group and Condition during Block 2 (Rotation).

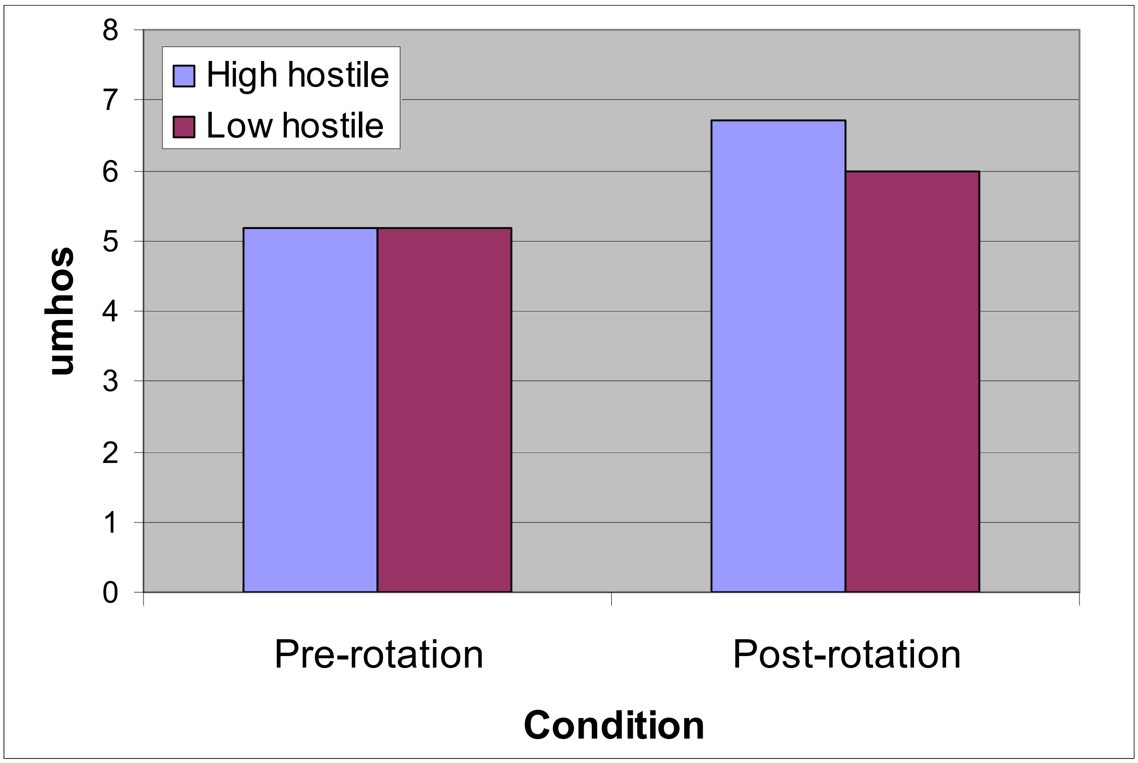


Figure 7. Mean skin conductance as a function of Condition and Trial during Block 2 (Rotation).

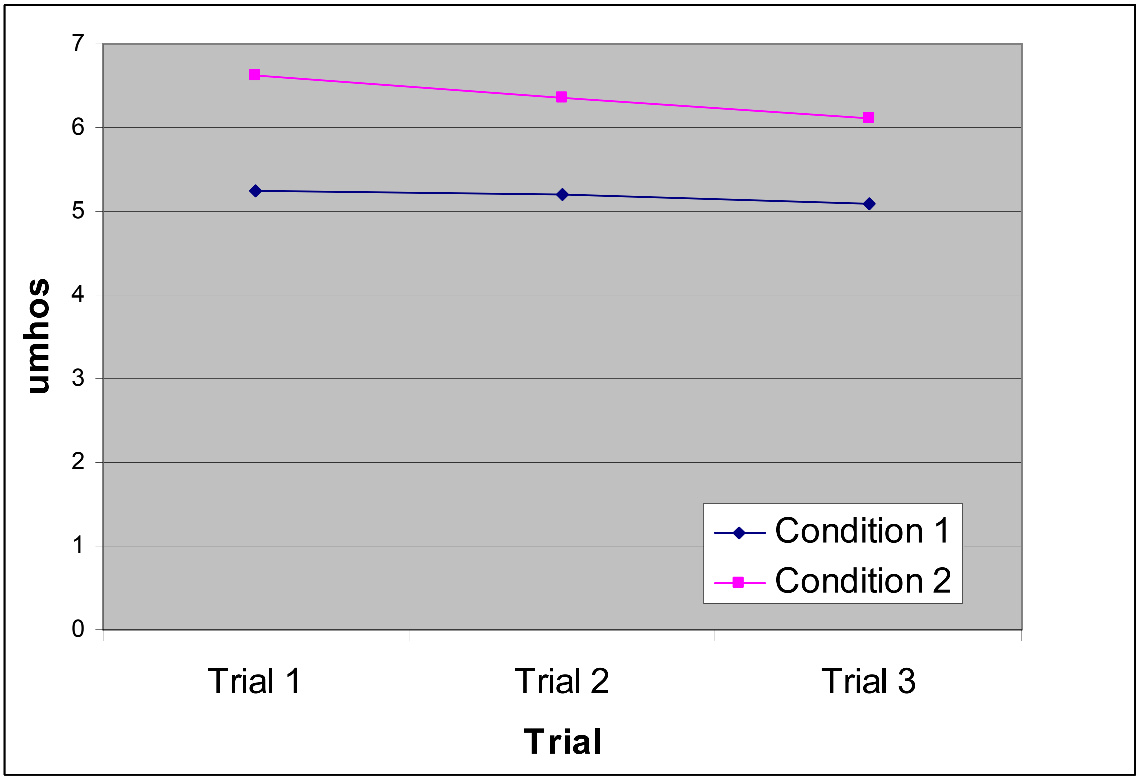


Figure 8. Mean skin conductance as a function of Condition during Block 3 (Dichotic II).

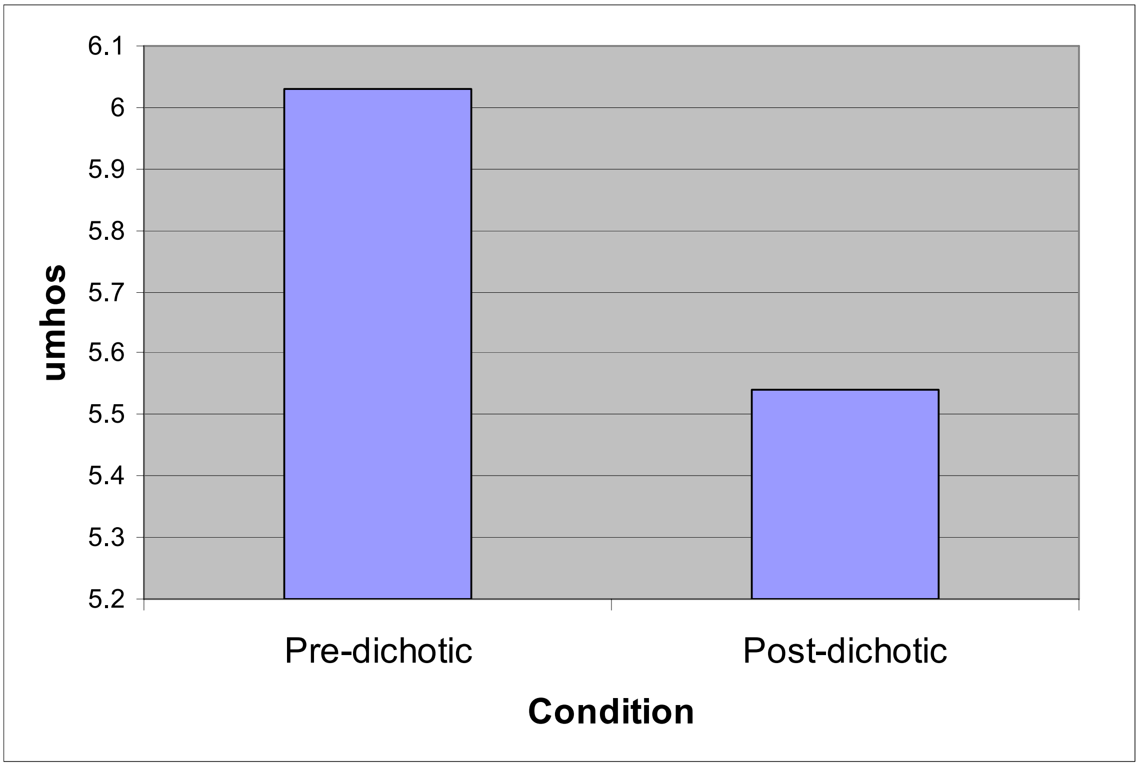


Figure 9. Mean skin conductance as a function of Trial during Block 3 (Dichotic II).

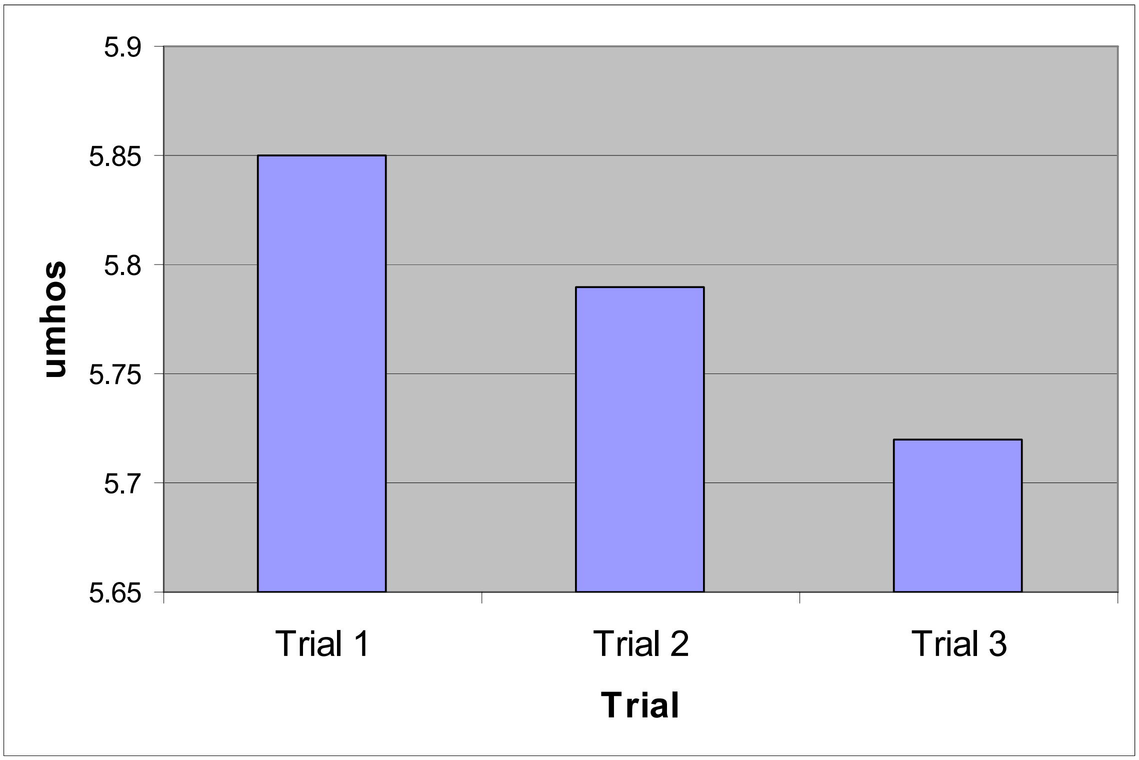


Figure 10. Mean skin conductance as a function of Group and Condition during Block 3 (Dichotic II).

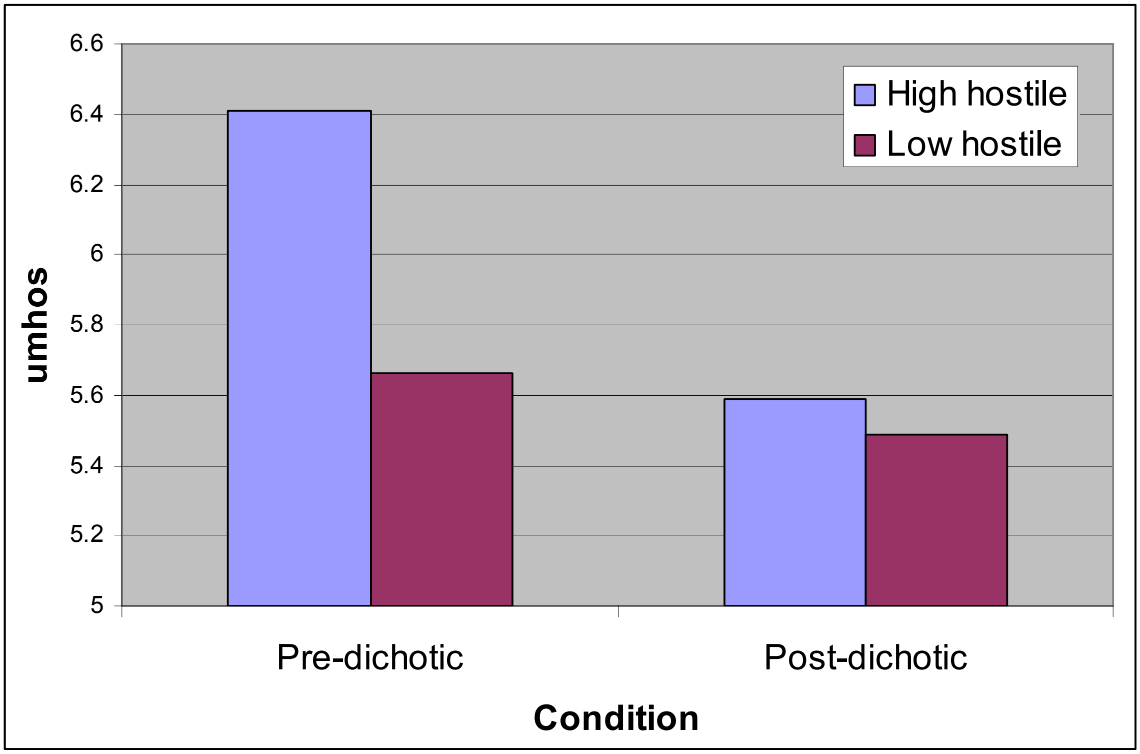


Figure 11. Number of correctly identified phonemes as a function of Ear (Dichotic I).

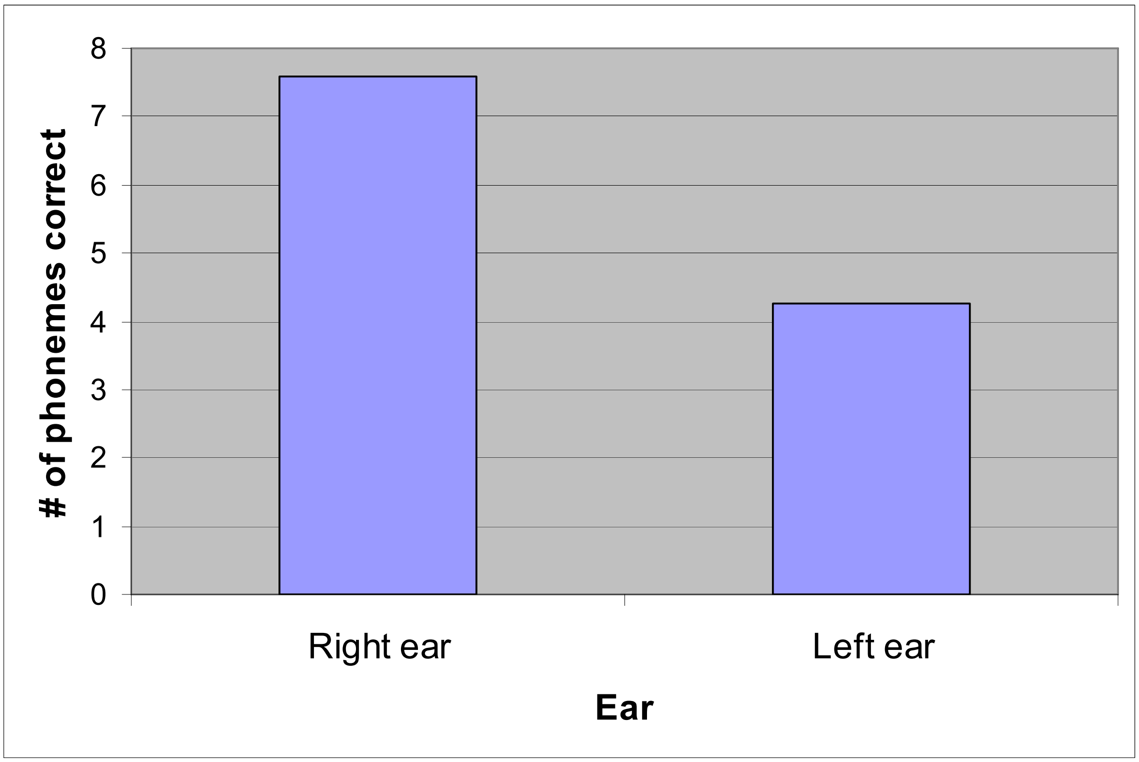


Figure 12. Number of correctly identified phonemes as a function of Trial (Dichotic I).

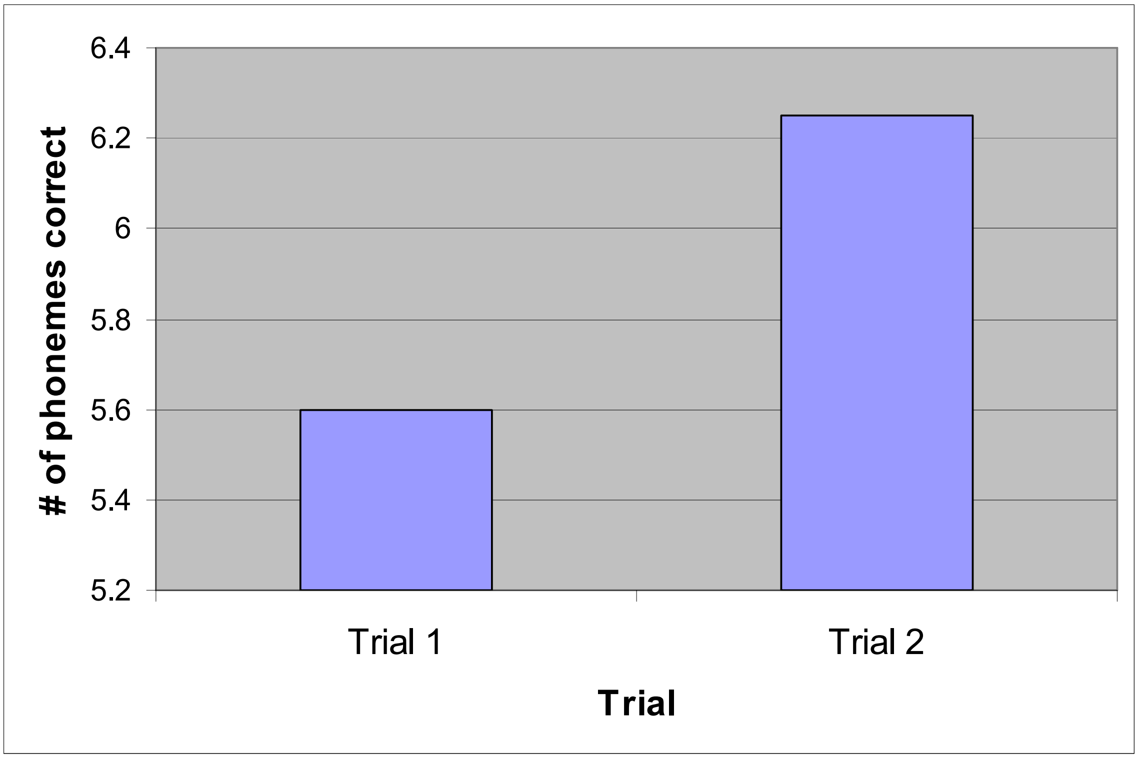


Figure 13. Number of correctly identified phonemes as a function of Ear (Dichotic II).

Figure 14. Number of correctly identified phonemes as a function of Trial (Dichotic II).

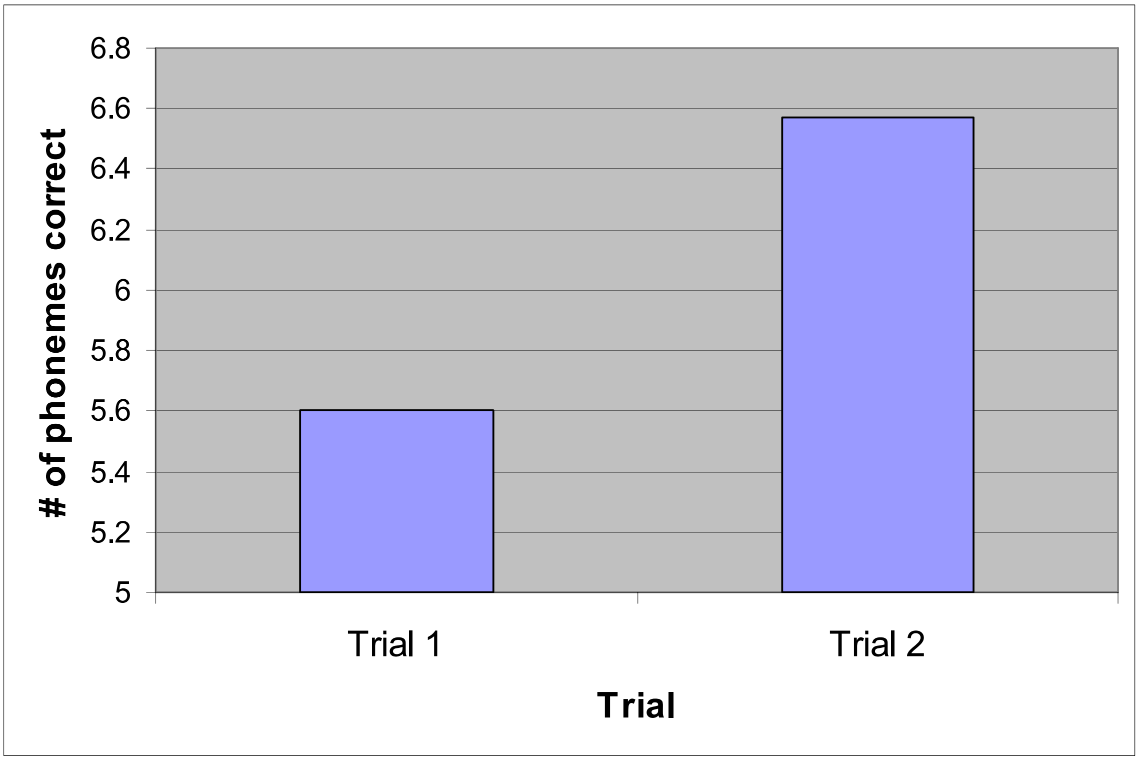


Figure 15. Number of correctly identified phonemes as a function of Ear and Trial (Dichotic II).

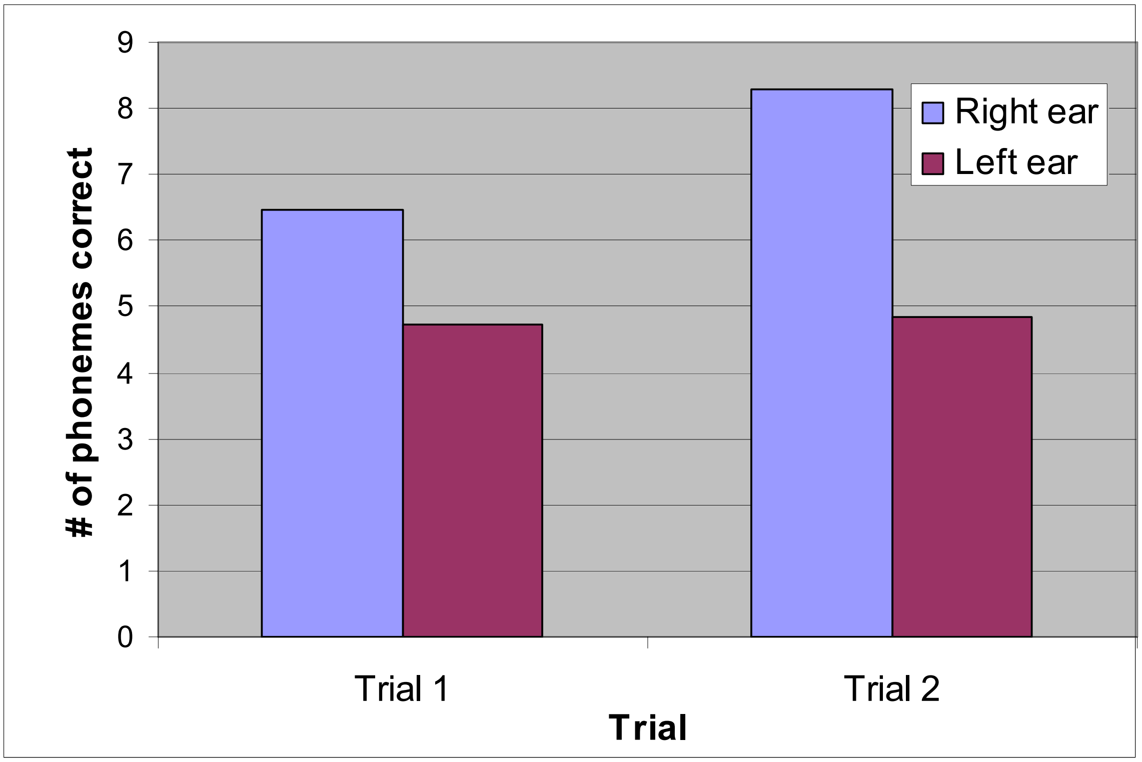


Table 1: Summary of skin conductance Analysis of Variance (ANOVA) sources: Block 1 (Dichotic I).

Source	**df**	**SS**	**MS**	**F value**	**Pr > F**
Group	1	.017	.017	0.00	.989
Condition	1	28.800	28.800	10.53	**.003****
Group x Condition	1	2.68	2.68	.98	.330
Hand	1	13.965	13.965	5.13	**.031***
Group x Hand	1	5.874	5.874	2.16	.153
Condition x Hand	1	1.828	1.828	.51	.480
Hostile x Condition x Hand	1	.222	.222	.06	.805
Trial	2	.289	.145	1.08	.346
Group x Trial	2	1.113	.556	4.16	**.021***
Condition x Trial	2	.338	.169	1.85	.167
Hand x Trial	2	.152	.076	3.08	.054
Group x Condition x Trial	2	.110	.055	.60	.551
Group x Hand x Trial	2	.044	.022	.88	.500
Hand x Condition x Trial	2	.002	.001	.03	.968
Group x Condition x Hand x Trial	2	.005	.003	.1	.909

Note: * P<.05; **P<.01

Table 2: Summary of skin conductance Analysis of Variance (ANOVA) sources: Block 2 (Rotation).

Source	**df**	**SS**	**MS**	**F value**	**Pr > F**
Group	1	10.759	10.759	.12	.736
Condition	1	127.954	127.954	50.63	**<.0001****
Group x Condition	1	11.195	11.195	4.43	**.044***
Hand	1	4.25	4.25	1.71	.202
Group x Hand	1	1.470	1.470	.59	.449
Condition x Hand	1	.200	.200	.20	.659
Hostile x Condition x Hand	1	.727	.727	.72	.402
Trial	2	6.758	3.379	21.44	**<.0001****
Group x Trial	2	.174	.087	.55	.579
Condition x Trial	2	1.684	.842	7.18	**.002****
Hand x Trial	2	.020	.010	.71	.498
Group x Condition x Trial	2	.002	.001	.1	.990
Group x Hand x Trial	2	.045	.022	1.57	.218
Hand x Condition x Trial	2	.014	.007	.90	.414
Group x Condition x Hand x Trial	2	.010	.005	.62	.542

Note: * P<.05; **P<.01

Table 3: Summary of skin conductance Analysis of Variance (ANOVA) sources: Block 3 (Dichotic II).

Source	**df**	**SS**	**MS**	**F value**	**Pr > F**
Group	1	15.517	15.517	.16	.695
Condition	1	22.362	22.362	11.66	**.002****
Group x Condition	1	9.306	9.306	4.85	**.036***
Hand	1	3.240	3.240	1.04	.316
Group x Hand	1	.047	.047	.02	.903
Condition x Hand	1	.0002	.0002	0.00	.964
Hostile x Condition x Hand	1	.042	.042	.49	.489
Trial	2	.999	.500	3.93	**.025***
Group x Trial	2	.063	.031	.25	.782
Condition x Trial	2	.054	.027	.59	.557
Hand x Trial	2	.094	.047	2.03	.141
Group x Condition x Trial	2	.112	.056	1.22	.303
Group x Hand x Trial	2	.052	.026	1.13	.330
Hand x Condition x Trial	2	.087	.044	1.29	.282
Group x Condition x Hand x Trial	2	.052	.026	.77	.468

Note: * P<.05; **P<.01

Table 4: Summary of dichotic consonant-vowel phonemes Analysis of Variance (ANOVA) sources: Dichotic I.

Source	**df**	**SS**	**MS**	**F value**	**Pr > F**
Group	1	.408	.408	.12	.730
Ear	1	336.675	336.675	29.50	**<.0001****
Ear x Group	1	1.008	1.008	.09	.769
Trial	1	12.675	12.675	15.73	**.0005****
Group x Trial	1	.008	.008	.01	.920
Ear x Trial	1	9.075	9.075	2.23	.147
Group x Ear x Trial	1	6.075	6.075	1.49	.232

Note: * P<.05; **P<.01

Table 5: Summary of dichotic consonant-vowel phonemes Analysis of Variance (ANOVA) sources: Dichotic II.

Source	**df**	**SS**	**MS**	**F value**	**Pr > F**
Group	1	2.700	2.700	2.10	.158
Ear	1	202.800	202.800	10.99	**.003****
Ear x Group	1	.133	.133	.01	.933
Trial	1	28.033	28.033	34.99	**.001****
Group x Trial	1	.033	.033	.04	.840
Ear x Trial	1	22.53	22.53	5.89	**.022****
Group x Ear x Trial	1	4.80	4.80	1.25	.272

Note: * P<.05; **P<.01

Appendix A

Medical History Questionnaire

1	Do you have any history of congenital or developmental problems?	Yes	No
2	Do you have any history of learning disabilities or special education?	Yes	No
3	Do you have any history of hypoglycemia (low blood glucose)?	Yes	No
4	Do you have any history of hyperglycemia (diabetes)?	Yes	No
5	Are you experiencing blood glucose problems at present?	Yes	No
6	Do you have any history of hypertension? (high blood pressure)	Yes	No
7	Do you have any history of hypotension? (low blood pressure)	Yes	No
8	Do you have any history of hyperthyroidism?	Yes	No
9	Do you have any history of hypothyroidism?	Yes	No
10	Have you ever suffered a head injury resulting in a hospital stay longer than 24 hours?	Yes	No
11	Have you ever been knocked out or rendered unconscious (more than 5 minutes)?	Yes	No
12	Have you ever suffered "black-out" or fainting spells?	Yes	No
13	Do you have a history of other neurological disorders (e.g. stroke or brain tumor)?	Yes	No
14	Have you ever received psychiatric/psychological care or counseling?	Yes	No
15	Have you ever been hospitalized in a psychiatric facility/hospital?	Yes	No
16	Have you ever been diagnosed with a psychiatric/psychological disorder?	Yes	No
17	Have you ever been administered any (neuro)psychological tests or measures?	Yes	No
18	Do you have a history of substance abuse or alcohol abuse?	Yes	No
19	Do you have any history of heart disease?	Yes	No
20	Do you have any history of pancreatic disease?	Yes	No
21	Are you currently taking any prescription blood-thinning medications?	Yes	No
22	Do you have a history of high blood pressure?	Yes	No
23	Do you have any uncorrected visual or hearing impairments?	Yes	No
24	Are you able to read, write, and speak English effectively?	Yes	No
25	Do you consume three or more alcoholic more than two nights a week?	Yes	No
26	Have you ever experienced a medical or psychiatric condition that could potentially affect cognitive functioning, such as stroke, electroconvulsive treatment, epilepsy, brain surgery, encephalitis, meningitis, multiple sclerosis, Parkinson's Disease, Huntington's Chorea, Alzheimer's dementia, Schizophrenia, or Bipolar Disorder?	Yes	No
27	Have you ever used smoked or used tobacco products?	Yes	No
28	Do you use any unprescribed or "illegal/street" drugs?	Yes	No
29	Are you taking any of the following medications: antidepressant, antianxiety, antipsychotic?	Yes	No
30	Are you taking any allergy or cold medication?	Yes	No

31	Do you frequently experience migraine headaches?	Yes	No
32	Do you have a history of chronic earache?	Yes	No
33	Do you often experience pressure in the inner ear?	Yes	No
34	Do you frequently hear a persistent ringing, buzzing, or hissing sound?	Yes	No
35	Have you ever been diagnosed with any of the following vestibular disorders: Orthostatic dysregulation, Meniere's Disease, Cogan's syndrome, Labyrinthine Infarct, Neurolabyrinthitis?	Yes	No
36	Do you have a history of panic attacks or agoraphobia?	Yes	No
37	Do you frequently experience sensations of nausea?	Yes	No
38	Do you frequently experience dizziness?	Yes	No
39	Do you currently participate in gymnastics, ballet, aircraft control?	Yes	No

If you answered "yes" to any of the above please explain fully:

____

____

____

____

Appendix B

Cook-Medley Hostility Scale

Directions: If a statement is true or mostly true, as pertaining to you, circle the letter T.

If a statement is false, or usually not true about you, circle the letter F.

Try to give a response to every statement.

1. When I take a new job, I like to be tipped off on who should be gotten next to.	T	F
2. When someone does me wrong, I feel I should pay him back if I can, just for the principle of the thing.	T	F
3. I prefer to pass by school friends, or people I know but have not seen for a long time, unless they speak to me first.	T	F
4. I often had to take orders from someone who did not know as much as I did.	T	F
5. I think a great many people exaggerate their misfortunes in order to gain the sympathy and help of others.	T	F
6. It takes a lot of argument to convince most people of the truth.	T	F
7. I think most people lie to get ahead.	T	F
8. Someone has it in for me.	T	F
9. Most people are honest chiefly through the fear of getting caught.	T	F
10. Most people will use somewhat unfair means to gain profit or an advantage, rather than lose it.	T	F
11. I commonly wonder what hidden reason another person may have for doing something nice for me.	T	F
12. It makes me impatient to have people ask my advice or otherwise interrupt me when I am working on something important.	T	F
13. I feel that I have often been punished without cause.	T	F
14. I am against giving money to beggars.	T	F
15. Some of my family have habits that bother me very much.	T	F
16. My relatives are nearly all in sympathy with me.	T	F
17. My way of doing things is apt to be misunderstood by others.	T	F
18. I don't blame anyone for trying to grab everything they can get in this world.	T	F
19. No one cares what happens to you.	T	F
20. I can be friendly with people who do things I consider wrong.	T	F
21. It is safer to trust nobody.	T	F
22. I do not blame a person for taking advantage of someone who lays himself open to it.	T	F
23. I have often felt that strangers were looking at me critically.	T	F
24. Most people make friends because friends are likely to be useful to them.	T	F

25. I am sure that I am being talked about.	T	F
26. I am likely not to speak to people until they speak to me.	T	F
27. Most people inwardly dislike putting themselves out to help other people.	T	F
28. I tend to be on guard with people who are somewhat more friendly than I had expected.	T	F
29. I have sometimes stayed away from another person because I feared doing or saying something that I might regret afterwards.	T	F
30. People often disappoint me.	T	F
31. I like to keep people guessing what I'm going to do next.	T	F
32. I frequently ask people for advice.	T	F
33. I am not easily angered.	T	F
34. I have often met people who are supposed to be experts who were no better than I.	T	F
35. It makes me think of failure when I hear of the success of someone I know well.	T	F
36. I would certainly enjoy beating a crook at his own game.	T	F
37. I have at times had to be rough with people who were rude or annoying.	T	F
38. People generally demand more respect for their own rights than they are willing to allow for others.	T	F
39. There are certain people whom I dislike so much I am inwardly pleased when they are catching it for something they have done.	T	F
40. I am often inclined to go out of my way to win a point with someone who has opposed me.	T	F
41. I am quite often not in on the gossip and talk of the group I belong to.	T	F
42. The man who had the most to do with me when I was a child (such as my father, step- father, etc.) was very strict with me.	T	F
43. I have often found people jealous of my good ideas just because they had not thought of them first.	T	F
44. When a man is with a woman, he is usually thinking of things related to her sex.	T	F
45. I do not try to cover up my poor opinion or pity of a person so that he won't know how I feel.	T	F
46. I have frequently worked under people who seem to have things arranged so that they get credit for good work, but are able to pass off mistakes to those under them.	T	F
47. I strongly defend my own opinions as a rule.	T	F
48. People can pretty easily change me even though I thought that my mind was made up on a subject.	T	F
49. Sometimes I am sure that other people can tell what I'm thinking.	T	F
50. A large number of people are guilty of bad sexual conduct.	T	F

Appendix C

State Trait Anxiety Inventory

Form X-1

Directions: A number of statements which people have used to describe them are given below. Read each statement and circle the appropriate number to the right of the statement to indicate how you fell now, that is, right at this moment. There is no right or wrong answer. Do not spend too much time on any one statement, but give the answer that seems to describe your present feelings best.

1. I feel calm……………………………………………………….	1	2	3	4
2. I feel secure………………………………………………………	1	2	3	4
3. I feel tense……………………………………………………..………	1	2	3	4
4. I am regretful……………………………………………………..	1	2	3	4
5. I feel at ease………………………………………………………	1	2	3	4
6. I feel upset………………………………………………………..	1	2	3	4
7. I am presently worrying over possible misfortune…………….	1	2	3	4
8. I feel rested…………………………………………………….	1	2	3	4
9. I feel anxious…………………………………………………………	1	2	3	4
10. I feel comfortable………………………………………………	1	2	3	4
11. I feel self-confident…………………………………………….	1	2	3	4
12. I feel nervous……………………………………………………..	1	2	3	4
13. I am jittery…………………………………………………………	1	2	3	4
14. I feel “high strung” …………………………………………….	1	2	3	4
15. I am relaxed…………………………………………………….	1	2	3	4
16. I feel content……………………………………………………	1	2	3	4
17. I am worried……………………………………………………	1	2	3	4
18. I feel over-excited and “rattled”………………………… ……	1	2	3	4
19. I feel joyful……………………………………………………	1	2	3	4
20. I feel pleasant………………………………………………….	1	2	3	4

Appendix D

Coren, Porac, and Duncan Laterality Inventory

Participant #: ____________________________

Circle the appropriate number after each item.

With which hand would you throw a ball to hit a target?	1	-1	0
With which hand do you draw?	1	-1	0
With which hand do you use an eraser on paper?	1	-1	0
With which hand do you remove the top card when dealing?	1	-1	0
With which foot do you kick a ball?	1	-1	0
If you had to pick up a pebble with your toes, which foot would you use?	1	-1	0
If you had to step up on a chair, which foot would you place on the chair first?	1	-1	0
Which eye would you use to peep through a keyhole?	1	-1	0
If you had to look into a dark bottle to see how full it was, which eye would you use?	1	-1	0
Which eye would you use to sight down a rifle?	1	-1	0
If you wanted to listen to a conversation going on behind a closed door, which ear would you place against the door?	1	-1	0
If you wanted to listen to someone's heartbeat, which ear would you place against his or her chest?	1	-1	0
Into which ear would you place you earphone of a transistor radio?	1	-1	0

# of Right + # of Left = Total Score

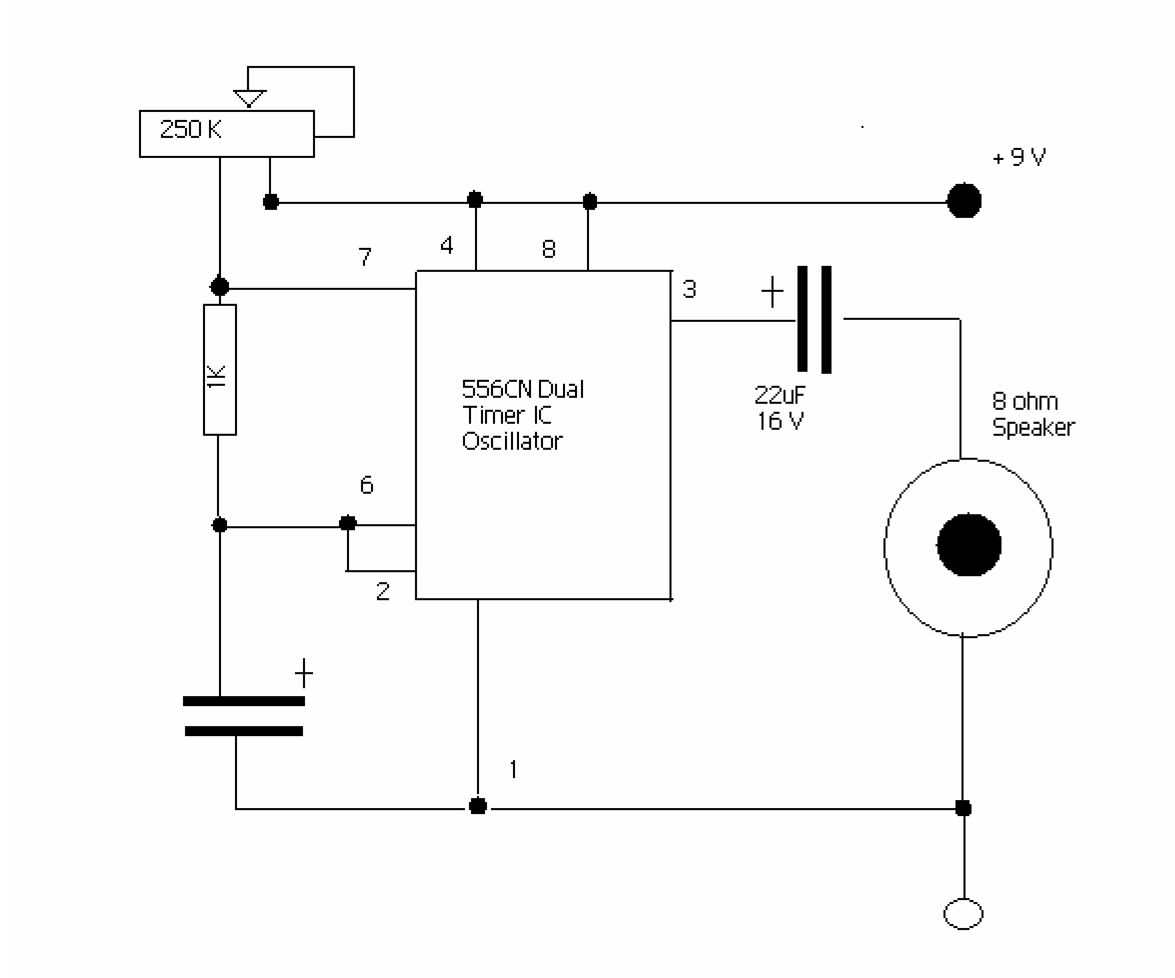
_________ + ________ = ___________

Is mother right or left hand dominant? __________

Is father right or left hand dominant? __________

Appendix E

Digital Timer Schematic



Adapted with permission from Dr. Tony van Roon, University of Guelph, Guelph, ON Canada

Appendix F

Vestibular Experiment Script

[Applying electrodes.]

"We're going to place electrodes on the tips of your fingers. The electrodes contain a salt water based gel solution. Do you have any skin allergies that you are aware of?"

[Leave and play instructions]

1."Please try to sit as still as possible and take a moment to become accustomed to your surroundings."

[Press play on video recorder. 2 minutes to relax and adjust]

[CD recorded instructions 1,2]

"Try to sit as still as possible and face forward in your seat. Try to keep your fingers as still as possible so as not to interfere with the electrodes. It will be important to try to look straight ahead during the entire experiment. During the experiment try to avoid closing your eyes or looking down."

"Now please look at the black line in front of you. Sometimes after rotation the line may appear to be moving even thought it is actually not. For now, try to tell me whether you perceive it to be moving leftward, rightward, or not at all."

[Assistant records response. Joe begins 2 min. of GSR]

[Place card on Stick]

3,4,5

Look at the card in front of you. There are six syllables each with numbers underneath. You are going to hear the syllables. Say the number with the syllable you hear out loud."

During practice trial participant must identify 10 out of 12 syllables correctly

6,7

"You are about to hear 30 trials of syllables. You will hear a syllable in the left ear and another syllable in the right ear at the same time. It will sound like two people talking at the same time. Your job is to listen carefully and say the number on the chart that corresponds to the syllable you hear most clearly. For example, if I thought I heard 'Ka' most clearly I would say 4 since that number goes with Ka. If I heard Ga most clearly I would say 3 since that number goes with Ga. Do you have any questions?"

[Dichotic task answers will be recorded by assistant. GSR recorded for 2 minutes post dichotic task.]

[Assistant enters and fastens loose electrode leads to chair]

8

"You will now be rotated in the chair. Try to keep your eyes open and face forward as much as possible. When we stop, try to remain as still as possible, with eyes open and try not to move or clench your hands"

[Assistant begins electronic metronome for one minute of paced rotation. Assistant stops at designated starting point and assesses vection. Electrode leads are handed to Joe for GSR recording.]

9 (preprogram)

"Now please look at the black line in front of you. Sometimes after rotation the line may appear to be moving even thought it is actually not. For now, try to tell me whether you perceive it to be moving leftward, rightward, or not at all."

Dichotic 2 phase:

10, 11

"You are about to hear 30 trials of syllables. You will hear a syllable in the left ear and another syllable in the right ear at the same time. Your job is to listen carefully and say the number on the chart that corresponds to the syllable you hear most clearly.

[Dichotic task answers will be recorded by assistant. GSR recorded for 2 minutes post dichotic task.]

[Participant is administered the Cook Medley scale and State-Trait to ensure reliability of hostile group. After completion participant is thanked and debriefed]

Appendix G

Informed Consent I

Title of Experiment: Cerebral activation to vestibular stimulation.
Principle Investigator: David W. Harrison
Co-Investigator: Joseph E. Carmona

I. Purpose of this research

You are invited to participate in a study about emotion and health. This questionnaire will assess medical, interpersonal and personality characteristics.

II. Procedures

To accomplish the goals of this study, you will be asked to complete a questionnaire about emotion and health. Based on the answers provided in the questionnaire you may or may not be contacted for participation in the second portion of the study.

III. Risks

There will be minimal discomfort associated with the completion of the questionnaire.

IV. Benefits

Your participation in this research will help clinical psychologists better understand correlates of emotion and health. No promise of benefits has been made to encourage you to participate.

V. Anonymity and Confidentiality

The results of this study will be confidential. The information you provide will not include information that can identify you (e.g., name, etc.). Instead, a subject number will be used on all forms you complete. Only the subject number will be used to identify you during data analysis and during the write up of the study results."

VI. Compensation

You may receive one extra credit point for the psychology class you enrolled in. For alternative methods of receiving extra credit, talk to your professor. If, as a result of this procedure, you should seek counseling, treatment will be made available at the Psychological Services Center and the University Counseling Center.

VII. Freedom to Withdraw

You are free to withdraw from this study at any time without penalty. If you choose to withdraw, you will still receive the extra credit and will not be penalized by any reduction in points. Talk to your professor if alternative forms of extra credit are desired.

X. Subject Permission

I have read and understand the informed consent and conditions of this project. I have had my questions answered. I hereby acknowledge the above and give my voluntary consent for participation in this project. If I participate, I may withdraw at any time without penalty. I agree to abide by the rules of this project.

____

Participant Signature Date

Should I have any further questions about this research or its conduct, I will contact:

____

Joseph E. Carmona
jcarmona@vt.edu
540-231-6914

David W. Harrison, PhD.
dwh@vt.edu
540-231-4422

Dr. David M. Moore
IRB Chair
moored@vt.edu
540-231-4991

Appendix H

Informed Consent II

Title of Experiment: Cerebral activation to vestibular stimulation.

Principle Investigator: David W. Harrison

Co-Investigator: Joseph E. Carmona

I. Purpose of this research

You are invited to participate in a study about GSR (sweat) and vestibular activation. This study will involve measurements of sense of motion, heart rate, skin conductance, and muscle tone after rotation in a specially designed chair.

II. Procedures

To accomplish the goals of this study, you will be asked to complete a listening test and to submit to skin conductance and heart rate measurement. Two self adhesive sensors will be placed on each hand by the experimenter. You will be asked to place the heart rate monitor sensor on your chest and provided with a private room to do so. Instructions for heart rate placement will be provided by the experimenter beforehand.

You may be asked to sit still while being rotated in a chair for about 1 minute. A video recording will be made during the procedures. This project will take approximately 50 minutes.

III. Risks

You may experience some discomfort associated with the rotating chair. You may develop motion sickness, including the feelings of nausea, headache, dizziness, and vomiting during or following procedures. You are fee to request termination of rotation at any time simply by telling the investigator that you feel too uncomfortable to continue. You will not be penalized in any way if you request early termination of rotation.

IV. Benefits

Your participation in this research will help provide for a better understanding physiological correlates of emotion, balance, and stress. No promise of benefits has been made to encourage you to participate. You may receive a synopsis or summary of this research when it is completed. Please give a self addressed stamped envelope to the experimenter if you wish for a synopsis.

Immediately following completion of the experiment you will have the opportunity to discuss the nature and purpose of the research. Any questions you may have regarding the study will be answered at this time or anytime thereafter should questions arise later.

V. Anonymity and Confidentiality

The results of this study will be confidential. The information you provide will not include information that can identify you (e.g., name, etc.). Instead, a subject number will be used on all forms you complete. Only the subject number will be used to identify you during data analysis and during the write up of the study results."

VI. Compensation

You may receive one extra credit point for participation in the project. You will need to speak with your instructor to verify that the instructor accepts bonus credits. For alternative methods of receiving extra credit, talk to your professor. No other compensation is offered in connection with this project.

VII. Freedom to Withdraw

You are free to withdraw from this study at any time without penalty. If you choose to withdraw, you will still receive the extra credit and will not be penalized by any reduction in points.

X. Subject permission

I have read and understand the informed consent and conditions of this project. I have had my questions answered. I hereby acknowledge the above and give my voluntary consent for participation in this project. If I participate, I may withdraw at any time without penalty. I agree to abide by the rules of this project.

____

Participant Signature Date

Should I have any further questions about this research or its conduct, I will contact:

____

Joseph E. Carmona
jcarmona@vt.edu
540-231-6914

____

David W. Harrison, PhD.
dwh@vt.edu
540-231-4422

____

Dr. David M. Moore
IRB Chair
moored@vt.edu

Appendix I

Internal Review Board Approval

540-231-4991

Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Institutional Review Board

Dr. David M. Moore
IRB (Human Subjects) Chair
Assistant Vice President for Research Compliance
1880 Pratt Drive, Suite 2006(0497), Blacksburg, VA 24061
Office: 540/231-4991; FAX: 540/231-0959
email: moored@vt.edu

DATE: November 2, 2005

MEMORANDUM

TO: David W. Harrison Psychology 0436
Joseph Carmona

FROM: David Moore

SUBJECT: **IRB Expedited Approval:** "Cerebral Activation to Vestibular Stimulation" IRB # 05-641

This memo is regarding the above-mentioned protocol. The proposed research is eligible for expedited review according to the specifications authorized by 45 CFR 46.110 and 21 CFR 56.110. As Chair of the Virginia Tech Institutional Review Board, I have granted approval to the study for a period of 12 months, effective November 1, 2005.

Virginia Tech has an approved Federal Wide Assurance (FWA00000572, exp. 7/20/07) on file with OHRP, and its IRB Registration Number is IRB00000667.

cc: File

Appendix J

Data for Skin Conductance

CMHO = Cook-Medley Hostility Score
CPD = Coren-Porec Laterality Score
STAI = State-Trait Anxiety Inventory
BLK = Block
COND = Condition
UMHO = Microsiemen

SUBJECT	AGE	SEX	CMHO	CPD	STAI	HAND	BLK	COND	TRIAL	UMHO
001	19	male	15	13	30	right	1	1	1	2.50798
001	19	male	15	13	30	right	1	1	2	2.50478
001	19	male	15	13	30	right	1	1	3	2.54313
001	19	male	15	13	30	right	1	2	1	2.20834
001	19	male	15	13	30	right	1	2	2	2.22960
001	19	male	15	13	30	right	1	2	3	2.23594
001	19	male	15	13	30	right	2	1	1	2.23594
001	19	male	15	13	30	right	2	1	2	2.25257
001	19	male	15	13	30	right	2	1	3	2.25257
001	19	male	15	13	30	right	2	2	1	2.23215
001	19	male	15	13	30	right	2	2	2	2.18144
001	19	male	15	13	30	right	2	2	3	2.18872
001	19	male	15	13	30	right	3	1	1	2.18872
001	19	male	15	13	30	right	3	1	2	2.25905
001	19	male	15	13	30	right	3	1	3	2.23850
001	19	male	15	13	30	right	3	2	1	2.24602
001	19	male	15	13	30	right	3	2	2	2.23963
001	19	male	15	13	30	right	3	2	3	2.22949
001	19	male	15	13	30	left	1	1	1	2.89936
001	19	male	15	13	30	left	1	1	2	2.86351
001	19	male	15	13	30	left	1	1	3	2.86351
001	19	male	15	13	30	left	1	2	1	2.54127
001	19	male	15	13	30	left	1	2	2	2.56612
001	19	male	15	13	30	left	1	2	3	2.56444
001	19	male	15	13	30	left	2	1	1	2.56444
001	19	male	15	13	30	left	2	1	2	2.56779
001	19	male	15	13	30	left	2	1	3	2.55944
001	19	male	15	13	30	left	2	2	1	2.45114
001	19	male	15	13	30	left	2	2	2	2.40033
001	19	male	15	13	30	left	2	2	3	2.39449
001	19	male	15	13	30	left	3	1	1	2.39449
001	19	male	15	13	30	left	3	1	2	2.44353
001	19	male	15	13	30	left	3	1	3	2.44201

001	19	male	15	13	30	left	3	2	1	2.41434
001	19	male	15	13	30	left	3	2	2	2.40549
001	19	male	15	13	30	left	3	2	3	2.39524
002	20	male	15	11	32	right	1	1	1	4.68099
002	20	male	15	11	32	right	1	1	2	4.51977
002	20	male	15	11	32	right	1	1	3	4.44326
002	20	male	15	11	32	right	1	2	1	5.07305
002	20	male	15	11	32	right	1	2	2	4.85413
002	20	male	15	11	32	right	1	2	3	4.51977
002	20	male	15	11	32	right	2	1	1	4.51977
002	20	male	15	11	32	right	2	1	2	4.16146
002	20	male	15	11	32	right	2	1	3	3.85579
002	20	male	15	11	32	right	2	2	1	6.07017
002	20	male	15	11	32	right	2	2	2	5.88859
002	20	male	15	11	32	right	2	2	3	5.75937
002	20	male	15	11	32	right	3	1	1	5.75937
002	20	male	15	11	32	right	3	1	2	5.80181
002	20	male	15	11	32	right	3	1	3	5.67634
002	20	male	15	11	32	right	3	2	1	3.93856
002	20	male	15	11	32	right	3	2	2	4.35218
002	20	male	15	11	32	right	3	2	3	4.28119
002	20	male	15	11	32	left	1	1	1	4.77054
002	20	male	15	11	32	left	1	1	2	4.57645
002	20	male	15	11	32	left	1	1	3	4.55000
002	20	male	15	11	32	left	1	2	1	5.30166
002	20	male	15	11	32	left	1	2	2	4.99875
002	20	male	15	11	32	left	1	2	3	4.78606
002	20	male	15	11	32	left	2	1	1	4.78606
002	20	male	15	11	32	left	2	1	2	4.46070
002	20	male	15	11	32	left	2	1	3	4.38616
002	20	male	15	11	32	left	2	2	1	6.08754
002	20	male	15	11	32	left	2	2	2	5.86098
002	20	male	15	11	32	left	2	2	3	5.77501
002	20	male	15	11	32	left	3	1	1	5.77501
002	20	male	15	11	32	left	3	1	2	5.81767
002	20	male	15	11	32	left	3	1	3	5.61041
002	20	male	15	11	32	left	3	2	1	4.46130
002	20	male	15	11	32	left	3	2	2	4.81603
002	20	male	15	11	32	left	3	2	3	4.75783
003	19	male	11	13	26	right	1	1	1	5.26859
003	19	male	11	13	26	right	1	1	2	5.10465
003	19	male	11	13	26	right	1	1	3	5.39864
003	19	male	11	13	26	right	1	2	1	5.62620
003	19	male	11	13	26	right	1	2	2	5.43213
003	19	male	11	13	26	right	1	2	3	5.54693
003	19	male	11	13	26	right	2	1	1	5.54693

003	19	male	11	13	26	right	2	1	2	5.62620
003	19	male	11	13	26	right	2	1	3	5.66669
003	19	male	11	13	26	right	2	2	1	6.25078
003	19	male	11	13	26	right	2	2	2	6.05840
003	19	male	11	13	26	right	2	2	3	5.70711
003	19	male	11	13	26	right	3	1	1	5.70711
003	19	male	11	13	26	right	3	1	2	5.70711
003	19	male	11	13	26	right	3	1	3	5.62556
003	19	male	11	13	26	right	3	2	1	6.31536
003	19	male	11	13	26	right	3	2	2	6.19609
003	19	male	11	13	26	right	3	2	3	6.25516
003	19	male	11	13	26	left	1	1	1	4.99730
003	19	male	11	13	26	left	1	1	2	4.77893
003	19	male	11	13	26	left	1	1	3	5.07460
003	19	male	11	13	26	left	1	2	1	5.39258
003	19	male	11	13	26	left	1	2	2	5.21404
003	19	male	11	13	26	left	1	2	3	5.28402
003	19	male	11	13	26	left	2	1	1	5.28402
003	19	male	11	13	26	left	2	1	2	5.42977
003	19	male	11	13	26	left	2	1	3	5.42977
003	19	male	11	13	26	left	2	2	1	6.56211
003	19	male	11	13	26	left	2	2	2	6.29961
003	19	male	11	13	26	left	2	2	3	6.01106
003	19	male	11	13	26	left	3	1	1	6.01106
003	19	male	11	13	26	left	3	1	2	5.70613
003	19	male	11	13	26	left	3	1	3	5.74779
003	19	male	11	13	26	left	3	2	1	6.17147
003	19	male	11	13	26	left	3	2	2	6.00211
003	19	male	11	13	26	left	3	2	3	6.05752
004	19	male	20	13	32	right	1	1	1	4.95810
004	19	male	20	13	32	right	1	1	2	4.86618
004	19	male	20	13	32	right	1	1	3	4.77760
004	19	male	20	13	32	right	1	2	1	5.21105
004	19	male	20	13	32	right	1	2	2	5.21105
004	19	male	20	13	32	right	1	2	3	5.14297
004	19	male	20	13	32	right	2	1	1	5.14297
004	19	male	20	13	32	right	2	1	2	5.10960
004	19	male	20	13	32	right	2	1	3	5.07666
004	19	male	20	13	32	right	2	2	1	6.37633
004	19	male	20	13	32	right	2	2	2	6.12820
004	19	male	20	13	32	right	2	2	3	5.85480
004	19	male	20	13	32	right	3	1	1	5.85480
004	19	male	20	13	32	right	3	1	2	5.68569
004	19	male	20	13	32	right	3	1	3	5.52608
004	19	male	20	13	32	right	3	2	1	5.74185
004	19	male	20	13	32	right	3	2	2	5.70028

004	19	male	20	13	32	right	3	2	3	5.70028
004	19	male	20	13	32	left	1	1	1	4.96672
004	19	male	20	13	32	left	1	1	2	4.81487
004	19	male	20	13	32	left	1	1	3	4.72813
004	19	male	20	13	32	left	1	2	1	4.82765
004	19	male	20	13	32	left	1	2	2	4.82765
004	19	male	20	13	32	left	1	2	3	4.79823
004	19	male	20	13	32	left	2	1	1	4.79823
004	19	male	20	13	32	left	2	1	2	4.76917
004	19	male	20	13	32	left	2	1	3	4.76917
004	19	male	20	13	32	left	2	2	1	6.03719
004	19	male	20	13	32	left	2	2	2	5.81429
004	19	male	20	13	32	left	2	2	3	5.41448
004	19	male	20	13	32	left	3	1	1	5.41448
004	19	male	20	13	32	left	3	1	2	5.30504
004	19	male	20	13	32	left	3	1	3	5.13215
004	19	male	20	13	32	left	3	2	1	5.24576
004	19	male	20	13	32	left	3	2	2	5.21105
004	19	male	20	13	32	left	3	2	3	5.14297
005	20	male	12	9	21	right	1	1	1	4.38866
005	20	male	12	9	21	right	1	1	2	4.27895
005	20	male	12	9	21	right	1	1	3	5.18651
005	20	male	12	9	21	right	1	2	1	4.77646
005	20	male	12	9	21	right	1	2	2	4.66331
005	20	male	12	9	21	right	1	2	3	4.53441
005	20	male	12	9	21	right	2	1	1	4.53441
005	20	male	12	9	21	right	2	1	2	4.50844
005	20	male	12	9	21	right	2	1	3	4.50329
005	20	male	12	9	21	right	2	2	1	6.06090
005	20	male	12	9	21	right	2	2	2	6.13648
005	20	male	12	9	21	right	2	2	3	6.23364
005	20	male	12	9	21	right	3	1	1	6.23364
005	20	male	12	9	21	right	3	1	2	5.87986
005	20	male	12	9	21	right	3	1	3	6.12693
005	20	male	12	9	21	right	3	2	1	4.78652
005	20	male	12	9	21	right	3	2	2	4.82169
005	20	male	12	9	21	right	3	2	3	4.88148
005	20	male	12	9	21	left	1	1	1	3.87660
005	20	male	12	9	21	left	1	1	2	3.91515
005	20	male	12	9	21	left	1	1	3	3.95448
005	20	male	12	9	21	left	1	2	1	4.51512
005	20	male	12	9	21	left	1	2	2	4.36979
005	20	male	12	9	21	left	1	2	3	4.21539
005	20	male	12	9	21	left	2	1	1	4.21539
005	20	male	12	9	21	left	2	1	2	4.25181
005	20	male	12	9	21	left	2	1	3	4.33133

005	20	male	12	9	21	left	2	2	1	5.81815
005	20	male	12	9	21	left	2	2	2	5.94106
005	20	male	12	9	21	left	2	2	3	5.94106
005	20	male	12	9	21	left	3	1	1	5.94106
005	20	male	12	9	21	left	3	1	2	5.55543
005	20	male	12	9	21	left	3	1	3	5.94106
005	20	male	12	9	21	left	3	2	1	4.59280
005	20	male	12	9	21	left	3	2	2	4.69131
005	20	male	12	9	21	left	3	2	3	4.73646
006	20	male	7	6	23	right	1	1	1	8.34168
006	20	male	7	6	23	right	1	1	2	8.30648
006	20	male	7	6	23	right	1	1	3	7.21105
006	20	male	7	6	23	right	1	2	1	8.47702
006	20	male	7	6	23	right	1	2	2	7.93059
006	20	male	7	6	23	right	1	2	3	7.59405
006	20	male	7	6	23	right	2	1	1	7.59405
006	20	male	7	6	23	right	2	1	2	7.88295
006	20	male	7	6	23	right	2	1	3	6.79459
006	20	male	7	6	23	right	2	2	1	13.1592
006	20	male	7	6	23	right	2	2	2	11.9237
006	20	male	7	6	23	right	2	2	3	10.7515
006	20	male	7	6	23	right	3	1	1	10.7515
006	20	male	7	6	23	right	3	1	2	11.2427
006	20	male	7	6	23	right	3	1	3	10.7515
006	20	male	7	6	23	right	3	2	1	7.43273
006	20	male	7	6	23	right	3	2	2	9.49397
006	20	male	7	6	23	right	3	2	3	9.47113
006	20	male	7	6	23	left	1	1	1	7.34721
006	20	male	7	6	23	left	1	1	2	7.10843
006	20	male	7	6	23	left	1	1	3	6.74318
006	20	male	7	6	23	left	1	2	1	8.45709
006	20	male	7	6	23	left	1	2	2	7.92908
006	20	male	7	6	23	left	1	2	3	7.65169
006	20	male	7	6	23	left	2	1	1	7.65169
006	20	male	7	6	23	left	2	1	2	7.94508
006	20	male	7	6	23	left	2	1	3	7.37920
006	20	male	7	6	23	left	2	2	1	11.2357
006	20	male	7	6	23	left	2	2	2	9.98223
006	20	male	7	6	23	left	2	2	3	8.93959
006	20	male	7	6	23	left	3	1	1	8.93959
006	20	male	7	6	23	left	3	1	2	9.66370
006	20	male	7	6	23	left	3	1	3	9.29852
006	20	male	7	6	23	left	3	2	1	7.95406
006	20	male	7	6	23	left	3	2	2	7.47105
006	20	male	7	6	23	left	3	2	3	6.98090
007	21	male	19	9	28	right	1	1	1	5.13938

007	21	male	19	9	28	right	1	1	2	5.24901
007	21	male	19	9	28	right	1	1	3	5.31276
007	21	male	19	9	28	right	1	2	1	6.50838
007	21	male	19	9	28	right	1	2	2	6.60668
007	21	male	19	9	28	right	1	2	3	6.33048
007	21	male	19	9	28	right	2	1	1	6.33048
007	21	male	19	9	28	right	2	1	2	6.39215
007	21	male	19	9	28	right	2	1	3	6.48694
007	21	male	19	9	28	right	2	2	1	7.78768
007	21	male	19	9	28	right	2	2	2	7.25658
007	21	male	19	9	28	right	2	2	3	6.90045
007	21	male	19	9	28	right	3	1	1	6.90045
007	21	male	19	9	28	right	3	1	2	7.19031
007	21	male	19	9	28	right	3	1	3	6.74673
007	21	male	19	9	28	right	3	2	1	9.16792
007	21	male	19	9	28	right	3	2	2	8.49531
007	21	male	19	9	28	right	3	2	3	8.04402
007	21	male	19	9	28	left	1	1	1	4.74482
007	21	male	19	9	28	left	1	1	2	4.80857
007	21	male	19	9	28	left	1	1	3	4.80857
007	21	male	19	9	28	left	1	2	1	6.02410
007	21	male	19	9	28	left	1	2	2	6.15597
007	21	male	19	9	28	left	1	2	3	5.88893
007	21	male	19	9	28	left	2	1	1	5.88893
007	21	male	19	9	28	left	2	1	2	5.96929
007	21	male	19	9	28	left	2	1	3	6.05188
007	21	male	19	9	28	left	2	2	1	7.52378
007	21	male	19	9	28	left	2	2	2	7.01439
007	21	male	19	9	28	left	2	2	3	6.61376
007	21	male	19	9	28	left	3	1	1	6.61376
007	21	male	19	9	28	left	3	1	2	6.66978
007	21	male	19	9	28	left	3	1	3	6.22673
007	21	male	19	9	28	left	3	2	1	9.17364
007	21	male	19	9	28	left	3	2	2	8.40944
007	21	male	19	9	28	left	3	2	3	7.99936
008	19	male	12	6	34	right	1	1	1	7.98281
008	19	male	12	6	34	right	1	1	2	7.81174
008	19	male	12	6	34	right	1	1	3	7.04241
008	19	male	12	6	34	right	1	2	1	10.7689
008	19	male	12	6	34	right	1	2	2	10.3444
008	19	male	12	6	34	right	1	2	3	9.73084
008	19	male	12	6	34	right	2	1	1	9.73084
008	19	male	12	6	34	right	2	1	2	9.19667
008	19	male	12	6	34	right	2	1	3	8.62262
008	19	male	12	6	34	right	2	2	1	10.1024
008	19	male	12	6	34	right	2	2	2	9.70403

008	19	male	12	6	34	right	2	2	3	9.22645
008	19	male	12	6	34	right	3	1	1	9.22645
008	19	male	12	6	34	right	3	1	2	8.62039
008	19	male	12	6	34	right	3	1	3	8.22423
008	19	male	12	6	34	right	3	2	1	9.51276
008	19	male	12	6	34	right	3	2	2	9.03261
008	19	male	12	6	34	right	3	2	3	8.67438
008	19	male	12	6	34	left	1	1	1	6.77808
008	19	male	12	6	34	left	1	1	2	6.36599
008	19	male	12	6	34	left	1	1	3	5.85991
008	19	male	12	6	34	left	1	2	1	11.1060
008	19	male	12	6	34	left	1	2	2	10.4709
008	19	male	12	6	34	left	1	2	3	9.66156
008	19	male	12	6	34	left	2	1	1	9.66156
008	19	male	12	6	34	left	2	1	2	8.97851
008	19	male	12	6	34	left	2	1	3	8.07050
008	19	male	12	6	34	left	2	2	1	10.3184
008	19	male	12	6	34	left	2	2	2	9.85358
008	19	male	12	6	34	left	2	2	3	9.22986
008	19	male	12	6	34	left	3	1	1	9.22986
008	19	male	12	6	34	left	3	1	2	8.49315
008	19	male	12	6	34	left	3	1	3	8.00935
008	19	male	12	6	34	left	3	2	1	9.22696
008	19	male	12	6	34	left	3	2	2	8.67784
008	19	male	12	6	34	left	3	2	3	8.19041
009	19	male	14	6	38	right	1	1	1	2.72480
009	19	male	14	6	38	right	1	1	2	2.66937
009	19	male	14	6	38	right	1	1	3	2.86352
009	19	male	14	6	38	right	1	2	1	4.14559
009	19	male	14	6	38	right	1	2	2	4.16753
009	19	male	14	6	38	right	1	2	3	3.99824
009	19	male	14	6	38	right	2	1	1	3.99824
009	19	male	14	6	38	right	2	1	2	3.97804
009	19	male	14	6	38	right	2	1	3	3.86100
009	19	male	14	6	38	right	2	2	1	5.04032
009	19	male	14	6	38	right	2	2	2	4.91449
009	19	male	14	6	38	right	2	2	3	4.82416
009	19	male	14	6	38	right	3	1	1	4.82416
009	19	male	14	6	38	right	3	1	2	4.68077
009	19	male	14	6	38	right	3	1	3	4.68077
009	19	male	14	6	38	right	3	2	1	5.19859
009	19	male	14	6	38	right	3	2	2	4.96894
009	19	male	14	6	38	right	3	2	3	4.81696
009	19	male	14	6	38	left	1	1	1	2.61856
009	19	male	14	6	38	left	1	1	2	2.56733
009	19	male	14	6	38	left	1	1	3	2.72740

009	19	male	14	6	38	left	1	2	1	3.88908
009	19	male	14	6	38	left	1	2	2	3.83230
009	19	male	14	6	38	left	1	2	3	3.65444
009	19	male	14	6	38	left	2	1	1	3.65444
009	19	male	14	6	38	left	2	1	2	3.63755
009	19	male	14	6	38	left	2	1	3	3.49235
009	19	male	14	6	38	left	2	2	1	4.79111
009	19	male	14	6	38	left	2	2	2	4.62235
009	19	male	14	6	38	left	2	2	3	4.54236
009	19	male	14	6	38	left	3	1	1	4.54236
009	19	male	14	6	38	left	3	1	2	4.41501
009	19	male	14	6	38	left	3	1	3	4.31816
009	19	male	14	6	38	left	3	2	1	4.81649
009	19	male	14	6	38	left	3	2	2	4.61872
009	19	male	14	6	38	left	3	2	3	4.46170
010	19	male	6	9		right	1	1	1	4.51378
010	19	male	6	9		right	1	1	2	4.44247
010	19	male	6	9		right	1	1	3	4.43247
010	19	male	6	9		right	1	2	1	4.84722
010	19	male	6	9		right	1	2	2	4.74212
010	19	male	6	9		right	1	2	3	4.84722
010	19	male	6	9		right	2	1	1	4.84722
010	19	male	6	9		right	2	1	2	4.81167
010	19	male	6	9		right	2	1	3	4.95707
010	19	male	6	9		right	2	2	1	5.17438
010	19	male	6	9		right	2	2	2	5.14732
010	19	male	6	9		right	2	2	3	4.99072
010	19	male	6	9		right	3	1	1	4.99072
010	19	male	6	9		right	3	1	2	4.99072
010	19	male	6	9		right	3	1	3	5.08089
010	19	male	6	9		right	3	2	1	5.27810
010	19	male	6	9		right	3	2	2	5.40120
010	19	male	6	9		right	3	2	3	5.51469
010	19	male	6	9		left	1	1	1	3.89894
010	19	male	6	9		left	1	1	2	3.77193
010	19	male	6	9		left	1	1	3	3.70799
010	19	male	6	9		left	1	2	1	4.51459
010	19	male	6	9		left	1	2	2	4.36445
010	19	male	6	9		left	1	2	3	4.43325
010	19	male	6	9		left	2	1	1	4.43325
010	19	male	6	9		left	2	1	2	4.45331
010	19	male	6	9		left	2	1	3	4.64235
010	19	male	6	9		left	2	2	1	4.88978
010	19	male	6	9		left	2	2	2	4.85361
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010	19	male	6	9	left	3	1	2	4.65836
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010	19	male	6	9	left	3	2	2	4.99790
010	19	male	6	9	left	3	2	3	5.10814
011	19	male	14	7	right	1	1	1	7.05219
011	19	male	14	7	right	1	1	2	6.92809
011	19	male	14	7	right	1	1	3	6.92809
011	19	male	14	7	right	1	2	1	7.82901
011	19	male	14	7	right	1	2	2	7.67636
011	19	male	14	7	right	1	2	3	7.67636
011	19	male	14	7	right	2	1	1	7.67636
011	19	male	14	7	right	2	1	2	7.75194
011	19	male	14	7	right	2	1	3	7.90764
011	19	male	14	7	right	2	2	1	8.87390
011	19	male	14	7	right	2	2	2	8.49113
011	19	male	14	7	right	2	2	3	8.22504
011	19	male	14	7	right	3	1	1	8.22504
011	19	male	14	7	right	3	1	2	8.05672
011	19	male	14	7	right	3	1	3	7.97512
011	19	male	14	7	right	3	2	1	8.25014
011	19	male	14	7	right	3	2	2	8.08081
011	19	male	14	7	right	3	2	3	7.99872
011	19	male	14	7	left	1	1	1	7.33676
011	19	male	14	7	left	1	1	2	7.26903
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011	19	male	14	7	left	1	2	2	7.63068
011	19	male	14	7	left	1	2	3	7.55744
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011	19	male	14	7	left	2	2	3	8.18599
011	19	male	14	7	left	3	1	1	8.18599
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011	19	male	14	7	left	3	1	3	7.85916
011	19	male	14	7	left	3	2	1	7.60572
011	19	male	14	7	left	3	2	2	7.18907
011	19	male	14	7	left	3	2	3	7.32279
012	20	male	11	11	right	1	1	1	2.60406
012	20	male	11	11	right	1	1	2	2.66037
012	20	male	11	11	right	1	1	3	2.58017
012	20	male	11	11	right	1	2	1	2.87525
012	20	male	11	11	right	1	2	2	2.71279

012	20	male	11	11	right	1	2	3	2.71279
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012	20	male	11	11	right	2	1	2	2.65427
012	20	male	11	11	right	2	1	3	2.67228
012	20	male	11	11	right	2	2	1	3.27259
012	20	male	11	11	right	2	2	2	3.16728
012	20	male	11	11	right	2	2	3	2.98479
012	20	male	11	11	right	3	1	1	2.98479
012	20	male	11	11	right	3	1	2	2.97127
012	20	male	11	11	right	3	1	3	2.93145
012	20	male	11	11	right	3	2	1	2.88404
012	20	male	11	11	right	3	2	2	2.83014
012	20	male	11	11	right	3	2	3	2.80994
012	20	male	11	11	left	1	1	1	3.43157
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012	20	male	11	11	left	1	1	3	3.38437
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012	20	male	11	11	left	1	2	3	3.65267
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012	20	male	11	11	left	2	2	3	4.27204
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012	20	male	11	11	left	3	1	2	4.31418
012	20	male	11	11	left	3	1	3	4.44069
012	20	male	11	11	left	3	2	1	3.91273
012	20	male	11	11	left	3	2	2	3.85904
012	20	male	11	11	left	3	2	3	3.81417
013	19	male	10	13	right	1	1	1	6.30422
013	19	male	10	13	right	1	1	2	6.24422
013	19	male	10	13	right	1	1	3	6.40681
013	19	male	10	13	right	1	2	1	6.94966
013	19	male	10	13	right	1	2	2	6.94966
013	19	male	10	13	right	1	2	3	6.75877
013	19	male	10	13	right	2	1	1	6.75877
013	19	male	10	13	right	2	1	2	6.57808
013	19	male	10	13	right	2	1	3	6.32447
013	19	male	10	13	right	2	2	1	7.59763
013	19	male	10	13	right	2	2	2	7.07854
013	19	male	10	13	right	2	2	3	6.85664
013	19	male	10	13	right	3	1	1	6.85664
013	19	male	10	13	right	3	1	2	6.64823
013	19	male	10	13	right	3	1	3	6.47333

013	19	male	10	13		right	3	2	1	6.43418
013	19	male	10	13		right	3	2	2	6.33072
013	19	male	10	13		right	3	2	3	6.23053
013	19	male	10	13		left	1	1	1	5.63978
013	19	male	10	13		left	1	1	2	5.59172
013	19	male	10	13		left	1	1	3	5.73842
013	19	male	10	13		left	1	2	1	6.45328
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013	19	male	10	13		left	1	2	3	6.24844
013	19	male	10	13		left	2	1	1	6.24844
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013	19	male	10	13		left	2	2	3	6.36975
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013	19	male	10	13		left	3	1	2	6.17010
013	19	male	10	13		left	3	1	3	6.03763
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013	19	male	10	13		left	3	2	3	5.71592
014	21	male	15	7	32	right	1	1	1	5.02553
014	21	male	15	7	32	right	1	1	2	4.55461
014	21	male	15	7	32	right	1	1	3	4.37844
014	21	male	15	7	32	right	1	2	1	6.49570
014	21	male	15	7	32	right	1	2	2	6.30835
014	21	male	15	7	32	right	1	2	3	6.83396
014	21	male	15	7	32	right	2	1	1	6.83396
014	21	male	15	7	32	right	2	1	2	6.18934
014	21	male	15	7	32	right	2	1	3	5.87530
014	21	male	15	7	32	right	2	2	1	6.16356
014	21	male	15	7	32	right	2	2	2	5.83471
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014	21	male	15	7	32	right	3	1	1	5.53918
014	21	male	15	7	32	right	3	1	2	5.23013
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014	21	male	15	7	32	right	3	2	1	5.55099
014	21	male	15	7	32	right	3	2	2	5.26870
014	21	male	15	7	32	right	3	2	3	5.01374
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014	21	male	15	7	32	left	1	2	2	6.56409
014	21	male	15	7	32	left	1	2	3	7.32086
014	21	male	15	7	32	left	2	1	1	7.32086

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014	21	male	15	7	32	left	2	2	1	6.36959
014	21	male	15	7	32	left	2	2	2	6.01902
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014	21	male	15	7	32	left	3	1	1	5.67215
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014	21	male	15	7	32	left	3	2	1	5.66136
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015	19	male	31	11	33	right	1	1	1	6.15195
015	19	male	31	11	33	right	1	1	2	6.06664
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015	19	male	31	11	33	right	1	2	1	5.68143
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015	19	male	31	11	33	right	1	2	3	5.49125
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015	19	male	31	11	33	right	2	1	3	5.73105
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015	19	male	31	11	33	right	2	2	3	6.95323
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015	19	male	31	11	33	right	3	1	3	7.43937
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015	19	male	31	11	33	right	3	2	2	5.76548
015	19	male	31	11	33	right	3	2	3	5.69872
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015	19	male	31	11	33	left	1	2	1	4.51520
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015	19	male	31	11	33	left	1	2	3	4.35055
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015	19	male	31	11	33	left	2	2	2	6.84435
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015	19	male	31	11	33	left	3	1	3	5.97222
015	19	male	31	11	33	left	3	2	1	5.35848
015	19	male	31	11	33	left	3	2	2	5.25127

015	19	male	31	11	33	left	3	2	3	5.16855
016	19	male	36	11	32	right	1	1	1	5.74660
016	19	male	36	11	32	right	1	1	2	5.64768
016	19	male	36	11	32	right	1	1	3	5.55994
016	19	male	36	11	32	right	1	2	1	5.40430
016	19	male	36	11	32	right	1	2	2	5.31672
016	19	male	36	11	32	right	1	2	3	5.25989
016	19	male	36	11	32	right	2	1	1	5.25989
016	19	male	36	11	32	right	2	1	2	5.14981
016	19	male	36	11	32	right	2	1	3	5.03778
016	19	male	36	11	32	right	2	2	1	6.64832
016	19	male	36	11	32	right	2	2	2	6.44164
016	19	male	36	11	32	right	2	2	3	6.34816
016	19	male	36	11	32	right	3	1	1	6.34816
016	19	male	36	11	32	right	3	1	2	6.21782
016	19	male	36	11	32	right	3	1	3	6.02744
016	19	male	36	11	32	right	3	2	1	5.35923
016	19	male	36	11	32	right	3	2	2	5.24499
016	19	male	36	11	32	right	3	2	3	5.14896
016	19	male	36	11	32	left	1	1	1	5.81470
016	19	male	36	11	32	left	1	1	2	5.69690
016	19	male	36	11	32	left	1	1	3	5.63978
016	19	male	36	11	32	left	1	2	1	5.43709
016	19	male	36	11	32	left	1	2	2	5.35573
016	19	male	36	11	32	left	1	2	3	5.30521
016	19	male	36	11	32	left	2	1	1	5.30521
016	19	male	36	11	32	left	2	1	2	5.17958
016	19	male	36	11	32	left	2	1	3	5.07279
016	19	male	36	11	32	left	2	2	1	6.97233
016	19	male	36	11	32	left	2	2	2	6.74536
016	19	male	36	11	32	left	2	2	3	6.63174
016	19	male	36	11	32	left	3	1	1	6.63174
016	19	male	36	11	32	left	3	1	2	6.50034
016	19	male	36	11	32	left	3	1	3	6.31273
016	19	male	36	11	32	left	3	2	1	5.55772
016	19	male	36	11	32	left	3	2	2	5.45756
016	19	male	36	11	32	left	3	2	3	5.39031
017	19	male	27	7	31	right	1	1	1	4.02868
017	19	male	27	7	31	right	1	1	2	4.06194
017	19	male	27	7	31	right	1	1	3	5.61432
017	19	male	27	7	31	right	1	2	1	5.14785
017	19	male	27	7	31	right	1	2	2	4.97859
017	19	male	27	7	31	right	1	2	3	4.77336
017	19	male	27	7	31	right	2	1	1	4.77336
017	19	male	27	7	31	right	2	1	2	4.58438
017	19	male	27	7	31	right	2	1	3	4.42964

017	19	male	27	7	31	right	2	2	1	5.90054
017	19	male	27	7	31	right	2	2	2	5.55111
017	19	male	27	7	31	right	2	2	3	5.29717
017	19	male	27	7	31	right	3	1	1	5.29717
017	19	male	27	7	31	right	3	1	2	5.21300
017	19	male	27	7	31	right	3	1	3	5.10485
017	19	male	27	7	31	right	3	2	1	4.52661
017	19	male	27	7	31	right	3	2	2	4.50588
017	19	male	27	7	31	right	3	2	3	4.37568
017	19	male	27	7	31	left	1	1	1	4.14140
017	19	male	27	7	31	left	1	1	2	3.92662
017	19	male	27	7	31	left	1	1	3	6.06958
017	19	male	27	7	31	left	1	2	1	5.11881
017	19	male	27	7	31	left	1	2	2	4.90822
017	19	male	27	7	31	left	1	2	3	4.74266
017	19	male	27	7	31	left	2	1	1	4.74266
017	19	male	27	7	31	left	2	1	2	4.57193
017	19	male	27	7	31	left	2	1	3	4.43794
017	19	male	27	7	31	left	2	2	1	5.89206
017	19	male	27	7	31	left	2	2	2	5.55926
017	19	male	27	7	31	left	2	2	3	5.29033
017	19	male	27	7	31	left	3	1	1	5.29033
017	19	male	27	7	31	left	3	1	2	5.13843
017	19	male	27	7	31	left	3	1	3	5.00771
017	19	male	27	7	31	left	3	2	1	4.32608
017	19	male	27	7	31	left	3	2	2	4.27906
017	19	male	27	7	31	left	3	2	3	4.16146
018	19	male	31	5	41	right	1	1	1	18.6776
018	19	male	31	5	41	right	1	1	2	20.6355
018	19	male	31	5	41	right	1	1	3	20.6355
018	19	male	31	5	41	right	1	2	1	12.3058
018	19	male	31	5	41	right	1	2	2	12.6214
018	19	male	31	5	41	right	1	2	3	12.4616
018	19	male	31	5	41	right	2	1	1	12.4616
018	19	male	31	5	41	right	2	1	2	12.9537
018	19	male	31	5	41	right	2	1	3	12.5012
018	19	male	31	5	41	right	2	2	1	14.6417
018	19	male	31	5	41	right	2	2	2	13.1721
018	19	male	31	5	41	right	2	2	3	13.3056
018	19	male	31	5	41	right	3	1	1	13.3056
018	19	male	31	5	41	right	3	1	2	13.1721
018	19	male	31	5	41	right	3	1	3	13.1721
018	19	male	31	5	41	right	3	2	1	14.0103
018	19	male	31	5	41	right	3	2	2	13.8136
018	19	male	31	5	41	right	3	2	3	13.8136
018	19	male	31	5	41	left	1	1	1	10.9027

018	19	male	31	5	41	left	1	1	2	10.9940
018	19	male	31	5	41	left	1	1	3	10.9940
018	19	male	31	5	41	left	1	2	1	13.5248
018	19	male	31	5	41	left	1	2	2	13.9563
018	19	male	31	5	41	left	1	2	3	13.7612
018	19	male	31	5	41	left	2	1	1	13.7612
018	19	male	31	5	41	left	2	1	2	14.2081
018	19	male	31	5	41	left	2	1	3	13.6184
018	19	male	31	5	41	left	2	2	1	16.0994
018	19	male	31	5	41	left	2	2	2	14.5522
018	19	male	31	5	41	left	2	2	3	14.3926
018	19	male	31	5	41	left	3	1	1	14.3926
018	19	male	31	5	41	left	3	1	2	14.0335
018	19	male	31	5	41	left	3	1	3	14.2881
018	19	male	31	5	41	left	3	2	1	15.2049
018	19	male	31	5	41	left	3	2	2	14.9736
018	19	male	31	5	41	left	3	2	3	15.0884
019	20	male	30	13	34	right	1	1	1	3.37475
019	20	male	30	13	34	right	1	1	2	3.23075
019	20	male	30	13	34	right	1	1	3	3.15565
019	20	male	30	13	34	right	1	2	1	4.88749
019	20	male	30	13	34	right	1	2	2	4.55394
019	20	male	30	13	34	right	1	2	3	4.33817
019	20	male	30	13	34	right	2	1	1	4.33817
019	20	male	30	13	34	right	2	1	2	4.14628
019	20	male	30	13	34	right	2	1	3	3.99482
019	20	male	30	13	34	right	2	2	1	6.41206
019	20	male	30	13	34	right	2	2	2	5.75586
019	20	male	30	13	34	right	2	2	3	5.23538
019	20	male	30	13	34	right	3	1	1	5.23538
019	20	male	30	13	34	right	3	1	2	4.84853
019	20	male	30	13	34	right	3	1	3	4.63177
019	20	male	30	13	34	right	3	2	1	4.82211
019	20	male	30	13	34	right	3	2	2	4.60766
019	20	male	30	13	34	right	3	2	3	4.48688
019	20	male	30	13	34	left	1	1	1	2.87947
019	20	male	30	13	34	left	1	1	2	2.76229
019	20	male	30	13	34	left	1	1	3	2.70721
019	20	male	30	13	34	left	1	2	1	4.56142
019	20	male	30	13	34	left	1	2	2	4.11773
019	20	male	30	13	34	left	1	2	3	3.96033
019	20	male	30	13	34	left	2	1	1	3.96033
019	20	male	30	13	34	left	2	1	2	3.70217
019	20	male	30	13	34	left	2	1	3	3.59402
019	20	male	30	13	34	left	2	2	1	6.20394
019	20	male	30	13	34	left	2	2	2	5.54041

019	20	male	30	13	34	left	2	2	3	5.00511
019	20	male	30	13	34	left	3	1	1	5.00511
019	20	male	30	13	34	left	3	1	2	4.59610
019	20	male	30	13	34	left	3	1	3	4.35222
019	20	male	30	13	34	left	3	2	1	4.44820
019	20	male	30	13	34	left	3	2	2	4.20585
019	20	male	30	13	34	left	3	2	3	4.06683
020	20	male	29	9	31	right	1	1	1	4.95373
020	20	male	29	9	31	right	1	1	2	4.91661
020	20	male	29	9	31	right	1	1	3	4.75050
020	20	male	29	9	31	right	1	2	1	7.99923
020	20	male	29	9	31	right	1	2	2	9.83826
020	20	male	29	9	31	right	1	2	3	9.23805
020	20	male	29	9	31	right	2	1	1	9.23805
020	20	male	29	9	31	right	2	1	2	8.94422
020	20	male	29	9	31	right	2	1	3	8.86368
020	20	male	29	9	31	right	2	2	1	6.99506
020	20	male	29	9	31	right	2	2	2	6.97029
020	20	male	29	9	31	right	2	2	3	6.64108
020	20	male	29	9	31	right	3	1	1	6.64108
020	20	male	29	9	31	right	3	1	2	6.69756
020	20	male	29	9	31	right	3	1	3	6.17253
020	20	male	29	9	31	right	3	2	1	6.18353
020	20	male	29	9	31	right	3	2	2	6.66507
020	20	male	29	9	31	right	3	2	3	6.42574
020	20	male	29	9	31	left	1	1	1	6.68789
020	20	male	29	9	31	left	1	1	2	6.66524
020	20	male	29	9	31	left	1	1	3	6.42591
020	20	male	29	9	31	left	1	2	1	6.12760
020	20	male	29	9	31	left	1	2	2	5.82825
020	20	male	29	9	31	left	1	2	3	5.66066
020	20	male	29	9	31	left	2	1	1	5.66066
020	20	male	29	9	31	left	2	1	2	5.58042
020	20	male	29	9	31	left	2	1	3	5.61224
020	20	male	29	9	31	left	2	2	1	8.33278
020	20	male	29	9	31	left	2	2	2	9.98044
020	20	male	29	9	31	left	2	2	3	8.66281
020	20	male	29	9	31	left	3	1	1	8.66281
020	20	male	29	9	31	left	3	1	2	9.23156
020	20	male	29	9	31	left	3	1	3	7.80421
020	20	male	29	9	31	left	3	2	1	7.20752
020	20	male	29	9	31	left	3	2	2	7.62637
020	20	male	29	9	31	left	3	2	3	7.42501
021	20	male	33	9	43	right	1	1	1	3.06560
021	20	male	33	9	43	right	1	1	2	3.00019
021	20	male	33	9	43	right	1	1	3	3.13393

021	20	male	33	9	43	right	1	2	1	3.40925
021	20	male	33	9	43	right	1	2	2	3.30896
021	20	male	33	9	43	right	1	2	3	3.29511
021	20	male	33	9	43	right	2	1	1	3.29511
021	20	male	33	9	43	right	2	1	2	3.26776
021	20	male	33	9	43	right	2	1	3	3.20133
021	20	male	33	9	43	right	2	2	1	5.82309
021	20	male	33	9	43	right	2	2	2	6.04668
021	20	male	33	9	43	right	2	2	3	6.00060
021	20	male	33	9	43	right	3	1	1	6.00060
021	20	male	33	9	43	right	3	1	2	5.91051
021	20	male	33	9	43	right	3	1	3	5.78035
021	20	male	33	9	43	right	3	2	1	3.53023
021	20	male	33	9	43	right	3	2	2	3.41390
021	20	male	33	9	43	right	3	2	3	3.32734
021	20	male	33	9	43	left	1	1	1	3.03115
021	20	male	33	9	43	left	1	1	2	3.15756
021	20	male	33	9	43	left	1	1	3	3.23541
021	20	male	33	9	43	left	1	2	1	3.68012
021	20	male	33	9	43	left	1	2	2	3.54748
021	20	male	33	9	43	left	1	2	3	3.50018
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021	20	male	33	9	43	left	2	1	3	3.33700
021	20	male	33	9	43	left	2	2	1	5.61545
021	20	male	33	9	43	left	2	2	2	5.73822
021	20	male	33	9	43	left	2	2	3	5.69671
021	20	male	33	9	43	left	3	1	1	5.69671
021	20	male	33	9	43	left	3	1	2	5.57569
021	20	male	33	9	43	left	3	1	3	5.53649
021	20	male	33	9	43	left	3	2	1	3.32757
021	20	male	33	9	43	left	3	2	2	3.18232
021	20	male	33	9	43	left	3	2	3	3.06346
022	19	male	31	10	34	right	1	1	1	2.85538
022	19	male	31	10	34	right	1	1	2	2.97626
022	19	male	31	10	34	right	1	1	3	3.09805
022	19	male	31	10	34	right	1	2	1	3.35539
022	19	male	31	10	34	right	1	2	2	3.33832
022	19	male	31	10	34	right	1	2	3	3.47996
022	19	male	31	10	34	right	2	1	1	3.47996
022	19	male	31	10	34	right	2	1	2	3.42546
022	19	male	31	10	34	right	2	1	3	3.37264
022	19	male	31	10	34	right	2	2	1	4.08117
022	19	male	31	10	34	right	2	2	2	4.03929
022	19	male	31	10	34	right	2	2	3	3.95013
022	19	male	31	10	34	right	3	1	1	3.95013

022	19	male	31	10	34	right	3	1	2	3.81983
022	19	male	31	10	34	right	3	1	3	3.73290
022	19	male	31	10	34	right	3	2	1	3.25988
022	19	male	31	10	34	right	3	2	2	3.20677
022	19	male	31	10	34	right	3	2	3	3.34292
022	19	male	31	10	34	left	1	1	1	2.65638
022	19	male	31	10	34	left	1	1	2	2.78412
022	19	male	31	10	34	left	1	1	3	2.88194
022	19	male	31	10	34	left	1	2	1	3.04377
022	19	male	31	10	34	left	1	2	2	3.03439
022	19	male	31	10	34	left	1	2	3	3.18666
022	19	male	31	10	34	left	2	1	1	3.18666
022	19	male	31	10	34	left	2	1	2	3.13590
022	19	male	31	10	34	left	2	1	3	3.06748
022	19	male	31	10	34	left	2	2	1	3.89172
022	19	male	31	10	34	left	2	2	2	3.84609
022	19	male	31	10	34	left	2	2	3	3.77963
022	19	male	31	10	34	left	3	1	1	3.77963
022	19	male	31	10	34	left	3	1	2	3.64660
022	19	male	31	10	34	left	3	1	3	3.57378
022	19	male	31	10	34	left	3	2	1	3.01159
022	19	male	31	10	34	left	3	2	2	2.93307
022	19	male	31	10	34	left	3	2	3	3.10665
023	19	male	35	12	34	right	1	1	1	5.00445
023	19	male	35	12	34	right	1	1	2	4.97914
023	19	male	35	12	34	right	1	1	3	5.01082
023	19	male	35	12	34	right	1	2	1	5.09590
023	19	male	35	12	34	right	1	2	2	5.09590
023	19	male	35	12	34	right	1	2	3	5.17630
023	19	male	35	12	34	right	2	1	1	5.17630
023	19	male	35	12	34	right	2	1	2	5.32328
023	19	male	35	12	34	right	2	1	3	5.50952
023	19	male	35	12	34	right	2	2	1	7.52117
023	19	male	35	12	34	right	2	2	2	7.42192
023	19	male	35	12	34	right	2	2	3	7.07514
023	19	male	35	12	34	right	3	1	1	7.07514
023	19	male	35	12	34	right	3	1	2	7.11349
023	19	male	35	12	34	right	3	1	3	6.82967
023	19	male	35	12	34	right	3	2	1	6.39215
023	19	male	35	12	34	right	3	2	2	6.67387
023	19	male	35	12	34	right	3	2	3	6.71944
023	19	male	35	12	34	left	1	1	1	4.63775
023	19	male	35	12	34	left	1	1	2	4.63775
023	19	male	35	12	34	left	1	1	3	4.60520
023	19	male	35	12	34	left	1	2	1	4.79042
023	19	male	35	12	34	left	1	2	2	4.76145

023	19	male	35	12	34	left	1	2	3	4.81974
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023	19	male	35	12	34	left	2	1	2	4.84346
023	19	male	35	12	34	left	2	1	3	4.88553
023	19	male	35	12	34	left	2	2	1	6.39435
023	19	male	35	12	34	left	2	2	2	6.32247
023	19	male	35	12	34	left	2	2	3	6.18345
023	19	male	35	12	34	left	3	1	1	6.18345
023	19	male	35	12	34	left	3	1	2	6.09726
023	19	male	35	12	34	left	3	1	3	5.97693
023	19	male	35	12	34	left	3	2	1	5.96937
023	19	male	35	12	34	left	3	2	2	6.07999
023	19	male	35	12	34	left	3	2	3	6.11778
024	20	male	33	7	40	right	1	1	1	1.79592
024	20	male	33	7	40	right	1	1	2	1.79592
024	20	male	33	7	40	right	1	1	3	1.79920
024	20	male	33	7	40	right	1	2	1	2.23157
024	20	male	33	7	40	right	1	2	2	2.28864
024	20	male	33	7	40	right	1	2	3	2.29665
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024	20	male	33	7	40	right	2	1	2	2.12554
024	20	male	33	7	40	right	2	1	3	2.03543
024	20	male	33	7	40	right	2	2	1	3.37669
024	20	male	33	7	40	right	2	2	2	3.53432
024	20	male	33	7	40	right	2	2	3	3.44163
024	20	male	33	7	40	right	3	1	1	3.44163
024	20	male	33	7	40	right	3	1	2	3.20098
024	20	male	33	7	40	right	3	1	3	2.94260
024	20	male	33	7	40	right	3	2	1	2.11365
024	20	male	33	7	40	right	3	2	2	2.14825
024	20	male	33	7	40	right	3	2	3	2.11820
024	20	male	33	7	40	left	1	1	1	1.42680
024	20	male	33	7	40	left	1	1	2	1.42732
024	20	male	33	7	40	left	1	1	3	1.42732
024	20	male	33	7	40	left	1	2	1	1.54182
024	20	male	33	7	40	left	1	2	2	1.54424
024	20	male	33	7	40	left	1	2	3	1.55768
024	20	male	33	7	40	left	2	1	1	1.55768
024	20	male	33	7	40	left	2	1	2	1.51804
024	20	male	33	7	40	left	2	1	3	1.46385
024	20	male	33	7	40	left	2	2	1	2.18614
024	20	male	33	7	40	left	2	2	2	2.19834
024	20	male	33	7	40	left	2	2	3	2.12938
024	20	male	33	7	40	left	3	1	1	2.12938
024	20	male	33	7	40	left	3	1	2	2.07769
024	20	male	33	7	40	left	3	1	3	2.00367

024	20	male	33	7	40	left	3	2	1	1.56071
024	20	male	33	7	40	left	3	2	2	1.55332
024	20	male	33	7	40	left	3	2	3	1.53634
025	20	male	33	7		right	1	1	1	2.32219
025	20	male	33	7		right	1	1	2	2.32768
025	20	male	33	7		right	1	1	3	2.33044
025	20	male	33	7		right	1	2	1	2.84110
025	20	male	33	7		right	1	2	2	2.70449
025	20	male	33	7		right	1	2	3	2.87429
025	20	male	33	7		right	2	1	1	2.87429
025	20	male	33	7		right	2	1	2	3.25983
025	20	male	33	7		right	2	1	3	3.04314
025	20	male	33	7		right	2	2	1	6.98666
025	20	male	33	7		right	2	2	2	7.04920
025	20	male	33	7		right	2	2	3	6.21465
025	20	male	33	7		right	3	1	1	6.21465
025	20	male	33	7		right	3	1	2	6.92521
025	20	male	33	7		right	3	1	3	6.98666
025	20	male	33	7		right	3	2	1	5.69606
025	20	male	33	7		right	3	2	2	5.77968
025	20	male	33	7		right	3	2	3	6.28733
025	20	male	33	7		left	1	1	1	3.12449
025	20	male	33	7		left	1	1	2	3.13444
025	20	male	33	7		left	1	1	3	3.14446
025	20	male	33	7		left	1	2	1	4.49333
025	20	male	33	7		left	1	2	2	4.25996
025	20	male	33	7		left	1	2	3	4.53474
025	20	male	33	7		left	2	1	1	4.53474
025	20	male	33	7		left	2	1	2	5.19265
025	20	male	33	7		left	2	1	3	4.85937
025	20	male	33	7		left	2	2	1	8.71004
025	20	male	33	7		left	2	2	2	8.90710
025	20	male	33	7		left	2	2	3	7.92142
025	20	male	33	7		left	3	1	1	7.92142
025	20	male	33	7		left	3	1	2	8.90710
025	20	male	33	7		left	3	1	3	8.90710
025	20	male	33	7		left	3	2	1	7.65580
025	20	male	33	7		left	3	2	2	7.58208
025	20	male	33	7		left	3	2	3	8.04699
026	20	male	28	6	45	right	1	1	1	4.39839
026	20	male	28	6	45	right	1	1	2	4.08784
026	20	male	28	6	45	right	1	1	3	4.95157
026	20	male	28	6	45	right	1	2	1	5.79341
026	20	male	28	6	45	right	1	2	2	6.06097
026	20	male	28	6	45	right	1	2	3	6.35445
026	20	male	28	6	45	right	2	1	1	6.35445

026	20	male	28	6	45	right	2	1	2	6.25352
026	20	male	28	6	45	right	2	1	3	6.10799
026	20	male	28	6	45	right	2	2	1	8.18572
026	20	male	28	6	45	right	2	2	2	7.89042
026	20	male	28	6	45	right	2	2	3	7.61568
026	20	male	28	6	45	right	3	1	1	7.61568
026	20	male	28	6	45	right	3	1	2	7.52831
026	20	male	28	6	45	right	3	1	3	7.49963
026	20	male	28	6	45	right	3	2	1	5.23966
026	20	male	28	6	45	right	3	2	2	5.74422
026	20	male	28	6	45	right	3	2	3	5.81206
026	20	male	28	6	45	left	1	1	1	3.12758
026	20	male	28	6	45	left	1	1	2	2.99437
026	20	male	28	6	45	left	1	1	3	3.36841
026	20	male	28	6	45	left	1	2	1	4.21088
026	20	male	28	6	45	left	1	2	2	4.25641
026	20	male	28	6	45	left	1	2	3	4.42380
026	20	male	28	6	45	left	2	1	1	4.42380
026	20	male	28	6	45	left	2	1	2	4.32657
026	20	male	28	6	45	left	2	1	3	4.21088
026	20	male	28	6	45	left	2	2	1	5.69230
026	20	male	28	6	45	left	2	2	2	5.54791
026	20	male	28	6	45	left	2	2	3	5.38109
026	20	male	28	6	45	left	3	1	1	5.38109
026	20	male	28	6	45	left	3	1	2	5.30853
026	20	male	28	6	45	left	3	1	3	5.28005
026	20	male	28	6	45	left	3	2	1	3.52108
026	20	male	28	6	45	left	3	2	2	3.72074
026	20	male	28	6	45	left	3	2	3	3.80709
027	19	male	35	5	62	right	1	1	1	10.5110
027	19	male	35	5	62	right	1	1	2	10.5110
027	19	male	35	5	62	right	1	1	3	10.3999
027	19	male	35	5	62	right	1	2	1	12.3222
027	19	male	35	5	62	right	1	2	2	12.2838
027	19	male	35	5	62	right	1	2	3	12.0212
027	19	male	35	5	62	right	2	1	1	12.0212
027	19	male	35	5	62	right	2	1	2	11.7696
027	19	male	35	5	62	right	2	1	3	11.5284
027	19	male	35	5	62	right	2	2	1	15.5385
027	19	male	35	5	62	right	2	2	2	14.6156
027	19	male	35	5	62	right	2	2	3	15.1208
027	19	male	35	5	62	right	3	1	1	15.1208
027	19	male	35	5	62	right	3	1	2	14.8359
027	19	male	35	5	62	right	3	1	3	14.9485
027	19	male	35	5	62	right	3	2	1	13.6933
027	19	male	35	5	62	right	3	2	2	13.4134

										6
027	19	male	35	5	62	right	3	2	3	13.4134
027	19	male	35	5	62	left	1	1	1	8.33111
027	19	male	35	5	62	left	1	1	2	8.26119
027	19	male	35	5	62	left	1	1	3	8.47458
027	19	male	35	5	62	left	1	2	1	9.41194
027	19	male	35	5	62	left	1	2	2	9.41194
027	19	male	35	5	62	left	1	2	3	9.21370
027	19	male	35	5	62	left	2	1	1	9.21370
027	19	male	35	5	62	left	2	1	2	9.04437
027	19	male	35	5	62	left	2	1	3	8.84126
027	19	male	35	5	62	left	2	2	1	11.6354
027	19	male	35	5	62	left	2	2	2	11.1731
027	19	male	35	5	62	left	2	2	3	11.4660
027	19	male	35	5	62	left	3	1	1	11.4660
027	19	male	35	5	62	left	3	1	2	11.3340
027	19	male	35	5	62	left	3	1	3	11.3996
027	19	male	35	5	62	left	3	2	1	10.3786
027	19	male	35	5	62	left	3	2	2	10.1120
027	19	male	35	5	62	left	3	2	3	10.1120
028	19	male	32	11	39	right	1	1	1	3.29413
028	19	male	32	11	39	right	1	1	2	3.17460
028	19	male	32	11	39	right	1	1	3	3.11187
028	19	male	32	11	39	right	1	2	1	3.28159
028	19	male	32	11	39	right	1	2	2	3.28159
028	19	male	32	11	39	right	1	2	3	3.22778
028	19	male	32	11	39	right	2	1	1	3.22778
028	19	male	32	11	39	right	2	1	2	3.26797
028	19	male	32	11	39	right	2	1	3	3.36576
028	19	male	32	11	39	right	2	2	1	4.04318
028	19	male	32	11	39	right	2	2	2	3.96181
028	19	male	32	11	39	right	2	2	3	3.77202
028	19	male	32	11	39	right	3	1	1	3.77202
028	19	male	32	11	39	right	3	1	2	3.63280
028	19	male	32	11	39	right	3	1	3	3.70110
028	19	male	32	11	39	right	3	2	1	2.95046
028	19	male	32	11	39	right	3	2	2	2.90689
028	19	male	32	11	39	right	3	2	3	2.69774
028	19	male	32	11	39	left	1	1	1	3.94524
028	19	male	32	11	39	left	1	1	2	3.75700
028	19	male	32	11	39	left	1	1	3	3.72148
028	19	male	32	11	39	left	1	2	1	3.79363
028	19	male	32	11	39	left	1	2	2	3.77544
028	19	male	32	11	39	left	1	2	3	3.70439
028	19	male	32	11	39	left	2	1	1	3.70439
028	19	male	32	11	39	left	2	1	2	3.72190

028	19	male	32	11	39	left	2	1	3	3.84926
028	19	male	32	11	39	left	2	2	1	4.44998
028	19	male	32	11	39	left	2	2	2	4.42497
028	19	male	32	11	39	left	2	2	3	4.16736
028	19	male	32	11	39	left	3	1	1	4.16736
028	19	male	32	11	39	left	3	1	2	4.01849
028	19	male	32	11	39	left	3	1	3	4.12371
028	19	male	32	11	39	left	3	2	1	3.41799
028	19	male	32	11	39	left	3	2	2	3.43289
028	19	male	32	11	39	left	3	2	3	3.22217
029	22	male	30	11	35	right	1	1	1	1.19659
029	22	male	30	11	35	right	1	1	2	1.19659
029	22	male	30	11	35	right	1	1	3	1.19605
029	22	male	30	11	35	right	1	2	1	1.49439
029	22	male	30	11	35	right	1	2	2	1.48874
029	22	male	30	11	35	right	1	2	3	1.48874
029	22	male	30	11	35	right	2	1	1	1.56570
029	22	male	30	11	35	right	2	1	2	1.52744
029	22	male	30	11	35	right	2	1	3	1.48504
029	22	male	30	11	35	right	2	2	1	2.32489
029	22	male	30	11	35	right	2	2	2	2.26081
029	22	male	30	11	35	right	2	2	3	2.08372
029	22	male	30	11	35	right	3	1	1	2.08372
029	22	male	30	11	35	right	3	1	2	1.91478
029	22	male	30	11	35	right	3	1	3	1.82428
029	22	male	30	11	35	right	3	2	1	1.53057
029	22	male	30	11	35	right	3	2	2	1.51876
029	22	male	30	11	35	right	3	2	3	1.45156
029	22	male	30	11	35	left	1	1	1	1.17470
029	22	male	30	11	35	left	1	1	2	1.16566
029	22	male	30	11	35	left	1	1	3	1.16359
029	22	male	30	11	35	left	1	2	1	1.65575
029	22	male	30	11	35	left	1	2	2	1.65366
029	22	male	30	11	35	left	1	2	3	1.74897
029	22	male	30	11	35	left	2	1	1	1.74897
029	22	male	30	11	35	left	2	1	2	1.69988
029	22	male	30	11	35	left	2	1	3	1.67672
029	22	male	30	11	35	left	2	2	1	2.56090
029	22	male	30	11	35	left	2	2	2	2.48964
029	22	male	30	11	35	left	2	2	3	2.35276
029	22	male	30	11	35	left	3	1	1	2.35276
029	22	male	30	11	35	left	3	1	2	2.23015
029	22	male	30	11	35	left	3	1	3	2.14043
029	22	male	30	11	35	left	3	2	1	1.82720
029	22	male	30	11	35	left	3	2	2	1.82382
029	22	male	30	11	35	left	3	2	3	1.76653

030	22	male	13	6	30	right	1	1	1	4.19280
030	22	male	13	6	30	right	1	1	2	3.98083
030	22	male	13	6	30	right	1	1	3	3.79656
030	22	male	13	6	30	right	1	2	1	5.56013
030	22	male	13	6	30	right	1	2	2	4.89630
030	22	male	13	6	30	right	1	2	3	4.63134
030	22	male	13	6	30	right	2	1	1	4.63134
030	22	male	13	6	30	right	2	1	2	4.00070
030	22	male	13	6	30	right	2	1	3	3.43718
030	22	male	13	6	30	right	2	2	1	8.37717
030	22	male	13	6	30	right	2	2	2	7.51383
030	22	male	13	6	30	right	2	2	3	6.71880
030	22	male	13	6	30	right	3	1	1	6.71880
030	22	male	13	6	30	right	3	1	2	7.10692
030	22	male	13	6	30	right	3	1	3	5.92951
030	22	male	13	6	30	right	3	2	1	3.84651
030	22	male	13	6	30	right	3	2	2	3.66736
030	22	male	13	6	30	right	3	2	3	3.36058
030	22	male	13	6	30	left	1	1	1	4.14161
030	22	male	13	6	30	left	1	1	2	3.90344
030	22	male	13	6	30	left	1	1	3	3.61658
030	22	male	13	6	30	left	1	2	1	3.61658
030	22	male	13	6	30	left	1	2	2	4.53737
030	22	male	13	6	30	left	1	2	3	4.12821
030	22	male	13	6	30	left	2	1	1	3.79403
030	22	male	13	6	30	left	2	1	2	3.35440
030	22	male	13	6	30	left	2	1	3	2.92860
030	22	male	13	6	30	left	2	2	1	2.92860
030	22	male	13	6	30	left	2	2	2	6.98012
030	22	male	13	6	30	left	2	2	3	6.39092
030	22	male	13	6	30	left	3	1	1	5.78945
030	22	male	13	6	30	left	3	1	2	5.92895
030	22	male	13	6	30	left	3	1	3	5.08637
030	22	male	13	6	30	left	3	2	1	3.07386
030	22	male	13	6	30	left	3	2	2	2.90168
030	22	male	13	6	30	left	3	2	3	2.65511

Appendix K

Data for Dichotic Consonant-Vowel Listening Task

CMHO = Cook-Medley Hostility Score
CPD = Coren-Porec Laterality Score
STAI = Stait-Trait Anxiety Inventory
DCV = Dichotic Consonant-Vowel Score

SUBJECT	AGE	SEX	CMHO	CPD	STAI	EAR	BLK	TRIAL	DCV
001	18	1	15	13	30	1	1	1	6
001	18	1	15	13	30	1	1	2	7
001	18	1	15	13	30	1	3	1	4
001	18	1	15	13	30	1	3	2	6
001	18	1	15	13	30	2	1	1	4
001	18	1	15	13	30	2	1	2	7
001	18	1	15	13	30	2	3	1	7
001	18	1	15	13	30	2	3	2	7
002	20	1	15	11	32	1	1	1	5
002	20	1	15	11	32	1	1	2	10
002	20	1	15	11	32	1	3	1	5
002	20	1	15	11	32	1	3	2	10
002	20	1	15	11	32	2	1	1	6
002	20	1	15	11	32	2	1	2	4
002	20	1	15	11	32	2	3	1	6
002	20	1	15	11	32	2	3	2	3
003	20	1	11	13	26	1	1	1	9
003	20	1	11	13	26	1	1	2	11
003	20	1	11	13	26	1	3	1	7
003	20	1	11	13	26	1	3	2	13
003	20	1	11	13	26	2	1	1	3
003	20	1	11	13	26	2	1	2	1
003	20	1	11	13	26	2	3	1	4
003	20	1	11	13	26	2	3	2	1
004	21	1	20	13	32	1	1	1	7
004	21	1	20	13	32	1	1	2	8
004	21	1	20	13	32	1	3	1	9
004	21	1	20	13	32	1	3	2	9
004	21	1	20	13	32	2	1	1	6
004	21	1	20	13	32	2	1	2	6
004	21	1	20	13	32	2	3	1	2
004	21	1	20	13	32	2	3	2	6
005	20	1	12	9	21	1	1	1	6
005	20	1	12	9	21	1	1	2	6
005	20	1	12	9	21	1	3	1	5

005	20	1	12	9	21	1	3	2	6
005	20	1	12	9	21	2	1	1	3
005	20	1	12	9	21	2	1	2	5
005	20	1	12	9	21	2	3	1	3
005	20	1	12	9	21	2	3	2	6
006	20	1	7	6	23	1	1	1	8
006	20	1	7	6	23	1	1	2	11
006	20	1	7	6	23	1	3	1	8
006	20	1	7	6	23	1	3	2	11
006	20	1	7	6	23	2	1	1	3
006	20	1	7	6	23	2	1	2	2
006	20	1	7	6	23	2	3	1	3
006	20	1	7	6	23	2	3	2	2
007	21	1	19	9	28	1	1	1	8
007	21	1	19	9	28	1	1	2	11
007	21	1	19	9	28	1	3	1	9
007	21	1	19	9	28	1	3	2	12
007	21	1	19	9	28	2	1	1	4
007	21	1	19	9	28	2	1	2	3
007	21	1	19	9	28	2	3	1	3
007	21	1	19	9	28	2	3	2	2
008	19	1	12	6	34	1	1	1	10
008	19	1	12	6	34	1	1	2	11
008	19	1	12	6	34	1	3	1	9
008	19	1	12	6	34	1	3	2	10
008	19	1	12	6	34	2	1	1	2
008	19	1	12	6	34	2	1	2	3
008	19	1	12	6	34	2	3	1	4
008	19	1	12	6	34	2	3	2	4
009	19	1	14	6	38	1	1	1	4
009	19	1	14	6	38	1	1	2	3
009	19	1	14	6	38	1	3	1	5
009	19	1	14	6	38	1	3	2	3
009	19	1	14	6	38	2	1	1	3
009	19	1	14	6	38	2	1	2	0
009	19	1	14	6	38	2	3	1	7
009	19	1	14	6	38	2	3	2	10
010	19	1	6	9		1	1	1	9
010	19	1	6	9		1	1	2	11
010	19	1	6	9		1	3	1	6
010	19	1	6	9		1	3	2	7
010	19	1	6	9		2	1	1	6
010	19	1	6	9		2	1	2	3
010	19	1	6	9		2	3	1	8
010	19	1	6	9		2	3	2	6
011	19	1	14	7		1	1	1	4

011	19	1	14	7		1	1	2	5
011	19	1	14	7		1	3	1	5
011	19	1	14	7		1	3	2	2
011	19	1	14	7		2	1	1	7
011	19	1	14	7		2	1	2	7
011	19	1	14	7		2	3	1	8
011	19	1	14	7		2	3	2	11
012	20	1	11	11		1	1	1	6
012	20	1	11	11		1	1	2	7
012	20	1	11	11		1	3	1	9
012	20	1	11	11		1	3	2	9
012	20	1	11	11		2	1	1	4
012	20	1	11	11		2	1	2	6
012	20	1	11	11		2	3	1	3
012	20	1	11	11		2	3	2	4
013	20	1	10	13		1	1	1	6
013	20	1	10	13		1	1	2	9
013	20	1	10	13		1	3	1	6
013	20	1	10	13		1	3	2	10
013	20	1	10	13		2	1	1	8
013	20	1	10	13		2	1	2	6
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