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Subjective Well-Being: Are You Busy Enough to be Happy?

This study attempted to determine if a relation exists between happiness and certain lifestyle habits (i.e., life structure) and personality traits (i.e., Type A achievement striving personality). We predicted there would be a positive correlation between (a) happiness and life structure, and (b) happiness and the achievement striving subset of the Type A personality scale. Eighty-six undergraduate student volunteers completed a battery of surveys. The achievement striving subset of the Type A personality scale and 3 measures of happiness were positively correlated. Life structure and positive affect also were positively correlated. These results suggest that achievement striving persons who perceive their life as structured report greater levels of happiness, or subjective well-being.

According to Fordyce (1988), Aristotle once said “happiness is so important, it transcends all other worldly considerations” (p. 355). For eons, people have looked on happiness as an ultimate goal of life; however, this goal seems to elude many people (Buss, 2000). The question “Who is happy?” has intrigued psychologists for quite some time. Studies reveal that most people are happy, but “some people are happier than others” (Myers & Diener, 1995, p. 17). These types of studies prompt questions concerning the aspects of life that may affect a person’s happiness. Are persons who have more leisure time more or less happy than persons who have less leisure time? Does happiness come with having certain personality traits? These two questions only skim the surface of the unknown aspects of happiness.

The scientific study of subjective well-being (SWB), life satisfaction, and happiness is relatively new; however, theories about these constructs are decades old (Myers & Diener, 1995). According to Diener (as cited in DeNeve & Cooper, 1998), research on SWB focuses primarily on why and how people experience their lives in positive ways. To better understand what constitutes subjective well-being, research has identified two broad aspects: an affective component, which is usually subdivided into positive affect (PA) and negative affect (NA), and a cognitive component, which is referred to as life satisfaction (Pavot & Diener, 1993).

Concisely, PA refers to the degree to which a person feels “enthusiastic, active, and alert,” whereas NA refers to a “general dimension of subjective distress and unpleasurable engagement that subsumes a variety of aversive mood states” (Watson, Clark, & Tellegen, 1988, p. 1063). As for the second aspect of SWB, Diener (1984) refers to life satisfaction as an integrated, global judgment of a person’s entire life. That is, persons evaluate the quality of their life based on their own set of standards and then compare these standards with perceived life circumstances, therefore making life satisfaction a “conscious cognitive judgment” (Pavot & Diener, 1993, p. 164). In addition, Diener (1984) reported happiness as being the influence of positive affect over negative

Author note. This research was presented at the 1999 Emporia State University Student Psychology Symposium, Emporia, Kansas.

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affect with attention on the emotional evaluation of one’s situation in life (i.e., an overall affective appraisal).

Although having an idea about what happiness, subjective well-being, and life satisfaction all mean, the task of finding out why and how people experience these constructs at high levels still exists. According to Csikszentmihalyi (as cited in Myers, 2000), understanding what constitutes happiness comes from knowing one’s quality of work and leisure experiences. With this, we speculate that there might be a relation between the amount of life structure and happiness and between the amount of life structure and SWB. In this research, life structure is referred to as having a planned schedule (e.g., for work, school, exercise, etc.) to which one is committed, that is, being involved and remaining active in activities throughout the day that are not considered “leisure” activities or “free time.”

Csikszentmihalyi (1990) reported that elevated positive moods were more frequent when participants were involved in challenging tasks rather than enjoying leisure time. Based on empirical research on the characteristics of happy people, Fordyce (as cited in Williams, Long, Gaynor, & Agesilas, 1987) developed the “14 fundamentals of happiness” which he has developed into a treatment program. It is noteworthy that these fundamentals include the following activity-related items: “(a) keep busy and be more active; (b) get better organized and plan things out; (c) be productive at meaningful work; and (d) develop positive, optimistic thinking” (p. 376). Bradburn (as cited in Emmons & Diener, 1985) extensively researched the area of SWB (more specifically, PA and NA) and found that PA was correlated with higher levels of activity.

Reviewing the literature that suggests a person’s activity level has an influence on his or her SWB, namely PA, brought us to speculate that there might be a relation between the achievement striving subset of Type A personality and happiness and between achievement striving and SWB. In the past, Type A behavior has been defined as behavioral and personality characteristics that include, but are not limited to: (a) highly competitive, (b) unable to relax, (c) ambitious in work, (d) perfectionist and demanding, and (e) hostile, aggressive, and angry (Davis & Palladino, 2000; Feldman, 1998; Lahey, 1995). Research indicates that Type A behavior consists of two independent factors, Achievement Striving (AS) and Impatience and Irritability (II; Spence, Helmreich, & Pred, 1987; Spence, Pred, & Helmreich, 1989). However, research on characteristics of the AS subset of the Type A personality is scant.

Nevertheless, Burke and Weir (1980) found those persons with greater Type A behaviors reported experiencing less depression and also reported greater life satisfaction. The data that are currently available on the AS subset of Type A behavior suggest that the “work-oriented achievement strivings measured by the AS scale remain significantly related to students’ high academic performance” (Spence et al., 1989, p. 176). Inferring from these data, persons who exhibit AS behaviors possess the tendency to be goal directed, as seen in high academic achievements. Emmons (as cited in Myers & Diener, 1995) found that “having goals, making progress toward goals, and freedom from conflict among one’s goals were all predictors of SWB” (p. 17). It is also noteworthy that DeNeve and Cooper (1998) conducted a meta-analysis of 137 personality traits and SWB, focusing predominantly on the Big Five personality factors (i.e., Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness to Experience). These researchers reported Conscientiousness, which includes goal-directed behavior and control-related traits, “obtained the strongest positive association with life satisfaction” (p. 220).

We conducted the current study on the assumption that there is a moderate relation between happiness and certain lifestyle habits and personality traits. More specifically, we predicted there would be positive correlations between (a) happiness and life structure, and (b) happiness and the Spence et al. (1987) achievement striving subset of the Type A personality test. We obtained our data from undergraduate college students using a battery of surveys to measure happiness and SWB and the achievement striving subset of Type A personality.

**Method**

**Participants**

Participants consisted of 86 undergraduate students (18 men and 68 women) enrolled in introductory psychology classes at a medium-size midwestern university. Participants ranged in age from 18 to 37 years ($M = 20.8$, $SD = 4.16$). Participation partially satisfied a research requirement.

**Materials**

Participants completed a battery of personality surveys. The battery consisted of the Fordyce Happiness Measures (Fordyce, 1988), the Satisfaction With Life Scale (Pavot & Diener 1993), the Positive and Negative Affect Schedules (Watson et al., 1988), an adapted version of the Achievement Strivings scale of the Jenkins Activity Scale (Spence et al., 1987), and a lifestyle log.
Fordyce Happiness Measures. The Fordyce Happiness Measures (HM) provides a global measure of happiness; it consists of “two, self-reporting items measuring emotional well-being: an 11-point, happiness/unhappiness scale, and a question asking for the time spent in happy, unhappy, and neutral moods” (Fordyce, 1988, p. 357). The 11-point scale consists of 11 statements that range from extremely happy (10) to extremely unhappy (0). The participant must check the one statement that best describes his or her “average” happiness, which will provide a “measure of intensity or quality of happiness” (Fordyce, 1988, p. 359). The second self-reporting item measures, in percentage estimates, the amount of time the participant spends in happy, unhappy, and neutral moods, which will provide a “measure of its frequency or quantity” (Fordyce, 1988, p. 359).

The HM has demonstrated strong validity (i.e., convergent, construct, and discriminative) and strong test–retest reliability, 0.98 (n = 111) for a two-day period, p < 0.001, and 0.67 (n = 27) for a four-month period, p < 0.001 (Fordyce, 1988). The HM has been compared to a wide assortment of other instruments used to measure happiness, well-being, and emotion. According to Fordyce (1988), such instruments include, but are not limited to, the “Affectometer-2 (Kammann & Flent), the Subjective Well-Being Inventory (Nagpal & Sell), the Wessman and Ricks Scale, and a number of simple happiness scales” (p. 363). The latter comparisons found the HM “to be among the strongest in convergent validity of all measures, and the strongest of the single-item measures they compared” (p. 364).

Construct validity for the HM is quite high. According to Fordyce (1988), “the HM has accumulated more validation data than any other well-being measure” (p. 365). This validation data has been gathered through the comparison of the HM to an immense number of well-known tests and inventories. A few of these inventories and tests (as cited in Fordyce, 1988), together with their respective correlations (p < .05 in all cases), include the “Affectometer-2 Happiness score, 0.71, (Kammann & Flent); Beck Depression Inventory, –0.54, (Beck); and the Minnesota Multiphasic Personality Inventory Depression subscale, –0.38, (Hathaway & McKinley)” (p. 365).

Lastly, the HM should have high discriminative validity, that is, the capability to distinguish between happy and unhappy persons. Fordyce (1988) reported intersocioeconomic studies in which the results corroborate predictions from past research that state persons of higher socioeconomic status score higher on the HM. Also noteworthy, data from other studies reveal “significant differences between HM scores obtained from various troubled populations (e.g., hospitalized depressives, individuals or couples seeking counseling, etc.) and those of more normal samples” (Fordyce, 1988, p. 371).

Satisfaction With Life Scale. The Satisfaction With Life Scale (SWLS) measures the cognitive component of subjective well-being by using a short five-item instrument (Pavot & Diener, 1993). Rather than measuring satisfaction with particular domains, the items on the SWLS are global (e.g., In most ways my life is close to my ideal). These types of items allow the participants to measure domains in their life using their own standards for happiness or success, therefore “arriving at a global judgment of life satisfaction” (Pavot & Diener, 1993, p. 164). The participants indicate their degree of agreement with each of the five statements using a scale ranging from 1 (strongly agree) to 7 (strongly disagree).

In a number of studies, the SWLS has shown good convergent validity with other types of measures of subjective well-being, including self- and non–self-report measures, such as the Life Satisfaction Index A (LSI-A), r (36) = .81, p < .01, (Diener, Emmons, Larsen, & Griffin, 1985; Pavot, Diener, Colvin, & Sandvik, 1991). In addition, evidence has indicated good discriminative validity with emotional well-being measures (Pavot & Diener, 1993; Pavot et al., 1991). Several studies show significant internal and temporal reliability (Pavot & Diener, 1993; Pavot et al., 1991). More specifically, Pavot et al. (1991) reported a coefficient alpha of .85 and a 2-week test–retest stability coefficient of .83 for the scale.

Positive and Negative Affect Schedules. The Positive and Negative Affect Schedules (PANAS; Watson et al., 1988) measure the affective components of subjective well-being. The scales consist of a list of 10 feelings and emotions (e.g., interested, alert, hostile). The participant rates each feeling/emotion using a 5-point Likert scale that ranges from 1 (very slightly or not at all) to 5 (extremely).

Watson et al. (1988) have determined that these 10-item scales “are internally consistent and have excellent convergent [.89 to .95] and discriminant [–.02 to –.18] correlations with lengthier measures of the underlying mood factors” (p. 1069). Watson et al. (1988) indicate that such lengthier measures include the “Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) and the State-Trait Anxiety Inventory State Anxiety Scale (A-State; Spielberger, Gorsuch, & Lushene, 1970)” (p. 1068). These researchers also stated that the general ratings may be used as trait measures of affect, as

\[1\text{Correlation data from Watson et al, 1988, p. 1066.}\]
supported by high stability coefficients. In particular, the PANAS-PA yielded a stability coefficient of .68, and the PANAS-NA yielded a stability coefficient of .71 (p < .002 in both cases).

**Achievement Striving scale.** The adapted Achievement Striving (AS) scale (Spence et al., 1987) consists of 14 items that measured the achievement striving component of Type A behavior (e.g., *I get highly involved in my work*). Research indicates that the Type A pattern consists of “two relatively independent factors labeled Achievement Strivings (AS) and Impatience-Irritability (II)” (Spence et al., 1989, p. 176). The AS scale attempts to measure the activity level of the participants in their work and academics (i.e., their achievement striving behaviors). The participants answered the 14 items on a Likert-type scale that ranged from 1 (*very much like me*) to 5 (*not at all like me*). We totaled the scores for the 14 items to produce a single, aggregate achievement striving score for each participant.

**Lifestyle structure log.** A lifestyle structure log, designed for this study, was included in the battery. This log consisted of a 24-hr, 7-day table on which the participants indicated the times they are committed (work, class, meetings, etc.), not time that they perceive as “free time.” These data were scored by adding the total number of hours the participant marked as being committed.

**Lifestyle structure scale.** The battery also included a 5-point Likert-type scale question, designed for this study, to measure perceived lifestyle structure. Using a 5-point scale (5 = *very structured*, 1 = *no structure*), the participants indicated which option most accurately described their entire week (i.e., weekdays and weekend). Participants completed this log to indicate how structured they perceived their life to be. We used the data to determine if a relation exists between life structure and happiness.

**Procedure**

The experimenter read directions explaining the consent form and the battery of surveys. Once the participants read, signed, and returned the consent form, they completed the personality measures. All testing took place in a classroom setting. Although no time limit was imposed, all participants completed the surveys within 20 min. Participants completed the lifestyle structure log after they completed the battery of personality surveys. All participants completed the log within 5 min.

**Results**

We calculated Pearson product-moment correlations to determine the relations between the various scales (α = .05). These correlations are shown in Table 1.

As can be seen in Table 1, the analyses yielded several significant correlations. As expected, participants who scored high on the Fordyce HM also reported high scores on the SWLS and the PANAS-PA.

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**TABLE 1**

**Correlations Between Scales of Measurement and Life Structure Instruments (N = 86)**

<table>
<thead>
<tr>
<th></th>
<th>Fordyce Happiness Measure</th>
<th>Satisfaction With Life Scale</th>
<th>PANAS PA</th>
<th>PANAS NA</th>
<th>Type A Achievement Striving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fordyce Happiness Measures</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfaction With Life Scale</td>
<td>0.584***</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PANAS PA</td>
<td>0.637***</td>
<td>0.497***</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PANAS NA</td>
<td>-0.363***</td>
<td>-0.469***</td>
<td>-0.409***</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Type A Achievement Striving</td>
<td>0.437***</td>
<td>0.319**</td>
<td>0.585***</td>
<td>-0.220*</td>
<td>1.000</td>
</tr>
<tr>
<td>Lifestyle structure log</td>
<td>0.206</td>
<td>0.209</td>
<td>0.294**</td>
<td>-0.087</td>
<td>0.399***</td>
</tr>
<tr>
<td>Perceived structure of life</td>
<td>0.209</td>
<td>0.113</td>
<td>0.338**</td>
<td>-0.143</td>
<td>0.549***</td>
</tr>
</tbody>
</table>

* *p < .05, **p < .01, ***p < .001.
Also, those participants who scored high on the SWLS reported higher scores on both dimensions of the PANAS. Participants with high scores on the AS scale tended to report high scores on both the Fordyce HM and the PANAS-PA, and moderately high scores on the SWLS. Participants who perceived their life as structured also scored high on the AS scale. Lastly, those participants who scored high on the lifestyle structure log also reported high scores on the PANAS-PA.

It is noteworthy that the analyses yielded a significant correlation between the lifestyle structure log and the question measuring perceived structure of life, \( r(84) = .275, p < .05 \). These data also produced an unexpected negative correlation relating age and the PANAS-NA, \( r(84) = -.263, p < .001 \).

**Discussion**

As expected, the three happiness measures (i.e., Fordyce HM, SWLS, and PANAS-PA and NA) were significantly related. The correlations between the SWLS and PANAS-PA and NA corroborate Smed (as cited in Pavot & Diener, 1993), showing a significant positive correlation between the SWLS and the PANAS-PA and a significant negative correlation between the SWLS and the PANAS-NA. The negative correlation between PA and NA has also been supported by prior research (Watson et al., 1988). These findings could be used to further validate the measures of happiness and subjective well-being used in this study.

Because the participants who perceived their lives as structured, and involved themselves in committed activities (e.g., work, school, meetings, exercise, etc.) rather than leisure time, reported a higher level of PA, the results of this study are consistent with previous research (Emmons & Diener, 1985). Specifically, the results of this study found that scores on the PANAS-PA were positively correlated with scores on the lifestyle structure log and the perceived structure of life question. That is, participants who perceived their life as being structured, and their time structured with events to which they were committed, showed higher states of PA, which are states of “high energy, full concentration, and pleasurable engagement” (Watson et al., 1988, p. 1063).

This study also found a positive relation between AS scores and scores on the lifestyle structure log and the perceived structure of life question. Thus, persons who stay active, remain productive, and engage in minimal leisure activities also have high achievement striving behaviors. Inferring from these data, one might conclude that persons with achievement striving behaviors possess characteristics such as staying active, being productive, setting goals, and minimizing leisure time. This pattern can be seen in several of the characteristics listed in many definitions of a person who exhibits Type A behaviors, such as works hurriedly, ambitious in work, achievement driven, and tends to be a workaholic (Lahey, 1995).

We found that AS scores correlated positively with scores on all three happiness measures, (Fordyce HM, SWLS, and PANAS-PA). That is, participants who possess achievement striving behaviors report higher states of happiness and SWB, as measured by the three happiness scales. These findings corroborate Burke and Weir (1980), who report that Type A individuals report less depression and greater satisfaction with life. The paucity of data in this area suggests that this finding deserves increased research attention and replication.

As stated earlier, the negative correlation between age and the PANAS-NA was unexpected. However, Watson et al. (1988) indicated that negative affect is “a general dimension of subjective distress and unpleasurable engagement that subsumes a variety of aversive mood states” (p. 1063). These researchers also described a low state of negative affect “being a state of calmness and serenity” (p. 1063). These descriptions help make sense of our significant correlation. Inferring from these data, as one grows older, feelings of subjective distress and unpleasurable engagements decrease. As these reactions decrease, there is an increase in the feeling of calmness and serenity. This finding could be used as a stepping stone to further investigate changes in affective states as persons become older.

Also noteworthy of discussion is the positive relation found between the lifestyle structure log and the question measuring perceived structure of life. Speculating from these data, the hours in a week that the participants indicated they were committed to coincide with the overall feeling of life structure as indicated by the 5-point Likert-type scale question. This relation prompts the inference that the lifestyle structure log measured what we intended it to measure. Nonetheless, further research needs to be conducted to develop a reliable and valid measure of lifestyle structure.

Overall, the results of this study indicate that achievement striving persons who perceive their life as structured relate greater levels of happiness, or life satisfaction. These results support our hypothesis that if persons possess achievement striving behaviors, then they tend to report a greater satisfaction with life. However, our prediction concerning the positive relation between happiness and/or SWB and life structure was not fully supported by the data. We did find that if persons lead a structured lifestyle then
they tend to report higher levels of “high energy, full concentration, and pleasurable engagement” (Watson et al., 1988, p. 1063), more commonly referred to as positive affect.

As reflected in the literature from the past decade, researchers have attempted to determine why and how persons experience their lives in a positive manner. This study contributes to that ongoing task. However, certain aspects of this study need further investigation. As mentioned earlier, data to support the relation between the achievement striving subset of Type A behavior patterns and happiness were not readily available in the literature. This deficit points to the need for studies to investigate (a) characteristics of persons who report high levels of the achievement striving subset of the Type A personality and (b) the relation between those characteristics and happiness and/or SWB. Likewise, further research into measuring lifestyle structure, and what constitutes this structure, is needed.

Other limitations in the present study that are worthy of further investigation are the high percentage of women (76%) and the large number of participants between the ages of 18 and 23 (88%) in the present sample. These percentages limit generalization to other populations, specifically adults over the age of 23 and men. Also, the predominance of women in the sample might have led to higher, or lower, scores on the scales of happiness and other measurements used in this study.

Research on happiness and SWB complements the “times” our society currently experiences. Specifically, it is becoming more obvious that our culture has turned to exterior possessions in an attempt to increase the feeling of happiness. However, William Cowper (as cited in Myers, 2000) seemed to be correct when he stated “Happiness depends, as Nature shows, less on exterior things than most suppose” (p. 65). In order to achieve the scientific pursuit of happiness, researchers must continue to investigate the many personality and lifestyle facets that can influence the construct of happiness and SWB.

References


Disability and Society: Appearance Stigma Results in Discrimination Toward Deaf Persons

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Numerous authors (e.g., Boyle, 1997; Fishbein, 1996; Katz, 1981) agree that nondisabled persons behave differently toward persons with disabilities. Some researchers have found that people without disabilities are prejudiced against their disabled counterparts (Blaska, 1993; Fishbein, 1996; Zola, 1993), whereas other researchers attribute negative attitudes toward persons with disabilities to feelings of ambivalence (Katz, 1981; Söder, 1990). For example, a person who is prejudiced against persons with disabilities will treat disabled individuals differently or unequally because they are different. However, a person who has ambivalent feelings intends to behave kindly toward persons with disabilities, but is apprehensive about interacting closely with them. Researchers clearly agree that disabled people are stigmatized and that the stigma is related to discriminatory attitudes of individuals. However, so few studies exist in this field that it is difficult for researchers to make effective comparisons or draw concrete conclusions from the findings.

Before discussing the connection between stigma and discrimination, it is important to first clearly define the relevant concepts. The ancient Greeks used the term stigma to refer to a bodily mark or characteristic that was designed to symbolize disgrace, for example, branding in the case of a slave or criminal, or placing a tribal mark upon an outcast (Goffman, 1963, as cited in Katz, 1981). Since that time, the meaning of the term has evolved, and the word stigma is now used to describe the disgrace due to an attribute, rather than the mark itself. Crocker, Voelkl, Testa, and Major (1991) state that disadvantaged groups in America, including the disabled population, are stigmatized based on their physical appearance. Such stigmas denote attributes that society considers to be socially unacceptable (Katz, 1981), which serves to exaggerate differences between disabled and nondisabled groups (Milner, 1983, as cited

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in Fishbein, 1996) and leads to dehumanization or depersonalization (Fishbein, 1996). Generalizations such as deaf people are melancholy (Jernigan, 1975, as cited in Bogdan & Biklen, 1977; Scott, 1969, as cited in Bogdan & Biklen, 1977), perpetuate the idea that specific undesirable characteristics are shared by all deaf persons. However, to stereotype, or conceptuallyize that people with similar disabilities are all alike, is incorrect, because a disability does not define the person.

The stigmatizing characteristic or mark of deaf persons remains unknown. Influenced by stereotypes, many nondisabled people assume that all persons with disabilities are incompetent (Katz, 1981). Fishbein (1996) attributes stigma to the “objective characteristics of the individual, which are often used to signify the person herself, e.g., ‘She’s deaf’; ‘She’s Jewish’; ‘She’s an African American’” (p. 15). Thus, it is conceivable that the stigma of deafness is characterized by a hearing aid or other assistive listening device, use of sign language or a sign language interpreter, a speech impediment due to the inability to hear, or simply the obvious difficulties of communicating with the hearing world.

Stigmatizing characteristics cause some non-disabled persons to classify disabled individuals into groups, prejudging and assigning disabled persons to categories based on their appearance. Generalization based on prejudice and stereotypes can lead to discrimination against persons with disabilities. Discrimination is the unfair and unequal treatment of individuals or groups based on prejudice and stereotypes, which may lead to harmful actions toward persons because of their perceived membership in a particular group (Bogdan & Biklen, 1977; Fishbein, 1996). Mistreatment of persons with disabilities occurs because society allows the defining characteristics of the disability to define the person (Fine & Asch, 1988). Boyle (1997) stated that society has considered the abnormalities of persons with disabilities, and has deemed them broken and inferior. Other authors have reported degrees of aversion to persons with disabilities based on the type of disability, for example, a permanent disability or chronic illness (Katz, 1981).

In order to make sense of the research findings, a background understanding of the nondisabled population’s negative behavior toward disabled persons is necessary. Kleck, Ono, and Hastorf (1966, as cited in Katz, 1981) wrote that society desires to treat disabled persons kindly, but finds intimate encounters with them aversive. Nondisabled persons have preconceived notions of how disabled persons should behave, and people with disabilities often act in accordance with those beliefs. Thus, disabled persons create a self-fulfilling prophecy, which lessens the normal persons’ apprehensiveness in face-to-face interactions and fuels further discrimination (Crocker et al., 1991; Katz, 1981). A central theme throughout the history of the deaf community is the dominant cultural view of deaf persons as incomplete and deficient, rather than merely different (Fishbein, 1996). This view perpetuates the societal norm of maintaining a distance from the deaf population, because nondisabled people feel that comfortable interpersonal interactions between the two groups require too much effort (Fishbein, 1996).

Boyle (1997) advanced this perspective when he wrote that societal barriers for the disabled result from a majority culture view of them as damaged, second-class citizens. Similarly, Hahn (1988) maintained that the problems of the disabled population stem from societal attitudes, rather than from limitations due to a disability. He asserted that the model for studying disabilities has changed from the “functional-limitations” perspective (p. 39), with a focus on what a disabled person cannot do, to the “minority-group” perspective (p. 39), with a framework for discrimination based on personal appearance. Goffman (1963, as cited in Rodin, Price, Sanchez, & McElligot, 1989) identified three types of flaws that mar social identity and perpetuate discrimination: physical disfigurement, flaws of character, and flaws of race or ethnicity. Rodin et al. (1989) operationally defined discrimination against persons who exhibit differences in speech or appearance as derogation, exclusion, and unfair treatment.

Borrowing the terminology of behaviorism, if stigmas are considered to be the stimulus, discrimination would be the response. In other words, given that stigma is the characteristic which brands a person as different or disabled, it follows that a stigmatizing characteristic can influence individuals without disabilities to note differences in disabled individuals and treat them differently. McArthur (1982, as cited in Makas, 1993) stated that because a person’s physical appearance has salience, society tends to categorize people on the basis of characteristics such as skin color or a physical disability, and also tends to pay more attention to people who have a novel physical appearance. Hahn (1988) wrote that modern society highly values the physical and behavioral capabilities that enable a person to master the environment. Hahn also asserts that persons without disabilities experience “aesthetic . . . anxiety” (p. 39), a fear that arises when interacting with people whose physical traits are regarded as unappealing. Similarly, Makas (1993) maintains that another reason nondisabled
persons experience physiological arousal when interacting with a disabled person, is due to the anxiety of violating a social norm. Some nondisabled persons become uneasy around persons with disabilities because they are unsure how to act in their presence and are concerned that they will offend them. Therefore, persons without disabilities intend to be friendly to persons with disabilities, but dislike contact with them (Kleck et al., 1966, as cited in Katz, 1981).

In summary, past research indicates that disabled persons, including deaf individuals, are stigmatized. The stigmas, based on the differences between the disabled and nondisabled groups, are related to discrimination. Although additional research in this area is critical, it should be conducted with a clear understanding of concerns and limitations of past research. Katz (1981) noted that the majority of information about attitudes toward the disabled has been gathered from literature, folklore, and personal accounts and that systematic research on the topic is scarce. One concern is that existing studies are not comparable because of their differing methodologies. Katz (1981) stated that studies concerning discrimination against deaf persons lack experiments with similar designs and procedures that are necessary to determine the possible causes of negative behavior toward persons with physical stigmas. Similarly, Makas (1993) remarked that in order to effectively compare studies, executed research must be based on similar definitions, rather than vague generalities. Researchers must define concepts clearly and provide detailed operational definitions.

An application of this methodological concern in performing studies with disabled confederates is to determine what identifies them as disabled. For example, Fine and Asch (1988) assert that a confederate in a wheelchair, who is faking a disability, is not a credible source of evidence as to how disabled people successfully negotiate social interactions. Data collected under false conditions are meaningless. Similarly, when carrying out a study using deaf confederates, the researcher must decide what will identify the person as deaf. The best choice may be to have deaf confederates who use sign language as their primary mode of communication. This identifying characteristic will be realistic and perhaps more noticeable than an assistive listening device. It will be obvious that communication is an issue with these confederates.

Another related issue is where to study discrimination; some possible locations include a retail store, a workplace, or an educational setting, because all three are situations in which deaf persons would normally be found so that the participants’ (i.e., clerks) suspicions would not be aroused. Previous studies of discrimination have been conducted in retail settings using a measure called “latency to serve” (Carlson et al., 1998, p. 129; Kraus, Davis, & Burns, 1997, p. 16). Kraus and colleagues (1997) found that race, sex, and type of attire are significant factors in determining the length of wait for service, presumably because clerks use easily observable characteristics as a basis for discrimination against their customers. Carlson and colleagues (1998) found that customers who are nicely dressed and are carrying shopping bags receive quicker service from store clerks, and consequently determined that both variables are viable factors related to discrimination against customers in a retail setting.

In their discussion of the Kraus et al. (1997) study, Horvat and Davis (1998) remarked that an experiment in a retail setting was ideal because it was a simple, objective study, performed in a realistic setting. Using single-entrance retail stores would narrow down the number of clerks (participants) and would ensure that the confederates would be seen by the clerks as they enter the store. The participants would retain anonymity, which would allow them to exhibit their true attitudes and behaviors, because they would have no reason to hide their real feelings. These conditions would not exist in a workplace or educational setting. A retail setting would also be ideal, because it is clear that retailers actively categorize customers in order to maximize product promotion and sales (Sharma & Levy, 1995). Also, there is evidence that customers’ interaction styles and appearance influence store employees’ willingness to comply with a return request (Krapfel, 1988).

Another issue is how to measure discrimination. One possibility is to use self-report measures, specifically questionnaires such as the Attitudes Towards Disabled Persons (ATDP) scale (Söder, 1990). However, it is clear that bias, untruths, or embellishments often influence responses on questionnaires, and the intensity of the response is difficult to capture (Fishbein, 1996). The other general category of measures includes behavioral observations. The benefit to this objective method of data-gathering is that the participants often do not know they are being observed (Carlson et al., 1998; Kraus et al., 1997). As mentioned previously, these researchers found that latency to serve is a good measure of discrimination against persons because of race, sex, attire, and potential to purchase.

In summary, these are the issues which must be considered prior to designing or replicating studies of discrimination. First, similar methodologies for studying discrimination must be used in order for
Researchers to compare the findings. In order to determine which studies are similar and consequently compare them, clear definitions of concepts are essential. Second, researchers must determine what characteristic will identify the confederate as disabled and ensure that the disability is not a false condition. Finally, the researchers must choose an appropriate location and determine how they will measure discrimination against persons with disabilities.

The present study was a field experiment performed in a retail setting, investigating discrimination against persons who are deaf and who use sign language as their primary means of communication. As in the studies by Kraus et al. (1997) and Carlson et al. (1998), discrimination was measured by a store clerk’s latency to serve or offer assistance to the confederates. Given the evidence from these studies that latency to serve in a retail store is a good measure of discrimination against persons because of race, sex, attire, and perceived potential to purchase, it would follow that latency to serve would be a good measure of discrimination against persons who have disabilities.

Method

Participants

The participants consisted of 77 sales clerks in 27 single-entrance, service-oriented retail stores in one large shopping mall in Michigan. Preliminary research of shopping malls in the area ruled out many of the malls because their philosophy and practice was to offer little or no customer service as a rule. We chose this shopping mall in Novi, MI (population 33,000), a suburb of Detroit, because it housed a variety of single-entrance retail stores and because customers appeared to be of various socioeconomic backgrounds, cultures, and ages. The stores were randomly selected from the shopping mall’s approximately 175 stores, based on similar price range of products, the number of entrances, and whether or not they offered service to customers. The sales clerks did not know they were being observed.

The confederates consisted of 20 people, 8 men and 12 women, ages 20 to 34 (mean age 24.6), 10 of whom were deaf (sign language users) and 10 hearing. Because a previous study had shown that customers’ style of dress may influence sales clerks’ responsiveness (Kraus et al., 1997), the confederates all wore dress-casual slacks and shirts. Confederates resided in the Detroit metropolitan area and were either college students or bachelor-level college graduates. They were recruited from responses to an informational flyer posted at Madonna University in Livonia, MI, and from flyers sent to persons associated with the researcher. Each confederate completed a consent form describing the study and giving his or her agreement to participate.

Procedure

All data for deaf and hearing confederates were collected during the same time frame, from 1:00 to 4:00 p.m. on Saturdays. The confederates were randomly assigned to pairs and then sent in pairs (of two deaf or two hearing people) into single-entrance, service-oriented retail stores. The deaf confederates were easily identifiable as deaf because they entered the stores using sign language to converse with their partners. Confederates were randomly assigned to stores. In each pair, one confederate carried a silent, digital stopwatch in his or her coat pocket. The stopwatch was activated as the pair crossed the threshold of the store and made eye contact with a sales clerk. Timing was stopped when a clerk approached and offered assistance. An offer of assistance was defined as the use of comments such as “May I help you?” or “Is there something specific that you are looking for?” or “If I can assist you, or help you find anything, please let me know.” After the timing was stopped, the confederate concluded his or her browsing and left the store. If the sales clerk responded to their entrance with, “Hello” or “I’ll be right with you,” timing was not stopped (Carlson et al., 1998; Kraus et al., 1997). If the confederates were not offered assistance within 6 min (Carlson et al., 1998), they left the store.

After leaving the store, the confederates showed the stopwatch to the researcher, who was positioned in the mall corridor outside of the stores. The researcher recorded the latency-to-serve times. A time of 6 min was recorded if a sales clerk did not approach the confederates. Following their participation, confederates were given the opportunity to ask questions and obtain clarification about the details of the study. Confederates were also told where they could obtain the results of the study.

Results

Sales clerks’ latency to serve deaf consumers compared to hearing consumers was tested using a t test for independent samples. Sales clerks took an average of 1.3 min (SD = 2.4) to serve hearing consumers, whereas they took an average of 3.9 min (SD = 2.4) to serve deaf consumers. The average latency to serve deaf consumers was significantly higher than the average latency to serve nondisabled, hearing consumers, t(87) = 5.03, p < .001. Inspection of the data indicated that many more deaf consumers than hearing consumers waited the maximum amount of time without receiving service. The Mann-Whitney
U test of mean ranks revealed that this was a statistically significant difference (mean rank for deaf confederates = 59.5, mean rank for hearing confederates = 30.2), \( U = 336.5, p < .001 \).

**Discussion**

The purpose of this study was to determine whether retail sales clerks exhibit a greater latency to serve deaf customers who use sign language as their primary mode of communication than hearing customers who communicate through spoken English. As expected, the results of this study supported this hypothesis. In addition, examination of the data indicated that compared to hearing consumers, many more deaf consumers waited the maximum amount of time, 6 min or more, without receiving service. Because the sales clerks discriminated against their customers based on observable, stigmatizing characteristics—ability to hear and mode of communication—deafness and disability can be added to the list of elements established in previous studies that affect salespersons’ response times (Carlson et al., 1998; Kraus et al., 1997). A visible difference in communication method and the potential of difficulty in communicating appear to influence the customers’ attractiveness to salespersons and thus their likelihood of receiving service. The data appear to support a negative view of deaf individuals in society, manifested in the form of a longer wait for service compared to their hearing counterparts.

Though the sales clerks often smiled at or simply ignored the deaf confederates, one discriminatory response is noteworthy. The encounter occurred with a pair of male, deaf confederates. They were quickly offered service upon entrance. However, when they gestured to the clerk to communicate with them in writing because they were deaf, the young female sales clerk rolled her eyes and responded, “You’re deaf? Oh forget it!” The clerk initially exhibited a desire to assist customers, but her attitude indicated her unwillingness to assist customers who were different.

Though previous studies have established that latency to serve is a sensitive measure of discrimination (Carlson et al., 1998; Kraus et al., 1997), one limitation of the present study is noteworthy. Results of the study indicated that discrimination against deaf consumers occurred. Whether store clerks discriminated based upon the deaf consumers’ personality or attitudes, or the stigmatizing characteristic of deafness, is unknown; however, it is unlikely that the sales clerk could have seen or known the confederates’ personalities from such a brief encounter. Nevertheless, ascertaining the cause of the discrimination would necessitate confirming store clerks’ attitudes with a follow-up questionnaire or interview. Regardless of this limitation, the finding that store clerks discriminated against deaf consumers remains.

Awareness of discrimination is important for all individuals who work with the public. Anecdotal evidence indicates that deaf consumers are aware of salespersons’ negative attitudes and tend to avoid stores that discriminate against them. Sales clerks who aim to perform their jobs well and aspire to offer prompt and fair service to all customers equally, regardless of stigmatizing characteristics, will desire to change the current state of retail affairs. Retailers who wish to retain customers rather than lose them will train their employees to treat all customers fairly and equally. They must become aware of the diverse needs of their customers and encourage sales clerks to be sensitive to those needs.

In addition to being good business practice, these changes are necessary for legal reasons. One purpose for which the Americans with Disabilities Act (ADA) of 1990 was written is to eliminate discrimination against persons who have disabilities. The ADA specifically restricts retail businesses from exhibiting discrimination against disabled patrons. The results of the present study suggest that retailers should teach employees to treat all customers fairly in their training sessions to ensure compliance with the ADA.

In conclusion, past research demonstrates that persons with disabilities, including deaf individuals, are stigmatized. The stigma, which occurs because of a differing physical characteristic, perpetuates discrimination. In addition, negative attitudes are associated with discrimination against the disabled population. However, due to the many unanswered questions in this field, additional research investigating discrimination against deaf persons is necessary. The present study could be a springboard for future research. For example, additional studies could examine the effects of appearance stigma (disability and deafness) in other settings in which interpersonal interaction is critical (e.g., restaurants, department stores, educational settings, and employment situations). The goal of this research should be an end to discrimination based on stigmatizing characteristics. Society must come to understand that the disability does not define the person.

**References**


The Effects of Noise and Sex on Children’s Performance on Recall and Spatial Tasks

The present study examined the effects of noise and sex as factors influencing children’s ability to perform recall and spatial tasks. The study consisted of 60 fifth- and sixth-grade students tested using the digit recall and block design subtests from the Wechsler Intelligence Scale for Children–Revised (WISC-R; Wechsler, 1974). The researcher randomly assigned boys and girls to 3 groups: an unstructured white noise group, a music group, and a silent control group. Children in each group completed the same WISC-R subtests. Children in the 2 experimental groups worked while exposed to unstructured white noise or music at 70 dB. The results of the study indicated no significant difference between boys and girls in performance on recall and spatial tasks in the presence of unstructured white noise or music. The present study did find significance between experimental conditions as children in the unstructured white noise group performed significantly better than children in the music group. However, neither experimental group performed significantly better than the control group. This study indicated that exposure to unstructured white noise increases children’s recall and spatial performance by improving concentration and organization ability.

Children must learn and develop their cognitive abilities in many different environments. These environments may contain elements that have an impact on children’s cognitive processes and overall learning. The existence of environmental distracters raises some interesting questions about how noise affects children’s cognitive abilities. If children are studying or trying to learn new material in proximity to a television, radio, or any noisy distraction, does this noise decrease their cognitive effectiveness or their ability to learn? There is also a question of sex and the effect of noise on children’s cognitive abilities. Do boys and girls have different reactions to noise?

In an attempt to answer the question of boys’ and girls’ reactions to noise, previous research has examined the relation between sex and the effects of noise on cognitive performance in college students and adults. The results of these studies indicate that sex is not a factor in performance under noisy conditions. In a study of 120 male and female Nigerian college students, Madu (1990) randomly assigned participants to a silent control group and three experimental noise groups consisting of exposure to 60, 80, and 100 dB of white noise. Participants then recalled words from a list of 30 words in either group. This experiment studied the effects of noise on sex and age and indicated no difference in the recall performance between men and women in noisy conditions. Srivastava (1988) discovered this same pattern in a study that focused on sex and the effects of adaptation to noise and performance. The results of this study indicated no significant differences between male and female adults classified as either adapted or not adapted to noise in their task performance. Gulian and Thomas (1986) examined the effects of noise and sex on mental arithmetic performance. In a between-subjects design, 72 men and women randomly assigned to 12 conditions consisting of noise and quiet performed arithmetic problems while given neutral, positive, and negative instructions. The results of this study indicated that noise impaired work rate, but not accuracy in both men and women in the noise conditions.

Noise can exist as unstructured white static noise or structured noise such as music. In an attempt to answer the question of noise effects on cognitive abilities, previous research has examined this factor in relation to noise and music and has revealed an interesting relation between unstructured white static noise...
noise and recall. Vitulli and McNeil (1990) explored college students’ short-term memory for numbers under unstructured white noise conditions. Sixteen male and 94 female undergraduates recalled a series of 25 random number sets in five different groups of white noise intensity. The results of this study indicated that higher background noise resulted in higher recall rates. Baker and Holding (1993) examined the effects of unstructured white noise and speech on cognitive task performance in a 2 × 2 × 5 (Sex × Time of Day × Noise Condition) between-subjects design. One hundred and sixty college men and women divided into 20 experimental blocks performed memory tasks while exposed to five levels of noise varying in intermittence and meaningfulness. The results of this experiment showed that noise increased recall performance. Smith, Whitney, Thomas, Perry, and Brockman (1997) examined the effects of caffeine and noise on mood, cognitive and memory performance, and cardiovascular functioning. They reported increased memory performance by participants exposed to noise and caffeine. The noise/caffeine group performed better than a noise/no caffeine group, although noise for both groups was significant compared to quiet and caffeine/no caffeine. Madu (1990) also reported increased recall with noise in the study concerning the effects of noise on sex and age. These past studies indicate that recall rate increases with unstructured white noise levels.

Additional research has shown a contradiction with the findings indicating that noise is associated with higher recall rates. Starnes and Loeb (1993) examined locus of control in memory recall in the presence of unstructured white noise. Fifty-four male and 72 female university students classified as either internal or external in locus of control for memory performed recall tasks using specific recall strategies in either an unstructured white noise or quiet condition. This study looked at both recall and memory strategy and found that unstructured white noise did not have a main effect on recall. A possible explanation for the contradictory results of this study compared to other studies concerning the effects of noise on memory is that this study employed specific memory strategies. Here the study placed more emphasis on how memory works instead of measuring basic recall accuracy. This contradiction also occurred in a study by Arnsten, Goldman, and Patricia (1998) that examined stress related to unstructured white noise and its effects on the cognitive functioning of monkeys. The results of this study showed that unstructured white noise stress impaired both cognitive functioning and working memory. The methodology of this study mainly concerned prefrontal cortical cognition and dopamine levels. This fact, in conjunction with the use of high noise levels of 105 dB, may explain the contradictory results of memory impairment relative to other studies.

Previous research has examined the effects of structured noise in the form of music on recall ability. Nittono (1997) conducted a within-subjects study concerning the effects of recall performance in the presence of pop music. Twenty-four undergraduate men and women recalled 20 sequences of nine digits while exposed to silence, forward pop/classical music, or backward pop/classical music, respectively. The results of this study found that the introduction of music during a recall task resulted in lower recall rates. Furnham and Bradley (1997) also looked at the detracting effects of pop music in a within-subjects design. Twenty participants classified as introverts or extroverts completed memory and reading comprehension tests in either a quiet control group or a music experimental group. The results of this study associated lower recall rates with instrumental music.

Past research concerning the relation between noise and spatial ability included a study by Vause (1998) that examined spatial processing in adverse auditory environments. The results of this study indicated that masking noise reduces spatial ability. Wilson and Brown (1997) examined the influence of Mozart’s music on spatial task performance in 22 undergraduate men and women. This within-subjects study consisted of participants randomly assigned to one of three groups consisting of Mozart’s music, relaxation music, and silence, respectively. Participants completed pencil and maze tasks after a 10-min listening period. The results indicated no significant increase in spatial ability associated with music. However, in a within-subject study by Rideout, Dougherty, and Wernert (1998), 32 male and female adults performed paper folding and cutting tasks in three groups consisting of a 10-min preexposure session of relaxation, Mozart’s sonata, or Mozart-like Yanni music. The results of this study showed that spatial ability improved with music.

Past research has produced two patterns of results concerning the effect of noise and sex on performance on recall and spatial tasks. The first is that there is no relation between sex and cognitive performance in the presence of noise. The second is that unstructured white noise seems to increase recall performance, whereas structured noise like music decreases recall. Past research has also shown conflicting results concerning the effects of noise on recall ability. Because previous research has focused on adults, researchers do not know the relation of noise and sex on recall and spatial ability in children. Children’s
cognitive development differs from that of adults. Therefore, unstructured and structured noise may have a more profound impact on children’s cognitive functioning and learning.

The present study looked for a relation between the sex of children and their ability to perform recall and spatial tasks in the presence of noise. Previous research has focused mainly on adults and the effects of noise on recall and spatial ability (Baker & Holding, 1993; Furnham & Bradley, 1997; Gulian & Thomas, 1986; Madu, 1990; Nittorno, 1997; Rideout et al., 1998; Smith et al., 1997; Srivastava, 1988; Starnes & Loeb, 1993; Vause, 1998; Vitulli & McNeil, 1990; Wilson & Brown, 1997). In addition, past research has shown contradictory results regarding the effects of noise on cognitive abilities (Arnsten et al., 1998; Rideout et al., 1998; Starnes & Loeb, 1993). Thus, the present study also explored the question of whether there is a difference in the effects of unstructured and structured noise on the cognitive abilities of children.

Method

Participants

Participation in the present study depended on children’s level of cognitive development. It was a goal of this study to recognize cognitive differences between adults and children. Therefore, only children who displayed a concrete operational stage of cognitive development participated in the experiment. Children between the ages of 7 and 11 typically exhibit a concrete level of thinking. Sixty fifth- and sixth-grade students from four intact elementary school classes in the southwestern Virginia area participated in the experiment. Each child included in this study participated only if the parents gave written consent and the teacher verbally consented. In addition, each child participated only if he/she verbally agreed to participate. A total of 28 boys and 32 girls who met these consent considerations participated in the present study. The ages of these children ranged from 9–11.

Instrumentation

The present study used two subtests from the Wechsler Intelligence Scale for Children–Revised (WISC-R; Wechsler, 1974). The WISC-R was selected because it is a standardized test with demonstrated validity and reliability that is normal for the age group included in this study. The subtests used from this inventory included the block design subtest to assess spatial ability and the digit recall subtest to assess recall memory. The block design subtest of the WISC-R consisted of nine blocks, each of which had two sides colored red, two sides colored white, and two sides colored half red and half white. These blocks can be arranged to form various geometric patterns. The test required that each child complete nine patterns. Each pattern had a specific time limit, and if the child failed two designs in a row, the test ended. The digit recall subtest of the WISC-R consisted of a series of numbers read by the test administrator to the child. The test required the child to accurately recite each series of numbers back to the test administrator. The series included seven forward-number series and seven backward-number series, each of which progressed in difficulty. If the child inaccurately recited two series in a row, the test ended. Each test provided a number score of the child’s performance with high scores indicating better performance.

Procedures

The present study used a between-subjects design. This type of design prevented a lengthy experimental period and eliminated any learning effects. A larger number of participants allowed for each child to be tested only once, which lessened the distraction on both the child’s learning and the school’s time.

The researcher randomly assigned children to either the control group or one of two experimental groups. Although there were unequal numbers of boys and girls, the researcher attempted to ensure that these numbers were reasonably equal in each group.

The same test administrator tested each child individually under a teacher’s supervision. The silent control group consisted of 10 boys and 11 girls assessed using the WISC-R digit recall and block design subtests in a quiet room. The experimental groups consisted of children assessed using the same digit recall and block design subtests of the WISC-R in the presence of noise. The first experimental group included 9 boys and 11 girls assessed in the presence of unstructured white noise registered at 70 dB. The second experimental group included 9 boys and 10 girls assessed in the presence of structured noise in the form of pop music (the Britney Spears song “Baby One More Time” repeated on a continual loop) registered at 70 dB. The researcher selected this particular vocalist because of the qualities of a female vocalist that are attractive to both boys and girls, and the artist’s popularity with the experiment’s target age group.

During the experiment each child sat with the test administrator at a table in an empty classroom that provided an environment free of distraction and offered appropriate supervision. An Emerson cassette
recorder and compact disc player (model no. PD6007) sat on the table 24 in. (61 cm) in front of the child’s work area. A Radio Shack digital sound meter (model no. 33-2055) ensured that unstructured white noise and music produced by playing recordings on the CD player registered 70 dB relative to the child’s position. Each child, regardless of group, received information as to why the CD player was on the table. Children in each group received instructions to perform as well as they could on the WISC-R subtests despite the presence or absence of noise or music from the CD player. The researcher informed each child that he/she was participating in a college research project, and each child received a description of the tasks he/she would be performing. The researcher asked each child if he/she had any questions about the tasks or the research project before proceeding with the experiment. Each child performed the block design subtest first and the digit recall subtest second. The test administrator presented and conducted each WISC-R subtest according to the WISC-R test manual. The researcher recorded each child’s score on an individualized score sheet, and a subject participation number insured children’s confidentiality. After testing, the researcher told each child that he/she had performed very well and thanked each child for his/her participation. As a reward and compensation for the child’s effort, each child whose parents had consented received a candy bar.

**Results**

**Combined Spatial and Recall Performance Between Groups**

The alpha level used for all statistical tests was .05. Analysis of the combined performance scores of recall and spatial tasks for noise groups yielded significance, $F(2, 55) = 4.33, p = .018$. Tukey’s HSD test indicated that the significant difference (see Figure 1) occurred between the two experimental groups with the music group showing lower performance ($M = 34.50$) than the white noise group ($M = 43.00$). The control group ($M = 38.00$) was not significantly different from either of the experimental groups. These combined scores also reflect better general intellectual functioning in the unstructured white noise group (Ogdon, 1986).

**Spatial Performance Between Groups**

The discovery of significance in the combined scores of the experimental groups suggested a similar trend in the individual subtest scores (see Figure 2). Analysis of spatial performance showed significant difference between the groups of silence ($M = 27.20$), white noise ($M = 31.90$), and music ($M = 24.84$), $F(2, 55) = 3.68, p = .03$. Subsequent Tukey’s tests indicated that the spatial scores for the noise group were significantly ($p < .05$) higher than the spatial scores for the music group.

**Recall Performance Between Groups**

The discovery of significance between groups for combined score and spatial score prompted analysis of the recall performance between groups. Although children’s recall performance in the unstructured
white noise group was better than the music group; this difference was not as strong as the spatial scores. However, the recall scores for the control group ($M = 10.80$), music group ($M = 9.63$), and white noise group ($M = 11.11$) followed the same trend as the spatial scores, $F(2, 55) = 2.71$, $p = 0.075$.

**Performance Differences Between Boys and Girls**

Boys and girls did not differ in their performance on the WISC-R subtests: boys ($M = 38.55$), girls ($M = 38.56$), $F(1, 56) = 0.007$, $p = .932$. To explore the possibility of reaction differences to noise between boys and girls, the researcher conducted an analysis of these two experimental groups. This analysis indicated that the performance of boys ($M = 39.29$) and girls ($M = 38.28$) did not differ, $F(1, 36) = 0.095$, $p = .759$.

**Discussion**

The results of the present study indicated that unstructured white noise produced significantly higher combined scores and spatial ability scores than did music. No significant difference existed between the two experimental groups and the control group. A similar, albeit marginally significant, trend was shown for recall performance. The scores of boys and girls did not differ.

The lack of any sex differences is consistent with previous research with adults (Gulian & Thomas, 1986; Madu, 1990; Srivastava, 1988). Therefore, we can tentatively conclude that in both children and adults, sex has no influence on the ability to recall information or perform spatial tasks in the presence of noise.

The results of this experiment support previous research concerning the effects of noise and performance on recall and spatial tasks. The significant difference between the noise and music groups indicates that children exposed to music experience a decreased ability to recall information and to perform spatial tasks. However, in agreement with previous research (Baker & Holding, 1993; Madu, 1990; Smith et al., 1997; Vitulli & McNeil, 1990), exposure to unstructured white noise increases children’s performance on recall and spatial tasks. In the present experiment, this increase in recall and spatial ability in the presence of unstructured white noise is relative only to the decrease in performance in the music group. This decrease in spatial ability in the presence of music supports the research findings of Vause (1998) and Wilson and Brown (1997). This pattern of increased performance associated with noise has occurred in previous research, but to date there is no explanation of why it occurs. Baker and Holding (1993) suggested that complex interactions between variables outside the experimental condition resulted in random increases and decreases in performance ability in the presence of noise. However, because several studies (Baker & Holding, 1993; Madu, 1990; Smith et al., 1997; Vitulli & McNeil, 1990) have reported this increase in performance, explanations regarding the random influence of outside interactions may not be tenable. Perhaps unstructured white noise has a calming effect, relative to music, that facilitates concentration and organization. This hypothesis requires further research.

**References**


Developmental Changes in Children’s Measurement Errors

Children as old as 4th graders still make fundamental measurement errors. Specifically, some children begin measuring from the number 1 on a ruler instead of from the end of the ruler (0), an error of cardinality. The present study investigated developmental changes in children’s measurement errors in 1st and 3rd graders via a 6-task testing session devised to emphasize measurement errors children tend to make. Each task made the cardinality error (measuring from 1 instead of 0) increasingly more salient to the children in an effort to facilitate recognition of their measurement errors. However, the results revealed that children do not understand the measurement principle of cardinality, and thus tend to be stable in their measurement strategies despite evidence indicating that such strategies yield incorrect answers.

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Children develop various strategies as they learn to measure; yet, even as late as fourth grade, they still make fundamental measurement errors. Children must understand the essential properties of measurement in order to avoid making errors, and some of these properties are more difficult for children to understand than others.

Ellis, Siegler, and Van Voorhis (1999) described the essential properties of measurement. First, children should understand that measurement is quantifiable. Second, children should understand that each unit of measurement must be equal in size, a standard unit. Third, children must also understand that each unit of measurement on the ruler can be represented by one and only one number, one-to-one correspondence. Fourth, children should understand the concept of cardinality. The child must understand that the last number that lines up with the object being measured is an indicator of how many units long the object is. Fifth, children should understand that the numbers are aligned in a stable order. Finally, the tool used to measure the object must not vary; it must yield reliable and stable measurements over time.

One measurement essential with which children seem to have particular difficulty is cardinality. Great doubt surrounds the issue of how cardinality develops (Frye, Braisby, Lowe, Maroudas, & Nicholls, 1989). Researchers speculate that cardinality questions such as “how many?” may be answered using a last-word strategy (Fuson, Pergament, Lyons, & Hall, 1985). For example, if the experimenter counts aloud five objects on a table and then asks the child “how many?” the child may just simply say the last number said, “five.” Fuson and colleagues (1985) found that there was no relation between being able to count correctly and giving correct answers to cardinality questions. Thus, this evidence supports the notion that children do not understand the relation between counting and cardinality and may, indeed, rely on such things as the last-word strategy (Frye et al., 1989).

These results are also consistent with the finding that, overall, children are better at determining if the counting procedure is correct than they are at determining the accuracy of a cardinality statement (Frye et al., 1989).

Author note. I would like to express my deepest gratitude to my advisor, Dr. Shari Ellis, for her insight, guidance, commitment, and assistance throughout this project. I would also like to thank Carrie Whittlemore for her help in the testing of the children and with the details of the project. Thank you to Randall Moreland for his talented development of the task illustrations. In addition, I thank Glen Springs Elementary School’s students, teachers, and administrators for all of their valuable contributions to the study.
Children’s understanding of the concept of cardinality can be examined by having them place numbers on a ruler. Results suggest that when 6-year-olds measure using a “broken ruler,” they are not able to adjust their measurement strategies to arrive at the correct answer (Nunes & Bryant, 1996). It appears that they cannot ignore the incorrect numbers and count the units on their own. When asked to choose among rulers, children do select rulers with equally spaced intervals, but they do not seem to understand that these spaces represent a unit of measurement (Nunes & Bryant, 1996). The problem of cardinality is also apparent in the finding by Ellis and Siegler (1995) that 50% of second graders began measuring at 1 instead of at the end of the ruler (0) and that even up to 30% of third and fourth graders consistently began measuring from 1. These results suggest that children as old as fourth graders still may not understand the concept of cardinality, an essential aspect of measurement.

The concept of zero itself seems to be difficult for children to understand. Evidence suggests that the understanding of zero lags behind and is more difficult to understand than other small counting numbers (Wellman & Miller, 1986). In fact, in arithmetic problems, the majority of errors involve problems with zero contained in them (Wellman & Miller, 1986). Children may know that zero is “none” or “nothing” but still not treat it as a counting number. Before they identify zero as the smallest number, children tend to insist that one is the smallest number even when they can verbalize that zero represents “none” (Wellman & Miller, 1986). Just as zero appears to create difficulties in math problems, so it also does in measurement tasks.

When 5- and 6-year-old children wrote numbers on an unmarked ruler, the vast majority did not use 0 as the starting point; 89% put 1 at the first mark on the ruler (Nunes & Bryant, 1996). Children also compared two rulers, one beginning at 0 and the other at 1, and then decided which had been drawn correctly. Only 2 of 22 children even used 0 as a criterion, and even one of those two applied the zero criterion incorrectly (Nunes & Bryant, 1996).

Ellis and Siegler (1995) have found similar results. In their study, 80% of kindergartners chose rulers that did not begin at 0. Their justifications included statements that the ruler was somehow “longer” and “better” because it had “more” numbers on it. Interestingly, second graders seemed to be able to select a ruler with all of the appropriate properties, yet half began measuring from 1.

The present study examined the developmental changes in children’s measurement misconceptions. A series of tasks was presented in which the issue of cardinality became increasingly salient so that a child who made a cardinality error (not measuring from 0) was faced with increasing “evidence” of his/her mistake. The experimenters hypothesized that the third graders would perform better across all tasks than first graders, that performance would decline for all age groups with Task 5, a nonconventional problem, and that performance would increase for the last task, which follows a “teaching session.”

**Method**

**Participants**

The participants were 20 first graders (mean age = 6 years, 9 months; range = 6 years, 6 months to 7 years, 3 months) and 20 third graders (mean age = 8 years, 10½ months; range = 8 years, 0 months to 9 years, 7 months) from a local elementary school in Gainesville, FL. All first- and third-grade students received a parental information and permission slip to be signed by their guardians. The groups of this study were selected from those students who returned a signed permission slip and expressed a desire to participate in the study. Each grade-level group was comprised of approximately equal numbers of girls and boys.

**Tasks**

Each child encountered a series of six tasks presented in a set order designed to make the issue of cardinality increasingly salient (see Figure 1). The experimenters presented and explained each task to the children and asked them to perform the task. Then, the children explained how they arrived at the particular answer they gave after the completion of each task. The children received positive feedback for any answer given whether it was correct or incorrect.

**Task 1: Measuring with a conventional ruler.** The children measured a 6-in. book with a conventional ruler and explained how they decided on their answers.

**Task 2: Measuring with a conventional ruler versus a tape measure.** In this task, the children first measured a new object, another book which was 11 in. long, with a ruler and then with a tape measure. The children explained any discrepancies between their first (ruler) and last (tape measure) answers.

**Task 3: Producing a line with the aid of a ruler.** The children viewed a 4-in. line drawn on the experimenter’s Magna Doodle with the ruler still in place and then drew a line of corresponding length on another, smaller, Magna Doodle using a similar ruler. The children explained how to make their line exactly match the experimenter’s line.
FIGURE 1

Task illustrations.

Task 1

Task 2

Task 3

Task 4

Task 5

Task 6
Task 4: Translating a measurement into units. The children first measured a 10-in. tube with a ruler and then guessed how many 1-in. blocks it would take to fill the tube. Then the children filled the tube with as many blocks as possible. Again, the children explained any discrepancies among their measurements, guesses, and the actual number of blocks it took to fill the tube.

Task 5: Measuring in the middle. The children viewed a calibrated tube with a 2-in. piece of colored paper set in the middle, not at the end (0). The children stated how long the piece of paper was. The children explained their reasoning for giving a particular answer.

Teaching session. If the child answered incorrectly in Task 5, a prompt was given to determine whether the child would change his/her answers. The experimenters pointed to the first marking and then to the second marking on the calibrated tube while asking “How far is it from here to here?” The child should respond, “one inch.” If the child did not respond correctly with this prompt, the experimenter used the 1-in. blocks to demonstrate that the paper was, in fact, 2 in. long.

Task 6 (transfer task): Measuring with a “broken” ruler. The children received a “broken ruler,” one that is torn at the left end and begins at 3. They measured a 5-in. line drawn on the small Magna Doodle with this ruler. The children once again explained how they arrived at their answers. One of the purposes of this task (with the same fundamental question as Task 5) was to see whether the children would transfer the learning from the previous teaching session to the present task in order to arrive at the correct answer.

Procedure

The child became familiar with the materials utilized in each task. For instance, the experimenter would ask, “Have you seen one of these before?” and if the child did not know what the object was, the materials were shown and explained to the child. However, at no time did the experimenter model measuring. An example would be explaining to a child what a Magna Doodle is, something we can “draw like this on” and then “erase like this.” Next, the child answered the specific questions of the particular task. After each answer, the child responded to an appropriate question such as, “How did you decide that it was ——— inches long?” or “Why do you think when you measured it with the ruler you said it was ——— inches long and now when you measured it with the ——— you said it was ——— inches long?” Such questions tapped the child’s explanation(s) for his/her answers.

Results

An analysis of variance (ANOVA) revealed no sex differences; thus, data for boys and girls were combined for the analysis reported below. Children’s answers were scored such that less advanced explanations/strategies received lower scores than more advanced explanations/strategies. More specifically, explanations were coded as follows: a child offering no explanation received a score of 0, a child offering an explanation received a score of 1, and a child verbalizing his/her recognition of the measurement error received a score of 2. Strategies were scored in much the same way: a child offering an apparent guess received a score of 0, a child reading the number that corresponded with the rightmost end of the object received a score of 1, a child counting the number of numerals that corresponded with the object received a score of 2, a child counting the number of spaces or units received a score of 3, and a child using subtraction to arrive at the correct answer received a score of 4. Thus, more advanced explanations and strategies received appropriately higher scores than less advanced explanations and strategies.

Measuring With a Conventional Ruler

In this task, 12 of 20 first graders and 3 of 20 third graders began measuring at some number other than 0, whereas 8 first graders and 17 third graders began measuring at 0. A Pearson’s chi-square analysis revealed that third graders were more likely than first graders to begin measuring from 0, $\chi^2(1, N = 40) = 8.64, p < .01$.

Conventional Ruler Versus Tape Measure

Performance in the first task was identical to performance in this task in which the children measured a new object, a book, with the same ruler. The proportion who measured from numbers other than 0 dropped, however, when children measured the same book with a tape measure. Only 6 of 20 first graders and 0 of 20 third graders began measuring from some number other than 0. Nonetheless, third graders were significantly less likely to measure from a number other than 0 than were first graders, $\chi^2(1, N = 40) = 7.06, p < .01$.

Third graders ($M = 1.67, SD = 0.58$) were not significantly better at explaining discrepancies in their answers than the first graders ($M = 0.63, SD = 1.06$), $F(1, 10) = 2.49, p > .05$. Of the eight first graders who had discrepancies in their answers, five could offer no explanation, two thought some physical property about the book had changed, and only one recognized the measurement error he/she had made. Only
three of the third graders had discrepancies for which to account, and one thought there was a change in the physical properties of the book, whereas two said that they “measured wrong” but did not recognize their real errors, that is, the different starting points.

**Producing a Line With the Aid of a Ruler**

In this task the participants drew a line as long as that shown on the experimenter’s Magna Doodle. Thirteen of 20 first graders and 10 of 20 third graders began drawing from some number other than 0. The differences between the two grades was not significant, $\chi^2(1, N = 40) = .92, p > .05$.

When the participants who had drawn the line incorrectly were asked to make their line match the line on the large Magna Doodle, only 1 of 12 first graders could explain his/her mistake. Of 10 third graders who drew incorrectly, 3 could not explain how to make the lines match, whereas 7 realized that they had not begun to measure from 0. Therefore, although the third graders did not perform significantly better than the first graders in drawing the line, the third graders ($M = 0.70, SD = 0.48$) were significantly better at recognizing their errors in drawing the line than first graders ($M = 0.08, SD = 0.28$), $F(1, 22) = 15.24, p < .01$.

**Translating a Measurement Into Units**

In this task, children measured a hollow tube, guessed how many 1-in. blocks it would take to fill the tube, and then tested that guess by filling the tube with the blocks. First graders were significantly more likely to measure from a number other than 0 than were third graders, $\chi^2(1, N = 40) = 3.96, p < .05$ (50% and 20% of first and third graders, respectively). Thus, 15 children in all obtained different measurements when using a ruler and when filling the tube with 1-in. blocks. When the participants explained discrepancies between their ruler measurements and how many 1-in. blocks it took to fill the tube, 6 of the 11 first graders could not explain the difference, and 5 blamed the difference on some characteristic of the blocks. Of the 4 third graders who had discrepancies, 2 blamed the blocks, and 2 recognized that they measured with the ruler incorrectly. An ANOVA showed that the third graders ($M = 1.5, SD = 0.58$) were significantly better at identifying the source of the discrepancies than the first graders ($M = 0.45, SD = .52$), $F(1, 14) = 11.18, p < .01$.

**Measuring in the Middle**

Analysis revealed significant grade differences in the sophistication of the strategies used to solve the problem, with third graders ($M = 2.35, SD = 0.88$) using more advanced strategies than first graders ($M = 1.00, SD = 0.65$), $F(1, 39) = 30.71, p < .01$. None of the first graders, but 30% of the third graders, answered the problem correctly. Twelve of 20 first graders simply reported the measurement to be the number that corresponded with the rightmost end of the paper, whereas 4 counted the number of numerals that corresponded with the paper and so reported the length to be 3 (the numerals 6, 7, and 8); the remaining 4 first graders offered apparent guesses. In contrast, 6 of 20 third graders arrived at the correct answer of 2 in. Three of those did so by counting the number of spaces or units, whereas 3 used subtraction ($8 - 6 = 2$). Third graders were most likely to get the problem wrong by counting the number of numerals (12 of 14 children). The two remaining third graders offered a “blind reading” of the numeral associated with the end of the paper (a “last-word” strategy choice).

**Teaching Session**

All of the children identified that the piece of paper in the calibrated tube in Task 5 was indeed 2 in. long via the help of the prompts when necessary.

**Transfer Task: Measuring With a “Broken” Ruler**

An ANOVA revealed that third graders ($M = 2.15, SD = 1.14$) used more advanced strategies than first graders ($M = 1.05, SD = 0.51$) in solving the problem, $F(1, 39) = 15.59, p < .01$. None of the first graders, but 40% of the third graders, arrived at the correct answer. Fifteen of 20 first graders simply reported the length of the line to be the number that corresponded with the rightmost end of line, whereas 3 counted the number of numerals that corresponded with the length of the line; the remaining 2 first graders offered apparent guesses. In contrast, 8 of 20 third graders answered the problem correctly. Six students did so by counting the number of spaces or units, whereas two used subtraction ($6 - 3 = 3$). Again, third graders were most likely to get the problem wrong by counting the number of numerals (7 of 12 children). Of the remaining five third graders, three reported a “blind reading” of the numeral associated with the end of the line, and two made apparent guesses. Summary data as to the number of participants who correctly answered each task in each age group can be seen in Figure 2.

**Discussion**

Overall, the results reveal that children generally do not fully understand the concept of cardinality, a principle of measurement (Ellis & Siegler, 1995). The findings support Piaget’s claim that without an
understanding of cardinality, the child will not be able
to measure correctly (Piaget, Inhelder, & Szeminska,
1960). In general, the third graders performed better
than the first graders across all tasks. Performance
on Task 5 did decrease as expected; however, the train-
ing session provided between Task 5 and Task 6 did
not improve performance. An unexpected finding
was the decreased performance in both grade levels
for Task 3.

It is evident that children do not seem to grasp
the concept of cardinality in that both grade levels
tended to make fundamental cardinality errors. A
cardinality mistake most common to the first graders
was simply reporting the number that lined up with
the end of the object being measured. Similar to
Fuson’s last-word strategy, the children are reporting
the last number on the ruler that corresponds with
the end of the object (Fuson et al., 1985). Children
neglect to compensate for a different starting point
and remain stable in their strategy choices, especially
in the calibrated-tube and broken-ruler tasks.

Another common cardinality mistake is the
tendency for children to measure from 1 instead of
from 0. A possible explanation for this type of card-
nality error is that children’s understanding of
measurement may be greatly influenced by their
understanding of counting (Ellis et al., 1999). It is
logical to reason that because children generally
begin to count from one and not zero, they may
erroneously assume they should also begin measur-
ing from one. However, if they are applying their
understanding of counting to measurement, what are
they counting? They must use up or pass a unit before
saying “one” (Nunes & Bryant, 1996). Children who
made the error of measuring from 1 instead of 0 were
faced with having to explain why they gave two differ-
ent answers in the same measurement task, yet few
were able to recognize the error made.

When the tasks did present evidence of a mea-
surement error, most children did not recognize their
error or change their strategies. The children tended
to blame some change in the physical properties of
the object being measured instead of considering that they may have measured incorrectly. Thus, it seems that children tend to be stable in their measurement strategies despite evidence that their measurement strategies do not result in correct answers.

Another example of the stability in children’s answers is that the “teaching session” after Task 5, in which children are told of their mistake and shown how to arrive at the correct answer, appears to have not helped improve performance as assessed in Task 6. When presented with Task 6, in which the question is fundamentally the same, the children generally stayed with their incorrect strategy despite the fact that they were just shown that it yields an incorrect answer. Another possible explanation for the lack of improvement between Task 5 and Task 6 is that the training provided between the tasks did not have all of the characteristics needed to result in improved performance.

An especially surprising finding was the decreased performance on Task 3, most notably for the third graders. This task was the only one that required creating a line as opposed to simply measuring a line. The most common mistake here was that the children, even those who had been measuring correctly, began drawing the line from 1 instead of from 0. Therefore, it seems that there may be something different about creating a line as opposed to measuring a line. Perhaps children gain more experience in measuring lengths than they do in creating lengths when measurement is being taught.

In general, it appears that children may understand and adhere to the conventions of measurement, but when a nonconventional problem is presented, their performances decrease greatly. For example, many of the children did well when a conventional ruler was used, but in the calibrated-tube and broken-ruler tasks, performance dropped sharply. Just as Piaget and colleagues (1960) claimed that children do not understand that counting to 10 means that there are 10 “things” that have been counted, it appears that children may know to read the last number at the end of the object, 10, but not understand that means the object is 10 units long. Perhaps when children are being taught measurement, they do not gain experience with nonconventional measurement problems, and as a result perform poorly when presented with such problems. It could be speculated that it is in the nonconventional problems that children learn the concept of cardinality because they cannot rely on “shortcut strategies” such as the last-word strategy; they must somehow demonstrate an understanding of cardinality in order to arrive at the correct answer.

Future research may want to examine teaching methods used to instruct children in the arena of measurement, as well as children’s performance associated with each of those methods. For example, research could examine children’s understanding of cardinality among children who either did or did not receive exposure to nonconventional measurement problems. Examination of the effectiveness of various types of training sessions and the characteristics of those sessions that result in improved performance would be beneficial in guiding future research and would provide important implications for effective methods of instruction. More research is needed to explore the difference between creating and measuring a line as well as the stability of incorrect measurement strategies despite conflicting evidence. The measurement essential of cardinality appears to be missing from most children’s concept of measurement, and further research is needed to pinpoint why and how to help children understand cardinality and its application to measurement.

References
Psychological Variables in Relation to Academic Success in Developmental Math Courses

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Although most people view procrastination as a negative and unproductive trait, it is estimated that 70% of college students procrastinate (Ellis & Knaus, 1977) and that such behavior negatively affects academic performance. According to Solomon and Rothblum (1984), procrastination is related to fear of failure arising from low self-esteem and high anxiety levels. In support of this hypothesis, Beswick, Rothblum, and Mann (1988) found that procrastination was correlated with low self-esteem and high anxiety in high school students. Solomon and Rothblum also found that although students gave a variety of reasons for their procrastination, fear of failure was salient.

Some students may use procrastination to protect their perceived level of self-worth (Owens & Newbegin, 1997). By using procrastination as an excuse for not studying or completing work, individuals can blame failure on lack of effort, thus keeping their self-concept intact. This contention is supported by Berzonsky’s (1992) “diffuse/avoidant orientation” (p. 772), which refers to an approach that an individual can use in order to escape the responsibility of an outcome. If a student waits too long to study for an exam, then the responsibility for failing is due to lack of time, and the individual has an excuse for doing poorly that is based on external control.

Lay (1988) attributes procrastination to overestimating or underestimating the time it takes to complete a task. This attribution implies that time restraint on task completion and how individuals deal with these restraints, optimistically or pessimistically, are key conditions for procrastination. According to Lay (1988), “optimistic persons would be more likely to form favorable outcome expectancies in some specific situation than pessimistic persons would, resulting in a greater likelihood of renewed effort on the part of the optimist than the pessimist” (p. 202).

Vallerand and Bissonnette (1992) suggested that how students make use of internal and external locus of control could affect their academic performance. This view is further supported by Rotter’s (1966) view that a person’s belief in personal control over situational outcomes may enhance environmental coping skills. According to Rotter, there is an interaction between internal locus of control and success. Individuals with a strong internal, as opposed to external, locus of control believe they personally are most influential over life events. The ability for individuals with internal control to take blame for their actions allows them to manipulate their environment in order to benefit from it. It is believed that high external control leads to passivity in the face of environmen-
tual difficulties. Thus, a student with an external locus of control may take a passive rather than active role when faced with academic challenges. Rotter (1966) indicated that internal–external locus of control can predict school success, with internals performing better than externals.

One of the major academic hurdles for first-year students at many colleges and universities is the general studies mathematics requirement. Many students enter college underprepared in mathematics; moreover, many of these students suffer from math anxiety (Betz, 1978). The present study sought to investigate associations between several psychological variables and the time it took students to complete units in developmental math courses. These courses are designed to help students make a successful transition into college-level math courses. Procrastination was predicted to be negatively correlated with grades and time completion.

Method

Participants

Participants for this study consisted of 250 undergraduates (147 women, 103 men) at Missouri Western State College who were enrolled in developmental math during the fall semester of 1998. This course encompasses both beginning and intermediate algebra. The class fulfills the prerequisite for general studies mathematics and uses a mastery-based format, which follows the premise that students learn at different rates. The students can test their mastery of the prescribed concepts whenever they are done with the assigned work. Approximately 6% of the students had enrolled in the course before and had failed or withdrawn from the course before completing it. The average course load per student was 12.31 academic hours, and over half (54%) were employed.

Survey Instruments

The participants completed a questionnaire packet that contained the following seven assessment instruments:

**The Life Orientation Test.** The Life Orientation Test (LOT; Scheier & Carver, 1985) consists of 12 items and measures optimism. Four items are keyed in a positive direction, four are reversed scored, and four are filler items designed to disguise the purpose of the test. Each item is rated on a 5-point Likert-type scale (4 = strongly agree to 0 = strongly disagree). Examples of items include statements such as “In uncertain times, I usually expect the best,” and “I hardly ever expect things to go my way.” The LOT’s test–retest reliability correlation is .79, and internal consistency is .76 (Cronbach’s alpha; Scheier & Carver, 1985).

**General Procrastination Scale.** Lay’s (1986) 20-item General Procrastination Scale is based on a 5-point Likert-type scale (5 = extremely characteristic to 1 = extremely uncharacteristic). Half the items are reversed scored. The items range from everyday statements such as, “I generally return phone calls promptly” to school-related statements such as “I usually start an assignment shortly after it is assigned.” The scale has a Cronbach alpha of .82 and a retest reliability of .80 (Lay, 1986).

**Rosenberg’s Self-Esteem Scale.** Rosenberg’s (1965) 10-item self-esteem inventory is evaluated on a 4-point Likert scale (4 = strongly disagree to 1 = strongly agree). An example of one of the questions is “I feel that I’m a person of worth, at least on an equal basis with others.” Silber and Tippett (1965) used the Guttman procedure to find internal reliability, reproducibility at 92 percent, and scalability at 72 percent. Test–retest reliability was reported to be .85.

**Rotter’s Internal–External Locus of Control.** Rotter’s (1966) internal–external locus of control scale is a 23-item, forced-choice scale, including 6 filler items that are intended to help disguise the purpose of the scale. For the purposes of this study, 11 of the 23 questions were used. Examples of items used in this study are “In my case, getting what I want has little or nothing to do with luck” and “Many times we might just as well decide what to do by flipping a coin.” The test–retest reliability is .72.

**Eckhoff’s Fear of Success Scale.** The Fear of Success Scale (Eckhoff, 1990) measures negative consequences associated with success. This measure consists of 13 true/false questions. An example of one of the questions is “Success may cause me to lose some of my closest friends.” Test–retest reliability is .78, and the Cronbach alpha is .62.

**Quick Measure of Achievement Motivation.** The Quick Measure of Achievement Motivation (Smith, 1973) consists of 17 true/false questions. Ten of the questions deal with achievement motivation, whereas 7 of the questions deal with carelessness in answering questionnaire items. An example of one of the questions is “I would sooner admire a winner than win myself.” The split-half reliability is .56.

**Fennema-Sherman Mathematics Attitude Scale.** A revised version of the Fennema-Sherman Mathematics Attitude Scale (Betz, 1978) evaluated math anxiety in this study. Participants recorded their responses on a 5-point Likert-type scale; responses ranged from 1 (strongly disagree) to 5 (strongly agree). The scale consisted of 10 items; half of the items were positively worded, whereas the other half were negatively worded. An example of one of the questions is “It wouldn’t bother me at all to take more math courses.”
Procedure

Math professors distributed the survey during the first week of class. The students completed the questionnaires during the class period and returned the questionnaire packets to the professor before leaving. Each student who intended to participate in this research project was asked to complete an informed consent form before completing the questionnaire packets. Students received five extra credit points for their participation in this study and were debriefed at the end of the semester.

Results

Intercorrelations

Table 1 summarizes the mean scores and t-value comparisons for the psychological variables for all students enrolled in the developmental math courses. Table 2 shows the intercorrelations among the psychological measures. As expected, procrastination was significantly negatively correlated with optimism, self-esteem, locus of control, and need for achievement. Math anxiety was not significantly correlated with procrastination, but there were significant negative correlations between math anxiety and optimism and between math anxiety and locus of control. As can be seen, there was a significant positive relation between optimism and both need for achievement and locus of control.

Multiple Regression

Regression analyses indicated that the psychological variables did not predict either math units completed or final grades. However, these measures did predict whether students would successfully complete the course, $R^2 = .03$, $F = 2.35$, $p < .05$. Stepwise regression indicated that need for achievement was the strongest predictor, $\beta = .17$, $t = 2.70$, $p < .01$. A subsequent analysis with need for achievement removed from the equation showed that both math anxiety, $\beta = -.18$, $t = -1.99$, $p < .05$, and procrastination, $\beta = -.18$, $t = -1.98$, $p < .05$, also predicted success in the self-paced class. Consistent with our predictions, students with high levels of achievement motivation and with low math anxiety and low procrastination scores were the students most likely to complete the class with a passing grade.

Discussion

Inspired by the need to improve student performance in developmental math courses, this study sought to determine whether psychological factors could predict math performance. The original hy-

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**TABLE 1**

<table>
<thead>
<tr>
<th>Psychological Variables</th>
<th>Successful students ($n = 140$)</th>
<th>Unsuccessful students* ($n = 110$)</th>
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<td>Procrastination</td>
<td>53.1</td>
<td>55.9</td>
<td>1.85</td>
</tr>
<tr>
<td>Optimism</td>
<td>20.1</td>
<td>18.3</td>
<td>2.28*</td>
</tr>
<tr>
<td>Self-esteem</td>
<td>32.9</td>
<td>31.7</td>
<td>1.52</td>
</tr>
<tr>
<td>Locus of control</td>
<td>5.6</td>
<td>5.7</td>
<td>0.26</td>
</tr>
<tr>
<td>Anxiety</td>
<td>33.5</td>
<td>36.7</td>
<td>2.01*</td>
</tr>
<tr>
<td>Need for achievement</td>
<td>8.9</td>
<td>8.4</td>
<td>2.43*</td>
</tr>
<tr>
<td>Fear of success</td>
<td>4.9</td>
<td>4.8</td>
<td>0.57</td>
</tr>
</tbody>
</table>

*Unsuccessful students were those who either withdrew from or failed the course.

* $p < .05$.

**TABLE 2**

Intercorrelations Among Psychological Variables ($N = 250$)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Procrastination</td>
<td></td>
<td>-.25**</td>
<td>-.24**</td>
<td>-.17**</td>
<td>.11</td>
<td>-.16*</td>
<td>-.04</td>
</tr>
<tr>
<td>2 Optimism</td>
<td></td>
<td></td>
<td>.50**</td>
<td>.26**</td>
<td>-.29**</td>
<td>.32**</td>
<td>-.08</td>
</tr>
<tr>
<td>3 Self-esteem</td>
<td></td>
<td></td>
<td></td>
<td>.23**</td>
<td>-.11</td>
<td>.27*</td>
<td>-.08</td>
</tr>
<tr>
<td>4 Locus of control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.25**</td>
<td>.38**</td>
<td>-.02</td>
</tr>
<tr>
<td>5 Anxiety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.06</td>
<td>-.14</td>
</tr>
<tr>
<td>6 Need for achievement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.12</td>
</tr>
<tr>
<td>7 Fear of success</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05. **p < .01.
When implementing this type of design, students can increase the number of tries per unit increased, as did grades. Student four attempts to successfully complete a unit; the number of tries on unit exams supports the effectiveness of self-paced learning in developmental courses. In addition, students had four attempts to successfully complete a unit in the present study. This procedure would give procrastinators a significant amount of time to complete each unit successfully.

Although the original hypothesis was not supported, procrastination, anxiety, and achievement motivation all significantly predicted successful completion of the developmental math course. These results are consistent with Solomon and Rothblum’s (1984) finding of a negative correlation between procrastination and self-esteem and also support Lay’s (1988) hypothesis that there is a negative relation between procrastination and optimism. In the present study, both optimism and self-esteem were significantly correlated negatively with procrastination.

The relation between procrastination and optimism found in this study should be of interest to teacher and school counselors. Lay (1988) suggests that optimistic procrastinators may postpone doing something undesirable by underestimating the time needed to complete a task. Educators and school counselors may want to take this result into consideration and help optimistic procrastinators prioritize their projects.

To help students through their math courses, it is also important to deal with their self-perceptions. The present results indicate a relation between procrastination and low self-esteem and suggest that students who suffer from poor academic performance in math courses ideally should receive psychological support from family and friends as well as academic assistance from teachers to enhance self-esteem. The ability for students to work at their own pace and interact one-on-one with faculty members may be the type of assistance that is needed to increase student self-confidence.

The present finding relating to grades and number of tries on unit exams supports the effectiveness of self-paced learning in developmental courses. In this study, the self-paced class is designed to allow each student four attempts to successfully complete a unit; the number of tries per unit increased, as did grades. When implementing this type of design, students can strive for success in an area regardless of previous failure.

Overall, the results of this study clearly indicate that psychological variables should be considered in designing developmental math courses and in structuring support services for students enrolled in these types of classes. However, although this study indicates several needs with regard to developmental math courses, it is important to remember the need for replication before generalization. This study was conducted at one college in the Midwest; therefore, this study should be replicated using students from other geographic areas. In addition, researchers should conduct correlational studies involving the effectiveness of self-paced math courses and regularly designed math courses. If further research addresses these limitations, it may be possible to reduce students’ math anxiety and thus increase math proficiency.

References


Commuters’ Subjective Perceptions of Travel Impedance and Their Stress Levels

The purpose of this project was to investigate automobile commuters’ subjective perceptions of travel impedance and their driver stress. The distance and time of the commute in relation to driver stress were also assessed. Commuters with high driver stress reported higher subjective perceptions of travel impedance, but the commuters with longer distance and time commutes did not report greater driver stress. The findings indicate that one of the key factors in determining a commuter’s stress level is the perception of impedance rather than whether physical impedance actually occurred. These findings suggest that persons with short distance and time commutes also feel driver stress and that a commuter does not have to have a long-distance or time-consuming commute to experience driver stress.

AMANDA D. GRAY

JENNIFER L. LUCAS*

Agnes Scott College

Almost 90% of the labor force in the United States commutes to work while driving alone (Novaco, Stokols, & Milanesi, 1990). The experience of the commuter is particularly interesting for its potentially negative effects on both work organizations and home environments. Although commuting is a relatively common experience, little research has been conducted on this phenomenon (Kluger, 1998). Prior research has focused primarily on the manner in which the experience of commuting affects the commuter’s health and well-being. This study investigated subjective perceptions of travel impedance and their relation to driver stress. Although past research has looked specifically at the relations between subjective perceptions of travel impedance and driver stress, researchers have only investigated these two factors independently.

Novaco, Kliwer, and Broquet (1991) defined impedance as a behavioral impediment to motion or goal attainment. Impedance includes any factor that hinders the objective to arrive at a particular destination. Novaco et al. (1991) divided impedance into two categories, physical and subjective. Physical impedance refers to the concrete external factors of the commuting environment, and it has historically been measured by using the miles and minutes commuted. Subjective perception of travel impedance involves the commuters’ perception of the constraints of the commute. This variable is measured by the commuter’s self-report of the commute (e.g., number of times brakes were applied, reduction of travel speed due to traffic lights or stop signs, etc.). Koslowsky and Krausz (1993) hypothesized that commuters’ perceptions of the commute could have more influence on their stress levels than the actual physical experiences.

In a longitudinal study, Novaco et al. (1990) used commuters from Irvine, California, to investigate physical and subjective perceptions of travel impedance. They assessed health effects, mood at home after commuting, and satisfaction with work, commut-
ing, and home. The health effects included how often the commuter was absent from work due to illness and the number of self-reported physical ailments such as colds, flu, and chest pain. Novaco et al. (1990) did not find a relation between the number of sick days, colds, or incidences of flu and subjective perceptions of travel impedance, but they did find that subjective perceptions of travel impedance were related to the number of reports of chest pain. However, the sample was small: only 7 of 79 participants reported chest pain. Novaco et al. (1990) also found that higher levels of subjective perceptions of travel impedance were related to a more negative mood at home after commuting, and less residential satisfaction.

In a study of 99 commuters from two large industrial companies in Irvine, Novaco et al. (1991) did not find any significant relations between subjective perceptions of travel impedance and desire to move, residential satisfaction, home physical environment, or cocooning (i.e., home is seen by the person as insulating the person from the outside world). In support of their 1990 finding, the authors again found that subjective perceptions of travel impedance negatively affected commuters’ mood at home.

Several researchers have also assessed various forms of driver or commute stress. Researchers have measured driver stress by using both physiological and psychological reactions. Gulian, Debney, Glendon, Davies, and Matthews (1989) note that the definition of driver stress has been problematic because of its possible physical and psychological components. The present study looks at the psychological aspects of driver stress, which include frustration and negative feelings. Driver stress is different from subjective perceptions of travel impedance because it involves perceived constraints on travel.

Schaeffer, Street, Singer, and Baum (1998) studied governmental employees who commuted to work using automobiles. Twenty-seven of the commuters were single drivers, and 19 were car-pool drivers. Schaeffer et al. (1998) found that single drivers with high physical impedance had significantly higher blood pressure and decreased performance on behavioral tasks at work, as compared to their low-physical impedance peers. They operationalized physical impedance as total distance traveled and total time of the trip.

Koslowsky and Krausz (1993) studied nurses from several large hospitals in Israel to evaluate commuting and stress symptoms. They evaluated stress symptoms by using the Pines & Aronson (1981) burn-out scale. The results of their study showed that the increase in stress symptoms associated with increases in commute time was related to employee attitudes. Those participants reporting more stress symptoms also reported more negative attitudes about their jobs.

Novaco, Stokols, Campbell, and Stokols (1979) and Stokols, Novaco, Stokols, and Campbell (1978) investigated the effects of traffic congestion by studying industrial employees who commuted to work by automobile. Traffic congestion was defined as distance and duration of the commute. Stokols et al. (1978) found that the commuters with the longest distances and durations reported the most annoyance and traffic congestion. The authors reported that greater commute times and distances were related to tense and nervous moods and increases in systolic blood pressure.

Evans and Carrère (1991) also examined the effect of traffic congestion on drivers’ stress levels. However, they recruited male bus drivers in Los Angeles as participants and studied their physiological stress. Increased exposure to peak traffic was associated with elevated levels of urinary catecholamines for the bus drivers. Urinary catecholamines are a reliable and valid indicator of occupational stress during a workday (Frankenhaeuser & Johansson, 1986). The bus drivers also had more difficulty with their ability to adjust speed, change lanes, and maneuver into curbside areas to pick up and discharge passengers when they were exposed to increased traffic congestion.

Based on the previous research, we predicted that commuters with high subjective perceptions of travel impedance would report higher driver stress levels. We also predicted that the commuters with high driver stress would report commuting for longer distances and times.

Method

Participants

A 1997 study by the Environmental Protection Agency found that Atlantans have the longest average commute of any city worldwide, at 34.7 miles per day (Wischman, 1998). Therefore, we felt it would be appropriate to ask Atlanta-area commuters to participate in our research study.

One hundred and ninety-one Atlanta-area commuters completed the same survey using either the one posted on the Internet (n = 123) or a paper version (n = 68). The participants who chose to take the paper survey (M = 41.10) were older than the participants who chose to take the survey on the Internet (M = 36.23), but they did not differ in reported levels of education, distance of commute, or length of commute. Six participants were dropped from the study because they did not report working
at least 30 hr a week. We felt that it was important to use only full-time workers because they commute on a more regular basis than part-time workers. The final number of Atlanta commuters used in this study was 186, 66 men and 116 women (4 did not report sex). The participants reported their race as being Caucasian/White (89%), African American/Black (4%), Asian (3%), Hispanic (2%), and American Indian (1%). Two of the participants did not report their race. The average age of the sample was 37.62 years. The majority of the participants had a bachelor’s degree or higher (66%). The average number of miles commuted a day was 38.86, and the total time commuting both ways was 67.94 min.

Materials

Subjective perceptions of travel impedance. Novaco et al. (1990) developed the Subjective Impedance Scale (SI) to assess perceived constraints in driving. An example item is “How often is your average speed reduced by heavy traffic while traveling to work?” The SI consists of 11 items and has two subscales including Evening Congestion and General Congestion Aversiveness. The higher scores on a 7-point Likert scale (1 = never, 7 = always) indicated more perceived constraints in driving. We summed the ratings to obtain an overall subjective impedance score for each participant. Novaco et al. (1991) reported a Cronbach alpha reliability coefficient of .91 for their scale.

Trait driver stress. Hennessy and Wiesenthal (1997) developed the 11-item Trait Driver Stress Inventory (TDSI) by revising Gulian, Matthews, Glendon, Davies, and Debney’s (1989) Driving Behavior Inventory. Hennessy and Wiesenthal defined trait driver stress as an individual’s general disposition to stress related to driving. An example item is “When I drive I feel frustrated.” Higher scores on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree) indicated greater trait driver stress. We summed the ratings to obtain an overall trait driver stress score for each participant. Hennessy and Wiesenthal reported a Cronbach alpha reliability coefficient of .92 for their scale.

Procedure

The researchers gave paper surveys and the Internet address for the Internet survey to coworkers, friends, and family members living in the Atlanta area. Some of the participants recruited other participants to be in the study. The participants who used the Internet survey submitted their data electronically, and the participants who filled out the paper surveys used postage-paid envelopes to send back their responses. The participants’ contribution to the research was voluntary.

Results

We calculated intercorrelations for subjective perceptions of travel impedance, driver stress, distance commuted, and time commuted (see Table 1). All of the correlations were significant and positive, except driver stress was not reliably correlated with distance or time commuted. This finding was unexpected because we predicted that there would be a strong positive relation between those variables, with those who commuted longer distances and took longer times having higher driver stress.

<table>
<thead>
<tr>
<th>Subjective perceptions of travel impedance</th>
<th>Driver stress</th>
<th>Distance commuted</th>
<th>Time commuted</th>
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<tr>
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<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Driver stress</td>
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<td>—</td>
<td>—</td>
</tr>
<tr>
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<td>.16*</td>
<td>—.07</td>
<td>—</td>
</tr>
<tr>
<td>Time commuted</td>
<td>.31***</td>
<td>—.06</td>
<td>.74***</td>
</tr>
</tbody>
</table>

*p < .05. **p < .01. ***p < .001.
Hennessy and Wiesenthal (1997) did not find sex differences in driver stress. A t test was used to assess whether the male and female commuters in our study differed on their reported levels of driver stress. Because the men (M = 38.94, SD = 10.94) and women (M = 37.85, SD = 13.34) did not reliably differ on their reported levels of driver stress, t(171) = 0.55, p = .582, the rest of the analyses were combined.

We split the participants into three groups based on their total subjective perceptions of travel impedance scores in order to assess whether those participants with high subjective perceptions of travel impedance had higher driver stress. Past researchers (Novaco et al., 1991) split their sample into two groups of participants with high and low subjective perceptions of travel impedance, respectively, based on median splits, but the larger sample size in this study allowed us to include an additional intermediate stress group. The commuters above the 75th percentile were considered to have high subjective perceptions of travel impedance (total score of 61 to 77), and the commuters between the 25th and 75th percentile were considered to have average subjective perceptions of travel impedance (total score of 43 to 60). The commuters lower than the 25th percentile were considered to have low subjective perceptions of travel impedance (total score of 11 to 42).

A one-way analysis of variance (ANOVA) showed that the commuters with high, average, and low subjective perceptions of travel impedance reported significantly different levels of driver stress, F(2, 171) = 9.61, p < .0001. Scheffé comparisons indicated that the commuters with high subjective perceptions of travel impedance reported significantly (p < .05) higher driver stress (M = 45.54, SD = 13.74) than the commuters with average subjective perceptions of travel impedance (M = 37.98, SD = 11.47) and the commuters with low subjective perceptions of travel impedance (M = 31.00, SD = 12.88). The commuters with average subjective perceptions of travel impedance also reported significantly (p < .05) higher driver stress than the commuters with low subjective perceptions of travel impedance.

Again, a one-way ANOVA comparing commuters with high, average, and low driver stress and commute distances and time was calculated, and percentiles were used to determine high, average, or low groups. The commuters above the 75th percentile (total score of 49 to 77) were considered to have high driver stress, and the commuters between the 25th and 75th percentile (total score of 27 to 48) were considered to have average driver stress. The commuters lower than the 25th percentile (total score of 11 to 26) were considered to have low driver stress. The one-way ANOVAs did not reveal differences in driver stress as a function of the number of miles commuted, F(2, 172) = .524, p = .593, or the amount of commute time, F(2, 173) = .19, p = .825.

Discussion

As predicted, this study found that high subjective perceptions of travel impedance were related to higher driver stress in commuters. This finding is consistent with Koslowsky and Krausz’s (1993) hypothesis that commuters’ perception of their travel constraints could have more influence on their stress levels than the actual physical constraints. The findings of this study indicate that one of the key factors to determining a commuter’s stress level is the perception of impedance as opposed to whether physical impedance, as measured by the distance and time of the commute, actually occurred.

Commuters experiencing high driver stress as a result of subjective perceptions of travel impedance should look into eliminating some of their stress. They could reduce stress by changing their work hours to avoid the rush hour, car-pooling so they do not have to drive every day of the week, avoiding driving on congested interstates or highways, or using public transportation. These alternatives could help to reduce the subjective perceptions of travel impedance that commuters experience.

The commuters with high driver stress did not commute for longer distances or for longer amounts of time. These findings could mean that persons with short-distance and short-time commutes also feel driver stress and that a commuter does not have to have a long-distance or time-consuming commute to experience driver stress.

Driver stress, subjective perceptions of travel impedance, and the possible variables related to them should be studied further in future research. Past research has found commuting stress to be related to aggressive driving (Gulian, Matthews, et al., 1989) and poor concentration (Matthews, Dorn, & Glendon, 1991). Both aggressive driving and poor concentration can lead to road-rage incidents or accidents. Also, long-term stress effects from commuting can accumulate and carry over into other aspects of a person’s life (Hennessy & Wiesenthal, 1997). For example, stress from commuting could possibly affect the commuter’s productivity at work, and increase absences or illnesses (Kluger, 1998).

One limitation of this study was that the participants provided their information through the use of a self-report questionnaire using either an Internet survey or a paper survey. The self-report questionnaire was appropriate for assessing subjective perceptions.
of travel impedance and driver stress from a psychological perspective, but physical measures of driver stress also would have been useful. Another limitation of this study is the lack of diversity within the sample. The majority of the sample reported that they were Caucasian/White and they had completed a bachelor’s degree or higher, which is not typical of the entire Atlanta population. Future research should use groups from different racial/ethnic backgrounds to see if those persons reporting high subjective perceptions of travel impedance also reported higher driver stress levels. Finally, commuters who consistently report high driver stress or those whose driver stress varies with the daily varying experiences of subjective perceptions of travel impedance should be studied longitudinally.

References
Sincere appreciation is expressed for the hard work on the part of the following individuals who served as reviewers for this issue. Without the assistance of such dedicated professionals, the Psi Chi Journal simply would not be able to function!

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Psi Chi Research Awards and Grants

Psi Chi annually sponsors national undergraduate and graduate research award competitions, as well as research awards for members submitting the best research for the regional and national paper/poster sessions. Members are encouraged to begin research papers early to submit for presentation at local, state, regional, or national conventions. Chapters are encouraged to provide an opportunity for members to rehearse their papers before an audience prior to presenting them at a convention.

In addition, Psi Chi also sponsors programs to fund student and faculty research. Descriptions of the award/grant competitions follow. Further information and submission forms may be obtained from Psi Chi’s national website (www.psichi.org) or from the Psi Chi National Office, P.O. Box 709, Chattanooga, TN 37401-0709; telephone: (423) 756-2044; e-mail: psichi@psichi.org.

Guilford Awards

All Psi Chi undergraduate members are eligible to submit their research for the Psi Chi/J. P. Guilford Undergraduate Research Awards. Cash awards are $1,000 for first place, $650 for second place, and $350 for third place. In addition, all winners and their faculty research advisors receive award certificates. The abstracts of the winning papers, as well as photographs and brief biographies of the top three winners, are published in *Eye on Psi Chi*. The deadline for this award is May 1 (postmark).

Allyn & Bacon Awards

The Psi Chi/Allyn & Bacon Psychology Awards, sponsored by Allyn & Bacon Publishers, are open to all undergraduate Psi Chi members and are awarded to those who submit the best overall empirical research papers. The awards are $500 for first place, $300 for second place, and $200 for third place. In addition, all winners and their faculty research advisors receive award certificates. The abstracts of the winning papers, as well as photographs and brief biographies of the top three winners, are published in *Eye on Psi Chi*. The deadline for this award is April 1 (postmark).

Erlbaum Awards

The new Psi Chi/Erlbaum Awards in Cognitive Science, sponsored by publisher Lawrence Erlbaum Associates, Inc., are open to all Psi Chi undergraduate and graduate Psi Chi members and are awarded to those who submit the best overall empirical studies in the area of cognitive science. The awards are $500 for the first-place graduate student and $500 for the first-place undergraduate student. In addition, the winners and their faculty research advisors receive award certificates. The abstracts of the winning papers, as well as photo-
graphs and brief biographies of the top two winners, are to be published in *Eye on Psi Chi*. The deadline for this award is April 1 (postmark).

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All psychology graduate students are eligible to submit their research for the Psi Chi/APA Edwin B. Newman Graduate Research Award. The winner receives: (1) travel expenses to attend the APA/Psi Chi National Convention to receive the award, (2) a three-year subscription to an APA journal of the winner’s choice, and (3) two engraved plaques, one for the winner and one for the winner’s psychology department, as a permanent honor to the winner. In addition, the abstract of the winning paper, as well as a photograph and brief biography of the winner, is published in *Eye on Psi Chi*. This award is only student research award presented during the prestigious APA/APF Awards ceremony at the APA/Psi Chi National Convention in August. The deadline for this award is February 1 (postmark).

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All Psi Chi members (undergraduate and graduate) are eligible to submit their research for the Regional Research Awards. Cash awards of $300 each are presented to students submitting the best research papers to Psi Chi sessions at regional conventions. The number of awards in each region vary with the size of the regions; 78 awards of $300 each are available for the 2001–2002 year. Award monies are distributed at the conventions following the presentations. The Psi Chi regional vice-presidents each send a Call for Papers and a letter to the Psi Chi chapters in their respective regions during the fall. These letters include information about the Regional Research Awards, the regional conventions, and submission deadlines for Psi Chi programs. Deadlines for submissions vary according to region and sometimes from year to year; check your fall regional mailing or Psi Chi’s national website (www.psichi.org) for details.

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All Psi Chi members (undergraduate and graduate) are eligible to submit their research for the National Convention Research Awards. Cash awards of $300 each are presented to students submitting the best research for Psi Chi sessions at the APA and APS national conventions. Up to eight awards are given: four for the APA Convention and four for the APS Convention. Award monies are distributed at the conventions following the presentations. A Call for Proposals is mailed to all chapters in the fall and is also available from the Psi Chi National Office or the Psi Chi national website (www.psichi.org). The deadline for submissions to the Psi Chi student sessions at both the APA and APS conventions is December 1 (postmark).

**Hunt Research Awards**

All Psi Chi student and faculty members are eligible to apply for a Thelma Hunt Research Award. Up to three awards of $3,000 each will be presented annually to enable members to complete empirical research that addresses a question directly related to Psi Chi, as posed by either (1) the Psi Chi National Council or (2) the researcher submitting a proposal. Unlike other national Psi Chi award/grant programs, the Hunt Awards focus on research directly related to the mission of Psi Chi. The deadline for this award program is October 1 (postmark).

**Undergraduate Research Grants**

All undergraduate Psi Chi members are eligible to apply for these undergraduate research grants. The purpose of this program is to provide funds for members to defray the cost of conducting a research project. Applicants may request up to $1,500 for each project. A total of $45,000 has been allotted for this student grant program. The deadline for this grant program is October 1 (postmark).

**Faculty Advisor Research Grants**

All current faculty advisors and coadvisors who have served an active Psi Chi chapter for at least one year are eligible to apply for these new faculty advisor research grants. The purpose of this program is to provide funds for advisors to defray the direct costs of conducting a research project (no stipends included). Two grants will be awarded annually within each of Psi Chi’s six regions. The maximum amount of each grant will be $2,000. The deadline for this grant program is June 1 (postmark).
 Psi Chi Journal of Undergraduate Research

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